

2026
GRADUATE SCHOOL
ADMISSION GUIDE

DCIST



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01

Admission Guide

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I. 2026 Admissions Guidelines

Admission Schedule

Procedures	2026 Spring			2026 Fall
	1st	2nd	3rd	
Online Application	'25.6.26.(Thu)-7.10.(Thu)	'25.8.28.(Thu)-9.11.(Thu)	'25.11.6.(Thu)-11.20.(Thu)	'26.4.16.(Thu)-4.30.(Thu)
Document Screening Results	'25.7.29.(Tue) 14:00	'25.9.30.(Tue) 14:00	'25.12.9.(Tue) 14:00	'26.5.19.(Tue) 14:00
Interview	'25.8.4.(Mon)-8.11.(Mon)	'25.10.13.(Mon)-10.20.(Mon)	'25.12.15.(Mon)-12.22.(Mon)	'26.5.25.(Mon)-6.1.(Mon)
Final Results	'25.8.25.(Mon) 14:00	'25.11.3.(Mon) 14:00	'26.1.12.(Mon) 14:00	'26.6.15.(Mon) 14:00

- * Spring: March-June/Fall: September-December.
- * All dates are based on Korean Standard Time(KST).
- * The above information is subject to change depending on the academic year.

Eligibility

Course	Eligibility
Master's	Applicants who have acquired or are expected to acquire a Bachelor's degree by February 2026 (for Spring 2026 intake) or by August 2026 (for Fall 2026 intake).
Integrated MS&Ph.D.	
M.E.P.	
Ph.D.	Applicants who have acquired or are expected to acquire a Master's degree by February 2026 (for Spring 2026 intake) or by August 2026 (for Fall 2026 intake).

Additional Eligibility Requirements for the Department of Biomedical Science&Engineering

Category	Additional Eligibility Requirements
MD-PhD Program	- Integrated Master's and Doctoral Program: Candidates who have obtained(or are expected to obtain) a bachelor's degree or higher and are candidates for a medical license, dental license, or Korean medicine license. - Doctoral Program: Candidates who have obtained(or are expected to obtain) a master's degree or higher and are candidates for a medical license, dental license, or Korean medicine license. * Master's program is not being recruited.
Graduate Program in Biomedical Science and Engineering	- No additional eligibility requirements. * The eligibility requirements for government scholarship students, Daegu-Gyeongbuk Institute of Science and Technology scholarship students, and general scholarship students for the master's program, integrated master's and doctoral program, and doctoral program are the same.

Departments and Programs

Department	Major	Available Scholarship	Available Program
Physics and Chemistry		Government General	Master's Doctoral Integrated MS& Ph.D.
Electrical Engineering and Computer Science			
Robotics and Mechatronics Engineering			
Energy Science and Engineering			
Brain Sciences			
New Biology			
Interdisciplinary Studies	Interdisciplinary Engineering	DGIST	
	Artificial Intelligence	Government General DGIST	
	Biomedical Science&Engineering		
	Quantum Information Science		
Department of Advanced Technology	Graduate School of Engineering Practice	General	M.E.P.

- * Applicants to the Integrated MS&Ph.D. program may be considered for admission to the Master's program depending on the department's assessment.
- * All classes of DGIST Graduate School are delivered in English language.
- * Employed applicants have to apply for 'General Scholarship'. Applicants who are currently employed can apply 'Government Scholarship' or 'DGIST Scholarship' only if they retire before admissions.

Required Documents

Compulsory	1. Application Form	· Must be filled out on the online application website. · Must be written in Korean or English language. · Interdisciplinary Engineering It is necessary to contact a faculty member in the field of interest before submitting the online application. · Robotics and Mechatronics Engineering. * Ph.D. applicants only.
	2. Statement of Purpose (SoP)	- It is necessary to contact a faculty member in the field of interest before submitting the online application. - It is necessary to state the name of lab you wish to join on the Statement of Purpose(SoP). · Electrical Engineering and Computer Science It is necessary to mention one to three research areas that you are interested in, on the SoP.
	3.(Expected) Graduation Certificate	· Both Graduation Certificate and Official Transcripts must be in ENGLISH or accompanied by a NOTARIZED ENGLISH TRANSLATION, and uploaded through the online application. · Both Graduation Certificate and Official Transcripts must be NOTARIZED BY the KOREAN CONSULATE in your country or APOSTILLED. · While an Expected Graduation Certificate is acceptable, it is mandatory to submit the Graduation Certificate before the admission date. * Applicants who attended or graduate from schools in China must submit Verification Report on Education and Degree issued by the Chinese Ministry of Education(CHSI - 学信网).
	4. Academic Transcripts	· Master's and Integrated applicants. - Undergraduate Graduation Certificate. - Undergraduate Academic Transcripts. · Doctoral applicants. - Both Undergraduate and Graduate Graduation Certificate. - Both Undergraduate and Graduate Academic Transcripts. · New Biology Include your class rank in Academic Transcripts(if possible).
Optional	5. English Proficiency Certificate	· New Biology Interdisciplinary Engineering Mandatory to submit English language test report - New Biology Certificate available from the last 4 years before the application deadline. - Interdisciplinary Engineering Certificate available from the last 2 years before the application deadline. * Optional for applicants except for those applying to New Biology and Interdisciplinary Engineering. · Only official certificates are accepted(TOEIC, TOEFL IBT, TOEFL CBT, TOEFL PBT, IELTS, TEPS and etc.). · No minimum score required. · Exemption. - Applicants who have completed their degree program in the majority native English speaking countries. - Antigua and Barbuda, Australia, The Bahamas, Barbados, Belize, Canada, Dominica, Grenada, Guyana, Ireland, Jamaica, Malta, New Zealand, St Kitts and Nevis, St Vincent and the Grenadines, Trinidad and Tobago, United Kingdom, United States. - Applicants who have completed their degree program in the countries where English is the official language. - Applicants who have been admitted to DGIST Graduate School before.
	6. Letter of Recommendation	· Submitted directly by the evaluator(to admission@dgist.ac.kr). · Written on the prescribed form(available on the DGIST Graduate Admissions website). · No limitation of the number of recommendation letters. · Must be written in Korean or English language.
	7. Other Certificates	· Any other certificates demonstrating the competencies and potential.

Document
Notarization

- **Apostille Certification**
- Official public documents(from state or public schools)



- Private documents(from private schools)



- **Consular Authentication**
- Korean Embassy and Consulate in the country where the university(or college) is located

Visa Issuance



1. Admission results are released on DGIST International Graduate Admissions website.
2. Submit the original copies of Graduation Certificate and Academic Transcripts(consular notarized or apostilled) to DGIST Admissions Team.
3. Certificate of Admission(CoA) issued by DGIST Admissions Team.
4. Receive your CoA via email and the Welcome Packet via post.
5. Apply for a visa at the Korean consulate and embassy in your country.

Notes

- Original copies of your Graduation Certificate and Academic Transcripts with consular notarization(or apostille) must be submitted via international post to DGIST Admissions Team.
- Proof of postage(e.g. DHL invoice, etc.) must be emailed to the DGIST Admissions Team.
- Original copy of CoA is also sent to students by post as a part of Welcome Packet including Scholarship Letter and Business Registration Certificate.
- As required documents for visa issuance will be sent as scanned copies via email, it is recommended to apply for a visa with the provided soft copies(However, please note that some countries may require original copies, so it's necessary to check this with the consulate in advance).
- Contact the Korean consulate in your country for general enquiries regarding visa issuance.

Important
Notes

- **Application**
- The application form and Statement of Purpose(SoP) must be submitted through the online application portal(UwayApply).
- The accessible link to the online application will be announced on DGIST International Graduate Admissions website(<https://dgist.ac.kr/iadm/>).
- Please ensure that all required documents are successfully uploaded to the online application. Missing documents may result in the failure of document screening process.

· **Documentation**

- All required documents must be written in English.
- All required documents, except for the application form and SoP, must be combined into a single PDF file, and uploaded to the online application before the due date.
- Once documents are submitted to the Admissions Team, they will not be returned under any circumstances.
- If any submitted documents are found to contain false information, the applicant's admission will be canceled.
- Applicants who attended or graduate from schools in China must submit Verification Report on Education and Degree issued by the Chinese Ministry of Education.(CHSI-学信网).

↪ Organization: 教育部学生服务与素质发展中心

↪ Website: <http://www.chsi.com.cn>

· **Etc.**

- Applicants to the integrated Master-Ph.D. program may be admitted to the Master's program instead, depending on the evaluation results of the department/major.
- Applicants are fully responsible for any disadvantages resulting from errors or omissions in the provided information.
- The results for each stage of the graduate admission process are released on the DGIST International Graduate Admissions website. It is the responsibility of the applicant to check the results.
- If an admitted applicant is unable to graduate from their previous school by the enrollment date, which is the starting date of the semester, their admission will be canceled.

II. Scholarships

There are no additional application processes for DGIST scholarship benefits.
Once applicants are accepted into the graduate program, they will automatically receive benefits based on the type of scholarship they applied for.



Government Scholarship

Scholarships that cover all(or part) of a student's educational expenses funded by the Korean government.

Coverage

Full tuition(3.84 million KRW per semester)

Stipend

- Master's: A minimum of 9.6 million KRW annually + additional incentives
- Doctoral: A minimum of 14.04 million KRW annually + additional incentives

Applicable Departments

All departments excluding Interdisciplinary Engineering of Interdisciplinary Studies, Graduate School of Engineering Practice, Advanced Technology.

DGIST Scholarship

Scholarships that cover all(or part) of a student's educational expenses supported by funds established by DGIST.

The stipend amount depends on factors such as departments/majors or involvement in research. For details, please contact the relevant departments/majors or the intended advisor.

- ※ The rate and coverage may vary based on your involvement in research projects and performance.
- ※ In most cases, international students apply for Government Scholarship unless pre-arranged with the intended advisor.

Stipend

- Master's: A minimum of 15 million KRW annually + additional incentives
- Doctoral: A minimum of 22 million KRW annually + additional incentives

Applicable Departments

Interdisciplinary Engineering of Interdisciplinary Studies, Artificial Intelligence of Interdisciplinary Studies, Biomedical Science&Engineering of Interdisciplinary Studies, Quantum Information Science of Interdisciplinary Studies.

General Scholarship

Scholarships that cover all(or part) of a student's educational expenses supported by domestic and international businesses, research and educational institutes.

Applicable Departments

All departments excluding Interdisciplinary Engineering of Interdisciplinary Studies.

- ※ General Scholarship is available for applicants who wish to pursue graduate studies while working at a job(which supports their expenses).
- ※ The amount of additional incentives will vary depending on students' research performance.
- ※ The above information is subject to change depending on the academic year.

Q. Is it possible to view the application form, Statement of Purpose(SoP), or recommendation letter before submitting the online application?

The forms are available in the Archive section of DGIST International Graduate Admissions website(<https://dgist.ac.kr/iadm/>). However, applicants are required to submit the application form and Statement of Purpose(SoP) through the online application portal(UwayApply) for admission. Also, the recommendation letter must be submitted directly by the evaluator and within the online application period.

Q. If I am unable to submit a graduation certificate for the online application, what alternatives are available?

A certificate of enrollment can temporarily replace the graduation certificate for the online application, but the graduation certificate must be submitted after admission to DGIST.

Q. What should I do if my transcript does not include the grades of my last semester which I am currently in?

You can submit the most recent transcript, which should include the grades for all courses completed before your last semester.

Q. Are documents in languages other than English acceptable for the online application?

No, DGIST only accepts documents written in English. However, if your institution is unable to issue documents in English due to its policy, you may submit them in Korean instead.

Q. Does DGIST limit the number of students admitted for each Spring 1st, 2nd, 3rd, and Fall term?

There is no specific limitation or quota for the number of admitted students for each admission period. However, if the total number of students exceeds the maximum capacity for the academic year, we may close admission for Spring 2nd, 3rd, or Fall term.

Q. What is the difference between a DGIST Scholarship Student and other scholarship types?

DGIST Scholarship Students receive scholarships that cover all(or part) of their educational expenses, supported by funds established by DGIST. The stipend amount may vary depending on factors such as department, major, or research participation. For more information, please refer to the scholarship types described in the previous section.

Q. Are there any minimum academic eligibility requirements for graduate admission?

There are no specific minimum requirements for academic eligibility for graduate admission. Even if your undergraduate(or graduate) major differs from the one you are applying for, your diverse background can be an advantage for convergence research.

Q. Is it necessary to contact a faculty member in the field of my interest before applying?

It is not mandatory, but recommended to reach out to a faculty member in your field of interest to inquire about the capacity of the lab and the possibility of conducting research of your interest in advance. You can find information about each lab on DGIST International Graduate Admissions website.

Q. Can I change the application process(Master, Integration, Ph.D.) after submitting the application?

You can contact the admission team to change your application process during the application period. However, changes are not allowed once the application period has ended.

Q. Do I need to submit a graduation certificate from the university I attended before transferring?

You only need to submit an official academic transcript(in English) from your previous university.

Contact

· E. admission@dgist.ac.kr

· T. +82-53-785-5143/5146

· A. 333, Techno jungang-daero, Hyeonpung-eup, Dalseong-gun, Daegu, 42988, Republic of Korea

III. Programs for International Students

Buddy Program

- Before arrival in Korea, a DGIST enrolled student, known as a DGIST Buddy, will be paired with each new international student. The Buddy will assist the new student in adapting to life at DGIST by picking them up at the Dong-Daegu station, assisting with dormitory check-in, and being a friend for the semester.

Korean Language Class

- DGIST provides Korean language classes not only for international students, but also for other international members such as faculty, researchers, staff, and long-term visitors, as well as their families. Two different levels of classes, one for beginners and the other for post-beginners, are offered each semester. International students can take the courses after registration at DGIST, while other members and their families can audit the courses.
- * International students must take at least one Korean Language course to meet the requirements for graduation. Students who achieve TOPIK level 3 or higher, or receive recognition of their proficiency from the professor of the Korean Language course, may be exempted from taking the course.
- * Auditors can take the courses for free of charge, and textbooks are provided.

Cultural Events

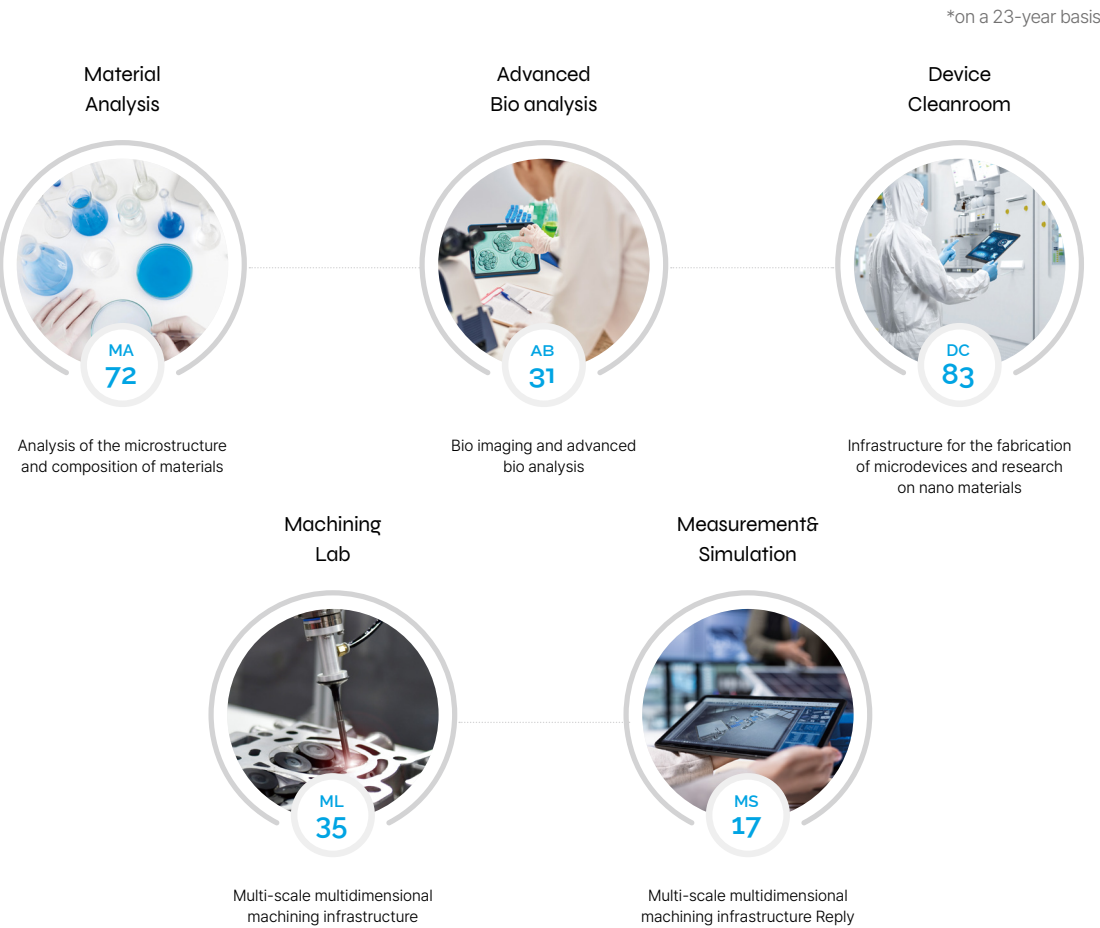
- The International Affairs Team provides cultural field trips to cultural and historical sites in Korea for all international members, aimed at enhancing their understanding of Korean business, culture, and history. These events are held once a semester, typically in May and October.



IV. Research Infrastructure

Institute of Next-generation Semiconductor Convergence Technology

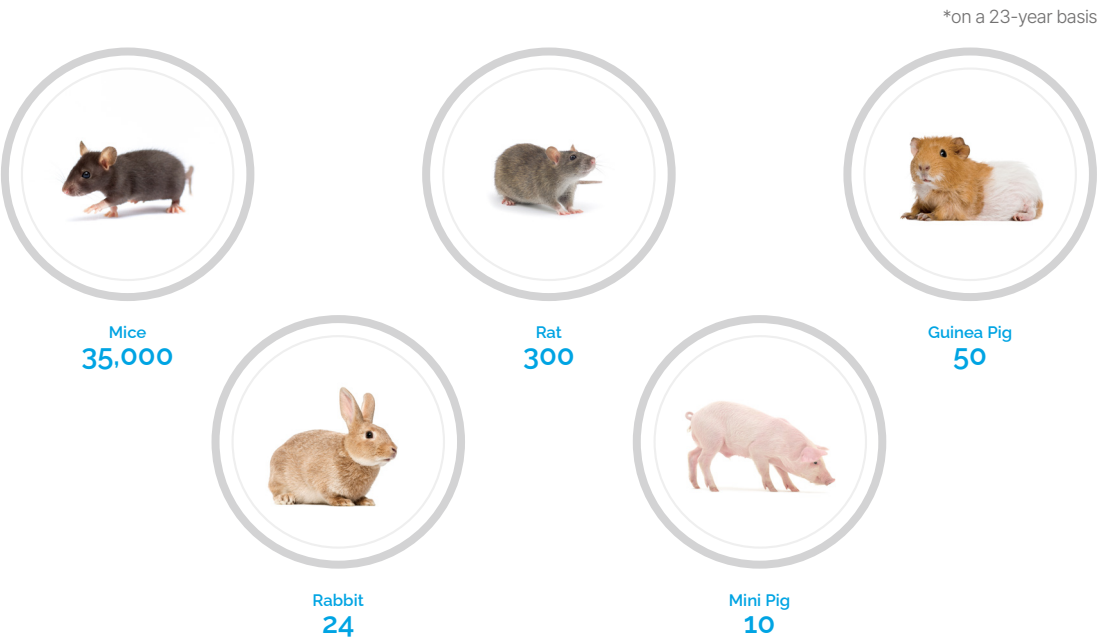
The best semiconductor research facilities at the university level in Korea.



- Through the CMOS module process infrastructure that only three universities(Seoul National University, KAIST and DGIST) have, it is possible to conduct semiconductor material verification and analysis in a single process.
- Users can conveniently check equipment availability and make reservations online at any time.
- The institute provides regular equipment and facility usage education program for students.

Laboratory Animal Resource Center

Provision of ethical, systematic management and technical support for animal experiments.



- The center provides experimental support for research in life sciences as well as biomedical engineering.
- In 2019, the Ministry of Food and Drug Safety in Korea qualified the center as the very first Korea Excellent Laboratory Animal Facility in Daegu.
- Variety of facility education programs are offered for both internal and external users.

Supercomputing AI Education and Research Center

Pursuing the development of converged science and technology based on supercomputing and big data.

- Development of DGIST's unique creative convergence education programs utilizing supercomputing.
- Research and development of globally competitive computational science and technology.
- Support for supercomputing R&D for external organizations, including research institutions and companies.
- Expansion of supercomputing-related human networks and ICT convergence culture.
- Development of AI and software(SW) educational programs and workforce training.
- Establishment and dissemination of industry-academia cooperation in AI and SW fields.

02 Departments and Majors

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III	Robotics and Mechatronics Engineering	044
IV	Energy Science and Engineering	056
V	Brain Sciences	064
VI	New Biology	076
VII	Interdisciplinary Studies	
	1. Interdisciplinary Engineering	092
	2. Artificial Intelligence	100
	3. Biomedical Science&Engineering	110
	4. Quantum Information Science	126

I. Physics and Chemistry

T. +82-53-785-6503

E. physchem@dgist.ac.kr

W. <http://physchem.dgist.ac.kr>

Mankind has innovated through the ages through endless development of new materials, both simple and complex, rather than rely solely on materials that exist naturally in the environment. Material sciences are a backbone of human history as well as contemporary science and technology.

The Department of Physics and Chemistry at DGIST seeks to contribute to the lives of future humanity by drawing on knowledge in chemistry and physics to develop new materials for the benefit of all of humanity. In particular, the department is a leader in technology-intensive material sciences through convergence of chemistry, physics, materials and biosciences, producing nanomaterials, functional materials, biomaterials, extreme materials and new drug materials needed by high-value industries. It drives technological trends and advances modern materials science while fostering global leaders and defining the future technologies.



Vision

- ✓ Research in contemporary physics and chemistry for new materials development
- ✓ Fostering creative talent
- ✓ Global leadership in research

Key areas of research

- ✓ Physical Perspective: Our research delves into advanced physical systems such as quantum materials, strongly correlated systems, topological structures, and superconductors, leveraging quantum mechanical approaches. We investigate optical and electronic behaviors in equilibrium and non-equilibrium states using ultrafast spectroscopy and electronic structure theory, uncovering new physical phenomena. This work also supports the development of quantum computing and quantum information science platforms
- Focus Areas: Quantum materials/devices, surface physics, spintronic devices, electron structure theory, next-generation semiconductors, ultrafast spectroscopy, quantum computing and machine learning-based materials
- ✓ Chemical Perspective: We design and synthesize functional materials like inorganic and organic molecules, supramolecular structures, organometallic compounds, nanoparticles, and high-performance polymers. Our work focuses on applications in catalysis, energy conversion, and sustainability. Using advanced techniques such as time-resolved spectroscopy and X-ray scattering, we analyze material properties and reaction mechanisms to address global challenges in energy and the environment
- Focus Areas: Catalysis, asymmetric organic synthesis, supramolecular chemistry, bioinspired materials, and structural dynamics

Research and Education Focus

- ✓ Multidisciplinary education and research combining advanced theories, experimental methods, and computational approaches in physics and chemistry for advanced materials and their applications
- ✓ Exploration of quantum materials, spintronics, next-generation semiconductors, quantum information science, synthesis, catalysis, materials chemistry, and ultrafast-spectroscopy, alongside the discovery of new physical and chemical phenomena
- ✓ Development of expertise to drive innovation in future materials, energy and environmental technologies, and quantum computing

Career paths

- ✓ Government-funded and corporate research institutes: Korea Research Institute of Chemical Technology, Korea Research Institute of Standards and Science, Korea Institute of Energy Research, Korea Advanced Institute of Science and Technology, Electronics and Telecommunications Research Institute, Korea Research Institute of Bioscience&Biotechnology, etc.
- ✓ Post-doctoral research: Labs in Korea, the U.S.and overseas Kolmar, etc.
- ✓ Machine learning-based materials research, ultrafast spectroscopy research

The interview process

- ✓ Inquiry into basic and applied knowledge in physics and chemistry, basic knowledge and character as a student of science, and future vision
- ✓ Oral presentation: Applicants for masters and combined masters&PhD programs are required to give a presentation on their understanding of important concepts acquired during bachelor's studies(English Powerpoint presentation, not exceeding 7minutes). Applicants for PhD programs are required to present their masters research anddoctoral research plans(English Powerpoint presentation, not exceeding 10 minutes)
- ✓ Applicants residing abroad and unable to present in person maybe inte viewed remotely

What topics are studied in the Department of Physics and Chemistry?

Physics and Chemistry are essential and breakthrough fields in the semiconductor and AI era.

In today's society, where Information(AI) and material(semiconductor) technology are highly valued, the role of chemistry and physics is to lead innovation and integration in these two fields. By learning basic theories and experimental techniques related to materials and energy, and conducting research on the latest material design, nanotechnology, semiconductor technology, biochemistry, and the environment, chemistry and physics plays an Important role in producing and storing new information. This specialized knowledge and skills are essential in the AI field, along with semiconductor technology, and are utilized in various fields. By conducting creative and innovative research in these fields, Physics and Chemistry students can grow into the future leaders who will lead the world.

As experts in cutting-edge research facilities and future convergent talents.

Department of physics and chemistry provides the best environment for learning and research, as well as the technology and equipment that will be used in actual research and industry. Through this, students can learn the experience and skills needed to solve problems based on theoretical knowledge. In particular, research is being conducted in a wide range of fields such as chemistry, physics, engineering, and life science, allowing students to choose their areas of interest to conduct research. Through this research

environment, our students can develop creativity, problem-solving skills required in the field, and practical skills.

What do students study in the Department of Physics and Chemistry?

The Department of Physics and Chemistry deals with convergence sciences, harmonizing the basic sciences, investigating the basic characteristics of matter through chemistry and physics, with applied sciences. Our academics are oriented toward cutting-edge convergence science encompassing physics, chemistry, biology and material sciences, and students explore new materials, biomaterials, nanomaterials, functional materials, flexible materials and other core areas important to progress in state-of-the-art sciences and industry.

What areas do students need to major in, and which courses must be completed to be eligible to apply for graduate studies in the Department of Physics and Chemistry?

The Department of Physics and Chemistry is involved in multidisciplinary convergence with a foundation in chemistry and physics. We encourage students holding degrees not only in chemistry and physics but also other natural and engineering sciences to apply. Any applicants with fundamental knowledge in general chemistry and physics and an interest in graduate level research may apply: Completion of chemistry and physics courses is preferred but not mandatory. Applicants accepted into our programs can consult with our faculty, with broad

expertise across a variety of academic fields, to decide their area of study.

What career opportunities are there for graduates of the Department of Physics and Chemistry?

Graduates holding advanced degrees from the Department of Physics and Chemistry may become professors or researchers at universities in Korea and abroad, or find employment in government-funded research institutes (Korea Research Institute of Chemical Technology and the Korea Research Institute of Standards and Science, etc.), private firms (Samsung Electronics, LG Electronics, SK Hynix, etc.), and public corporations. DGIST also operates a student-initiated research and entrepreneurship program with support from local government, further diversifying graduates' career options.

I'd like to know more about the labs at the Department of Physics and Chemistry.

Prof. Joon Goo Kang

[Chemical physics/machine learning/materials design](#)

Computational Materials Theory Lab

- Chemical physics-Materials research at the intersection of physics, chemistry, and computational science-First principles(Density functional theory, DFT) modeling of real materials
- Machine learning/materials design-New materials through high-throughput screening and machine learning-Materials design for energy and information applications

Prof. Seong Kyun Kim

[Inorganic Chemistry/Catalytic Chemistry/Energy&Environmental Materials](#)

Sustainable Chemistry Lab

- Catalytic Chemistry
 - Biomass, Waste Polymer, food waste Conversion Catalysts
- Energy&Environmental Materials
 - Solar Desalination Materials
 - Atmospheric Water Harvesting Materials
- Sustainable Materials from Biomass Conversion

Prof. So Yeun Kim

[Strongly Correlated Quantum Materials/Ultraviolet-Infrared Spectroscopy](#)

Correlated Matter Spectroscopy Lab

- Emergent phases in strongly correlated materials
 - Phase transition mechanism
 - Quasiparticle investigation
- Non-equilibrium and Equilibrium Optical Spectroscopy
 - Low-energy(infrared, terahertz) electrodynamics
 - Time-resolved polarimetry/scattering measurement

Prof. Aa Ram Kim

[Computational Quantum Many-Body Physics](#)

Quantum Many-Body Theory Group

- Developing computational algorithms for strongly-correlated systems
 - Diagrammatic Monte Carlo method
 - Dynamical mean-field Theory
- Emergent phenomena of strongly correlated systems
 - Model study of experimentally measurable response functions
 - Symmetry-breaking including superconductivity magnetism, and so on

Prof. Young Wook Kim

[Quantum Hall Effect/Topological Quantum Computing/Quantum Circuit](#)

Topological Quantum Device

- Quantum Hall Effect
 - Dissipationless quantized current in two-dimensional materials
- Topological Quantum Computing/Quantum Circuit
 - Build quantum circuit including topological quantum gate based on anyon

Prof. Jong Goo Kim

[Reaction Mechanism/Protein Structural Dynamics/Time-resolved X-ray](#)

Scattering

Reaction Mechanism&Structural Dynamics Lab

- Reaction Mechanism Study
 - Revealing reaction mechanism by visualization of real-time structural changes of molecules
 - Investigating transition states of reactions by tracking the wavepacket motion in the femtosecond region
- Protein Structural Dynamics
 - Investigating the kinetics and three-dimensional intermediate structures of protein-involved reactions
 - Elucidating reaction mechanisms of biological reactions using machine learning techniques

Prof. Cheol Gi Kim

[Spintronics Devices/Bio-NEMS&MEMS/Sensors](#)

Emerging materials science and multifunctional devices

- Novel spintronics devices
- Innovative 3D field sensors
- Bio-NEMS/MEMS
- Bio-initiative magnetic device

Prof. Hye Won Moon

[Inorganic Synthesis/Main Group Chemistry/Organometallic Chemistry](#)

Molecular Inorganic Synthesis and Catalysis Lab

- Molecular organometallic catalyst development
 - New ligand design and synthesis
 - Spectroscopic and crystallographic studies
 - Reactivity studies and reaction development
- Small molecule activation and reduction
 - Coordination chemistry of main group complexes
 - Main group(electro) catalysis development

Prof. Kee Seong Park

[Quantum Materials](#)

Novel Quantum Materials Lab

- Single Crystal Synthesis
 - Flux method, chemical vapor transport, etc.
 - Exploration of new quantum materials
 - topological materials/magnetic materials/superconductors
- Physical properties of Materials
 - Measurement of electrical, magnetic and thermal properties
 - Elastic and inelastic scattering using X-ray and neutrons

Prof. Jin Hee Park

[Organic-Inorganic Hybrid Materials](#)

Organic-Inorganic Hybrids Lab

- Functional Metal-Organic Frameworks/Polyhedra/Aerogels
 - Inorganic/organic/supramolecular chemistry-based synthesis
 - Development of stimuli-responsive smart materials
 - Studies of porous structures and functionalities
 - Energy and environmental applications: (photo)catalysis, sensing, and sorption

Prof. Dae Ha Seo

Nano-chemistry/Bio-physics/Cell biology

SMALL Lab

• Nanochemistry

- Synthesis and design of nanoparticles

- Single catalysis study

- Diagnosis and therapeutic research using nanoparticles

• Biophysics

- Single molecule/cell imaging, tracking, and AI analysis

- Biomolecular mechanism research through movie of cell signaling

- Diagnosis of diseases through physical parameters

Prof. Sang Won Seo

Organic Chemistry/Organometallic Chemistry/Catalysis

Chemical Design&Sustainable Catalysis

• Chemical Design

- Reaction development through design of new chemicals

• Base Metal Catalysis

- Design of new catalytic systems based on cheap base metals

- Mechanistic investigations using computational chemistry

• Biocatalysis

- Development of new chemoenzymatic catalysis

Prof. Jung Pil Seo

Quantum Physics/Topological Matters/Future Semiconductors

Nanospm Lab

• Quantum Physics

- Scanning Tunneling Microscopy

- Quantum Microscopy

• Topolgical Matters/Semiconductors

- Dirac Materials

- Superconducting Heterostructures

- 2D Semiconductors

Prof. Joo Young Sung

Time&Space-resolved Spectroscopy/Next Generation Energy Materials/Photophysical Dynamics

FemtoLab for Advanced Energy Materials

• Time and Space-resolvedS pectroscopy

- Investigation on photophysical properties of next generation energy materials by fs-transient absorption/reflection microscopy

• Next Generation Energy Materials/Photophysical Dynamics

- Charge carrier dynamics and photophysics of perovksites

- Charge carrier dynamics and photophysics of quantum dots

- Charge carrier dynamics and photophysics of two-dimensional semiconductors

Prof. Chun Yeol You

Spintronics/Magnetism

Spin Phenomena Information Nano-devices Lab

• Spintronics and emerging magnetic materials

- Spin nano devices for the next generation semi-conductor applications

- Non-volatility and ultra-fast devices

- High density and low power consumption memory devices

- Emerging spin phenomena and materials properties

- Close relationship with INST and Sensorium at DGIST

Prof. Sung Gi Lee

Organic Synthesis/Reaction and Catalyst Development

Organic Synthesis and Catalysis Lab

- Organic Synthesis

- Reaction and Catalyst Development

- Material Development

Prof. Sung Won Lee

Flexible electronics/Bio Sensors/Bio compatible device

Bio-harmonized device Lab

• Flexible electronics

- Development of extremely flexible&stretchable devices using hybrid materials

• Bio sensors/Bio compatible devices

- Sweat&Air permeable device fabrication for extremely bio compatible electronics

- Skin attachable bio sensors for long term health monitoring

- Development of implantable materials and devices

Prof. Shin Buhm Lee

Semiconductor/Energy/Sensor/Film/Nanostructure

Semiconductor Energy Sensor Lab

• Intelligent information technology

- Semiconductors for artificial intelligence system, Quantum computing display, automobile

• New energy industry

- Hydrogen economy, Transparent solar cell, All-solid-state nanobattery

• Bio-health

- Healthcare sensor, Medical material

Prof. Jae Dong Lee

Condensed Matter Physics Theory/Ultrafast Dynamics

Quantum Dynamics and Information Lab

• Ultrafast qunatum dynamics

- Quantum dynamics in ultrafast world

- Nonequilibrium phenomena

• Quantum information dynamics

- Extracting quantum information from spectroscopy simulation

- Development of quantum information

Prof. Nak Cheon Jeong

Inorganic Chemistry/Supramolecular Chemistry/Metal-Organic Framework(MOF)/Conducting materials

NC Laboratory of Advanced Inorganic Materials Chemistry

• Hybrid Organic-Inorganic Supramolecular Nanoporous Materials

- Synthesis of Supramolecular Materials

- Catalytic Activity Studies of Supramolecular Materials

- Research on Atmospheric Water Harvesting and Production

• Inorganic Materials

- Studies on Ionic Conductivity and Electrical Conductivity

- Research on Electron Transfer Reactions

- Investigation of Novel Chemical Bonds in Nanoscale Environments

Prof. Byung Hyuck Jung

Organic Synthesis/Asymmetric Catalysts/Natural Products and Drug Synthesis

Asymmetric Organic Synthesis and Drug Synthesis Lab

• Organic Synthesis

- Synthetic Studies of Novel C-C Bond Formation

• Asymmetric Catalysts

- Transition Metal-Catalyzed Asymmetric Synthesis

- Organocatalytic Asymmetric Synthesis

• Natural Products and Drug Synthesis

Prof. Chang Hee Cho

Semiconductors/Nanophotonics/Quantum Information Devices

Future Semiconductor Nanophotonics Lab

• Semiconductor Optics

- Physics of Excitons and Polaritons

- 2D/Perovskite Semiconductors

• Quantum Information Devices

- Polaritonic Devices for Quantum Information Processing

Prof. Seon Ki Hong

Organic/Polymeric Biomaterials

Bioinspired Organic Materials Lab

• Nature-inspired Emerging Materials

- Polyphenol-based adhesive organic/polymeric materials

• Materials for biomedical applications

- Nanomaterials for disease diagnosis and therapy

- Surface biofunctionalization

- Tissue-adhesive hydrogels, soft materials

Prof. Jung Il Hong

Spintronics/Magnetism/Nano Materials

Spin Nanotech Lab

• Nature-inspired Emerging Materials

- Electric and magnetic properties of nanomaterial

• Spintronics

- Thin films of metal, semiconductor, and oxide materials

Faculty

**Jin Hee Park** Professor/Department Chair

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Research interests: Stimuli-responsive organico/inorganic hybrid materials for energy and environmental applications
Career&Major achievements: Senior Researcher Korea Electrotechnology Research Institute(KERI)

**Joon Goo Kang** Associate Professor

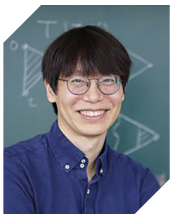
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Career&Major achievements: Senior Scientist | National Renewable Energy Laboratory(NREL)

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Research interests: Inorganic/Organometallic/Catalyst Chemistry | Polymer/Biomass | Water Treatment
Career&Major achievements: Postdoctoral Researcher in KAIST&UCLA | Researcher in SamsungCheil Industries&SK Innovation | College of Transdisciplinary Studies/DGIST

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Research interests: Emergent phenomena | Ultrafast-Infrared Spectroscopy
Career&Major achievements: Postdoctoral Researcher in University of Illinois at Urbana-Champaign, Stanford University/SLAC Natl.Accelerator Lab

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Career&Major achievements: Postdoctoral Researcher in University of Fribourg | King's College London | Goethe University

**Young Wook Kim** Associate Professor

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Research interests: 2D Materials | Quantum Device | Quantum Transport
Career&Major achievements: Postdoctoral Researcher in Max Planck Institute for Solid State Research | Alexander von Humboldt Fellow

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Research interests: Time-resolved X-ray Scattering | Reaction Mechanism Study | Protein Structural Dynamics
Career&Major achievements: Research Fellow at Institute for Basic Science(IBS)

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Research interests: Novel magnetic material | NEMS/MEMS devices | Nanobioelectronics
Career&Major achievements: Professor at Chungnam National University | Invited professor at Tohoku University&McMaster University | Director, Center of NanoBioEngineering&Spintronics

**Hye Won Moon** Assistant Professor

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Research interests: Inorganic synthesis | Main group chemistry | Organometallic chemistry
Career&Major achievements: Postdoctoral researcher at Max-Planck-Institut für Kohlenforschung

**Kee Seong Park** Assistant Professor

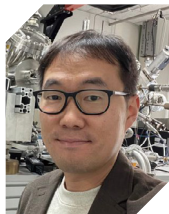
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Career&Major achievements: Postdoctoral researcher at Brookhaven National Laboratory | Research Associate at the University of Virginia | Assistant Professor in Undergraduate studies of DGIST

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**Jung Pil Seo** Professor

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Career&Major achievements: Postdoctoral Research Associate in Princeton University

**Joo Young Sung** Assistant Professor

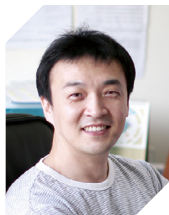
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**Chun Yeol You** Professor

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Research interests: Spin Nano-Devices | Condensed Matter Physics | Magnetic Materials&Thin Films
Career&Major achievements: Professor Dept of Physics, Inha University, Korea | Post-Doc, Argonne National Lab., USA

**Sung Gi Lee** Associate Professor

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Research interests: Organic synthesis | Catalysis | Asymmetric reactions | Radicals
Career&Major achievements: Postdoctoral Researcher in Max-Planck-Institut | Postdoctoral | Postdoctoral Researcher in Boston College | Senior Researcher in SK Innovation

**Sung Won Lee** Professor

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Research interests: Ultra-thin and Bio-Compatible, Device Fabrication and Bio Sensor development
Career&Major achievements: Postdoctoral Researcher in the University of Tokyo(Japan)

**Shin Buhm Lee** Professor

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Degree: Ph.D., Seoul National University
Research interests: Semiconductor Energy | Sensor
Career&Major achievements: Postdoctoral Researcher in University of Cambridge(UK) and Oak Ridge National Laboratory(US)

**Jae Dong Lee** Professor

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Research interests: Theory of solid state physics | Ultrafast dynamics | Nonequilibrium phenomena | First-principles calculation
Career&Major achievements: JAIST Associate Professor | NIMS-ICYS Fellow | CALTECH Researcher | Researcher at Tokyo University | MPI-FKF Researcher

**Nak Cheon Jeong** Professor/Associate Vice President for Academic Affairs

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Degree: Ph.D., Sogang University
Research interests: Inorganic Chemistry | Supramolecular Chemistry | Nanoporous Materials | Ionic Conductivity
Career&Major achievements: Postdoctoral Fellow at Northwestern University

**Byung Hyuck Jung** Associate Professor

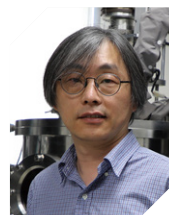
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Degree: Ph.D., KAIST
Research interests: Asymmetric Organic synthesis | Synthesis of Natural Products and Drugs
Career&Major achievements: Postdoctoral Researcher in Boston College | Postdoctoral Researcher in KAIST | Senior Researcher in Samsung Electro-mechanics | Assistant Professor in Undergraduate studies of DGIST

**Chang Hee Cho** Professor

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Research interests: Photonic semiconductors | Nanophotonics materials/devices
Career&Major achievements: Postdoctoral Researcher, University of Pennsylvania | Visiting Professor, POSTECH

**Seon Ki Hong** Associate Professor

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Degree: Ph.D., KAIST
Research interests: Nature-inspired biomaterials | Tissue adhesive hydrogels | Bioactive surface fabrication | Molecular diagnostics
Career&Major achievements: Postdoctoral researcher in Massachusetts General Hospital | Harvard Medical School

**Jung Il Hong** Professor/Director, DGIST-LBNL Research Center for Emerging Materials

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Degree: Ph.D., Northwestern University
Research interests: Electric and magnetic properties of nanomaterial systems
Career&Major achievements: Georgia Tech Research Faculty | CMRR(in Univ. of Cal.-SanDiego) Researcher | RPIABB Postdoctoral fellow

Interview

Q — Welcome. Please introduce yourself.

Hello. My name is Yu Hyeon-Hye, and I received my doctoral degree from the Department of Physics and Chemistry at DGIST. My advisor was professor Kim Chil-Min(Retired, Chair Professor in School of Undergraduate Studies, DGIST). My area of research was non-hermitian physics in 2-dimensional microlaser resonance mode dynamics, and am currently an OLED optics research engineer in a lab under the CTO at LG Display.

Q — What were your reasons for choosing the DGIST graduate school, and your department and lab here?

I majored physics as an undergraduate and chose to continue graduate-level studies to pursue my interest in optics. Research in optics generally involves experiments exploring the interactions between light and matter. I was drawn to the fact that I could engage in both experimental and theoretical research in my lab. In particular, I was able to encounter computing science while carrying out theory-based optics simulation research. Convergence is the motto of DGIST, and there are ample opportunities for cross-lab exchange and cooperative research. I appreciated the opportunity to explore and choose from a broad range of research areas.

Q — Please tell us about your area of research and research goals.

My lab is engaged in theoretical research on the nonhermitian characteristics apparent in resonance mode dynamics of 2-dimensional micro-scale resonators and quantum chaos phenomena in closed resonators(hermitian systems). Based on this research, we are developing extremely high-sensitivity bio-chemical sensors based on ultra-high Q-factor microlasers or lasers with exceptional points apparent in nonhermitian systems.

Q — Please tell us in detail about your career path after graduating from DGIST.

After graduating I sought career paths related to my research experience in optical simulation. I am currently in charge of OLED optic simulations at LG Display. Specifically, I am responsible for

There are many opportunities to conduct various exchanges and collaborative research between laboratories.



Hyeon Hye Yu

Department and Program | Physics and Chemistry, Ph.D.
Nationality | Republic of Korea
Assigned Lab | Micro Laser Lab.
Current Position | Research Engineer, LG Display

proposing and examining high optical extraction efficiency structures through wave and ray optical simulations in the structure between OLED elements and substrates. My research experience as a doctoral candidate was immensely helpful not only in my determining and adapting to my work responsibilities, and in taking on opportunities to engage in more indepth and interesting work.

Q — What sets DGIST apart from other universities?

DGIST affords students more opportunities to develop expertise in their areas of study and has a great research environment. Students also have access to various measuring equipment and well-equipped and well-staffed fabs. No tuition burden means students can focus solely on academics. There is a liberal atmosphere of exchange among labs, in which students can engage other students involved in other fields of research to broaden their horizons.

Q — Any words of advice to would-be DGIST graduates?

If you have an interest in academics and want to accumulate research experience, I strongly recommend graduate school. In graduate school, one learns how to carry out research in a proactive and self-initiated manner. Honing your professional skills in graduate schools will be helpful in choosing a career path that is right for you, and for adapting to your work environment. Making the most out of the methodologies available to you as you carry out your research-simulation tools and experimental/measuring equipment, for example - will increase your employment or further study opportunities after you receive your degree.

Q — Welcome. Please introduce yourself.

Hello, I am Young Kyoung Ha, who earned an integrated M.S.&Ph.D. degree in the Semiconductor Energy Sensor Lab.(Advisor: Professor Shin Buhm Lee) at the Department of Physics and Chemistry, DGIST. My research focuses on strongly correlated electron system in oxide films for transparent conductors and neuromorphic devices. Currently, I am working as an assistant professor in the Department of Materials Science and Engineering at Myongji University.

Q — What were your reasons for choosing the DGIST graduate school, and your department and lab here?

The reason I decided to pursue graduate school was that it would provide a more stable opportunity to continue my studies. Among various universities, I chose DGIST because I felt it aligned perfectly with my passion for academics and research, and I believed it would offer the ideal environment for focusing solely on research.

In particular, the Semiconductor Energy and Sensor Lab focuses not only on designing thin-film materials but also on analyzing and interpreting the physical properties of thin films based on a variety of theoretical frameworks. I was confident that this approach would greatly help me develop the ability to interpret research topics in a more integrated and comprehensive manner during my graduate studies.

Q — Please tell us about your area of research and research goals.

My research goal, both now and in the future, is to conduct studies that can benefit people in various fields. To achieve this, I have been developing and designing transparent conductive materials and devices that overcome existing limitations using oxide thin films with strongly correlated electron systems. I have also conducted research on next-generation semiconductor devices, specifically neuromorphic devices, by injecting ions into oxide thin films. By analyzing the physical and material-related issues, I proposed and implemented new materials based on physical theories to overcome these limitations. Currently, I am conducting research on designing nanostructures that can overcome the limitations of thin films using oxides, with the goal of developing biosensors.

Q — Please tell us in detail about your career path after graduating from DGIST.

After graduating from DGIST, I immediately worked as a postdoctoral researcher at the Max Planck Institute for Solid State Research in Germany. During my preparation for postdoctoral research, I focused on identifying the expertise and skills that I needed to enhance in order to

Anyone can easily access various state-of-the-art research equipment and DGIST offers extensive support to ensure that students can fully focus on both research and academics.



Young Kyoung Ha

Department and Program | Physics and Chemistry, Integrated M.S.&Ph.D.
Nationality | Republic of Korea
Assigned Lab | Semiconductor Energy Sensor Lab.
Current Position | Assistant Professor, Department of Materials Science and Engineering, Myongji University

become an outstanding researcher and gain strength and competitiveness. Based on these considerations, I established criteria and decided to pursue postdoctoral research at Max Planck Institute in Germany. During that period, I was able to acquire new skills that I felt were essential. Moreover, there were many opportunities to actively share and exchange academics knowledge with students, researchers, and professors from around the world. These experiences have become invaluable assets for me, and I am now continuing my research as an assistant professor in the Department of Materials Science and Engineering at Myongji University, building on everything that I have learned.

Q — What sets DGIST apart from other universities?

DGIST makes great efforts to provide research infrastructure. Anyone can easily access various state-of-the-art research equipment through DGIST's internal research institute. Additionally, DGIST offers extensive support to ensure that students can fully focus on both research and academics, which I find to be a significant advantage compared to other universities or institutes.

Moreover, all the professors at DGIST are highly passionate about their research and are deeply dedicated to mentoring and guiding their students. I believe that all these aspects of DGIST's research infrastructure enable researchers to enjoy their work and grow into outstanding scientists.

Q — Any words of advice to would-be DGIST graduates?

If you find that you are interested in academics and curious about research, becoming a graduate student at DGIST would be a great choice. I believe you can not only achieve academic and research accomplishments but develop the ability to solve problems proactively and independently, no matter what you pursue after graduation. I highly recommend participating in DGIST's internship program to gain research experience. It will help you make a good decision.

Also, if you are wondering, "Will I be able to do well?" Is this the right path for me?" I'd like to say that it's find to try first and decide later. If it's something you are interested in, I am sure you will eventually succeed, even if it takes time. And if you feel that your choice is not the right one, it will still be a valuable experience that helps you understand yourself better. All paths are find. Don't be afraid.

Lastly, I encourage you to embrace challenges and experience, including graduate school. Whatever choice or decision you make, I hope it leads you down a path that makes you happy. :)

II. Electrical Engineering and Computer Science

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Embracing the next generation through convergence of Electrical Engineering and Computer Science ICT industries that are dependent upon electrical engineering and computer science technology are one of the fastest growing ones in the world. For the future knowledge-based society, electrical engineering and computer science technology takes the key role in converging BioTechnology(BT), CultureTechnology(CT), EnergyTechnology(ET), NanoTechnology(NT), RobotTechnology(RT), and many more. We are seeking for ambitious, passionate, and enthusiastic students who have a vision for creative engineering research and development. The goal of Electrical Engineering and Computer Science department is to foster these students to have: 1) creativity for seeking new research and directions 2) practicality for solving real world problems 3) global networking to embrace international perspectives 4) social entrepreneurship for generating new value in existing and novel applications to advance the future industry.

Introduction to the department

In the Department of Electrical Engineering and Computer Science, we offer various education and research opportunities in electrical engineering, electrical engineering systems, and computer science. We are primarily focusing on core research areas such as Intelligent Computing Systems, Connected Smart Systems, Advanced Semiconductor, Bio-Medical Systems, Cyber-Physical Systems, and Artificial Intelligence(AI) techniques. Beyond traditional information and communication engineering areas, we are actively collaborating with other departments for diverse interdisciplinary research. With innovative education and research efforts, we aim to train leaders in academia and industry who develop core technologies in the future.

Vision

- ✓ Becoming the department of excellence with international academic recognition
- ✓ Advancing core technologies needed for the development of future industries
- ✓ Educating professionals equipped with both the ability of global research&development and the sense of technology management
- ✓ Opening up new fields through information and communication convergence with other fields of study

Key areas of research

- ✓ Select specialized major research areas and support them intensively
- ✓ Cluster the related specialized major research areas as centers
- ✓ Conduct convergence research between each field of information and communication and other fields of study

Specialized Research Fields

- | | |
|--|--|
| <ul style="list-style-type: none"> ✓ Intelligent Computing Systems <ul style="list-style-type: none"> - Big Data/Cloud Computer - Computer Architecture - Operating Systems - Storage Systems ✓ Advanced Semiconductor <ul style="list-style-type: none"> - Sensor Semiconductor IC - Next Generation Transistor - Neural Interface - Nano-electronic Device ✓ Cyber-Physical Systems <ul style="list-style-type: none"> - Realtime Embedded System - Resilient Transport System - Intelligent Transport System - Self-driving Car | <ul style="list-style-type: none"> ✓ Connected Smart Systems <ul style="list-style-type: none"> - Internet of Things - 5G Mobile Communication - Satellite Communication - Wireless Sensor Network ✓ Bio-Medical Systems <ul style="list-style-type: none"> - Brain-Machine Interface - Smart Healthcare - Bioinformatics - Bioelectronics |
|--|--|

- ✓ CPS Global Center
 - The CPS Global Center at DGIST, established in 2012, performs both fundamental research to develop new principles, models, and theories for CPS and inter-disciplinary research to apply CPS to a number of areas including automobiles and transportations
 - It is one of the biggest center in Korea dedicated to CPS research. The CPS Global Center has built a strong global research network with world-class researchers in CPS, actively collaborating with four participating institutes in USA: University of Virginia, University of Michigan, University of Pennsylvania, and Carnegie Mellon University
- ✓ Resilient Cyber-Physical Systems Research Center
 - DGIST research proposal on CPS resiliency won Korean government funding
 - Resilient Cyber-Physical Systems Research Center has begun 8 year journey of R&D for safe, convenient and energy-efficient future society
 - The center focuses on Real time Resilient Cyber-Physical Systems Software Technology that enables continuous operation despite external attacks or internal faults, reduced capacity operation if the severity of faults and attacks is too high to maintain full operation and graceful degradation if failure is inevitable
 - The outcome will contribute to the economic growth of local and national economy as well as technology based, safe, convenient and energy efficient society
- ✓ Brain Engineering Convergence Research Center
 - Selected by the Ministry of Science and ICT for the Biomedical Technology Development Project
 - The Center has developed a medical device source technology for treating various brain diseases such as Parkinson's disease, ementia, and cognitive disorders
- ✓ Research Center for Extreme Exploitation of Dark Data(EEDD)
 - Selected as an Engineering Research Centers(ERC) of the Ministry of Science and ICT and the Korea
- ✓ Research Foundation(KRF) in 2018
 - The center is doing research about the nation-wide next generation information platform that can extremely exploit dark data in the entire process of collection, storage, management, and analysis

Academic
Events

International Workshop on Cyber-Physical Systems(IWCPS): For developing collaboration research with the highest levels of national and international research institutions, CPS Global Center hosts annual workshop with the theme of the Cyber-Physical Systems.

Student Events

- ✓ EECS Student Conference: Gives opportunity to students to convey information about their thesis and research plans with sharing background knowledges. The workshop also cultivates paper writing and presentation skills
- ✓ Wook Hyun Kwon Outstanding Research Award/Kyu-Young Whang Outstanding Research Award: Based on exemplary academic skills and excellent research achievements of the students, give Wook Hyun Kwon/Kyu-Young Whang Outstanding Research Award and prize
- ✓ EECS Happy Hour: Along with pursuing healthy activities with all the department members, the event cultivates humanity through culture programs and promotes unity between the members

Convergence
with Other
Departments

- ✓ Convergence with Physics and Chemistry: Research on electronic devices based on new materials
- ✓ Convergence with Robotics and Mechatronics Engineering: CPS and brain mapping based rehabilitation robot technologies, Machine-learning based brain machine interface, Sensor and actuator wireless interface
- ✓ Convergence with Energy Science and Engineering: Energy IT convergence technologies including smart grid and renewable energy
- ✓ Convergence with Brain Sciences: Medical imaging, Biomedical signal processing, Nano devices with possible application to human body, Database and data mining for medical applications, Biomedical wireless communications and network
- ✓ Convergence with New Biology: Next Generation Sequencing(NGS) genome data analysis, Largescale protein mass spectrum data analysis

Career paths

- ✓ Faculty
- ✓ Government research institutes including Agency for Defense Development(ADD), Defense Agency for Technology Quality(DTaQ), Korea Testing Laboratory(KTL), Korea Airports Corporation
- ✓ Research centers of conglomerates companies including Samsung Electronics, LG Electronics, Samsung Display, Hyundai Motor Company, and Hyundai Mobis
- ✓ Prospective foreign and mid-sized industries including UL Korea, SL and Innowireless
- ✓ Ph.D. Course

The interview
process

- ✓ Oral examination about foundations and applications of information&communication, computer, electronics, mathematics, physics, chemistry, attitude, personality, and vision as an engineer
- ✓ English Presentation of up to 5 minutes(5 slides) about an important concept that you learned through your undergraduate core courses for MS degree applicants, and that is related to your future Ph.D. research for Ph.D. degree applicants
- ✓ A part of the interview will be conducted in English
- ✓ Online interview can be arranged for students residing outside Korea, upon early request



Student Conference

In the Department of Electrical Engineering and Computer Science, students take the initiative to plan and carry out programs, cultivating their leadership and teamwork skills. They also share knowledge among researchers and provide opportunities for feedback on research by communicating research findings through academic events



Development of Hybrid Structures for Graphene-Metallic Organic Structures with Hierarchical Porous Structures

- Professor Kwon Hyuk-joon's team at DGIST develops a "graphene-metal organic structure hybrid gas sensor" that can monitor the main culprit of fine dust in real time with a sensor that resembles "human lungs"
- Published online in May in the world-renowned journal Nature Communications



Professor Hwang Jae-youn's Team at DGIST: Drawing Characters with Ultrasonic Beams! Development of Deep Learning-Based Real-Time Ultrasound Hologram Generation Technology

- Proposal of a deep learning network and learning framework that allows real-time flexible configuration of ultrasonic beam shapes
- Featured as the cover paper in the February issue of the international academic journal "IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control."
- It is expected to lead to the development of patient-specific precision stimulation techniques in the field of ultrasound brain stimulation and therapy, targeting conditions such as Alzheimer's disease, depression, and pain

What topics are studied in the Department of Electrical Engineering and Computer Science?

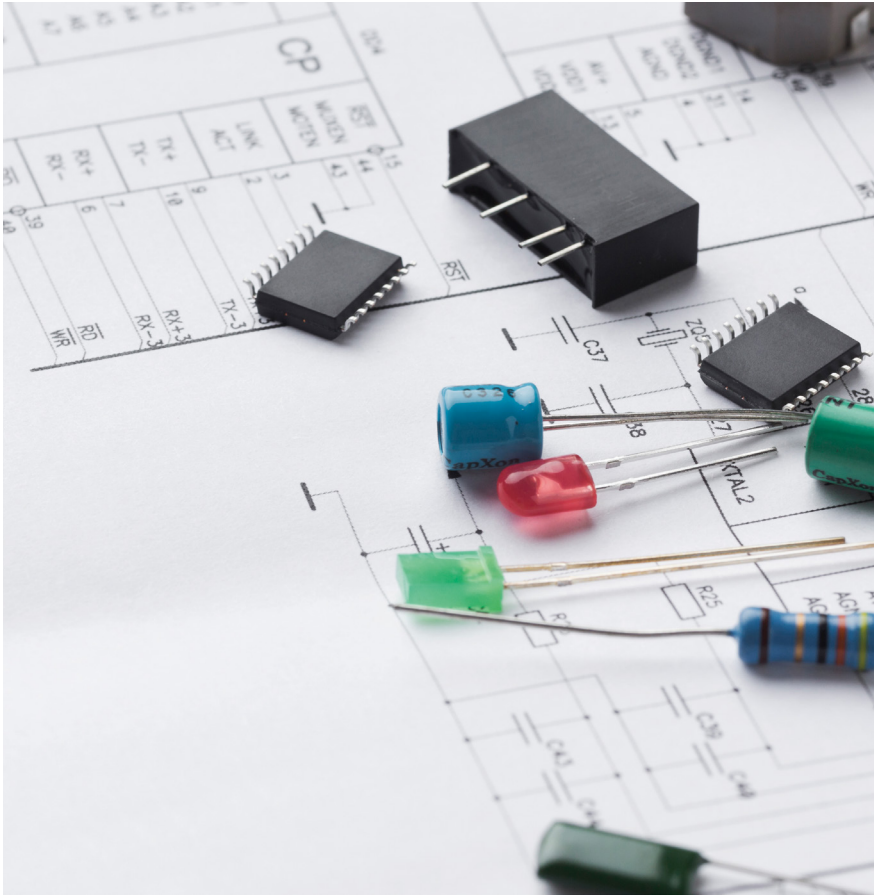
What do students study in the Department of Electrical Engineering and Computer Science?

Electrical Engineering and Computer Science department has a goal of fostering internationally competitive researchers and leaders. In order to pursue such a goal, we educate students with existing core technologies, such as information and communication, electronics, data processing, and electrical engineering to have fundamental skills sets. Furthermore, we ami to apply convergence technology in order to generate new ideas for technological transformation. To achieve these goals, we are researching various future convergence technologies through mutual cooperation with domestic and international institution sand researchers.

Ultimately, Electrical Engineering and Computer Science department embraces various research areas that will impact the development of convergence technology.

What are the prerequisites for applying to the Department of Electrical Engineering and Computer Science?

Electrical Engineering and Computer Science department emphasizes on converging various disciplines by fostering research that requires diverse technologies. Therefore, we encourage students not only from IT related fields, but also from other natural science and engineering fields to apply. Please do not hesitate applying to our department although you may not taken many IT related courses. However, you must have suitable knowledge and skill sets for your specific research interest.



I'd like to know more about the labs at the Department of Electrical Engineering and Computer Science.

Prof. Jin Ho Chang

Medical Acoustic Fusion Imaging and Therapy

- Wearable&Flexible device
- New signal and image processing algorithms to improve the efficiency of disease diagnosis
- High intensity focused ultrasound(HIFU) for cancer treatment
- Molecular imaging using photo acoustic effect
- Combined ultra sound and light techniques for imaging and therapy
- Improving the performance of optical imaging and treatment using ultrasound energy
- Deep learning algorithms for improvement of medical image quality
- New signal and image processing algorithms to improve the efficiency of disease diagnosis
- Ultrasound sensors
- New ultrasound sensors for ultrasound therapy, photoacoustic imaging, cell imaging, etc.

Prof. Ji Woong Choi

Communication System and Signal Processing/Machine Learning Research on communication theory and signal processing/machine learning technologies for advanced communication systems and biomedical system

- Future mobility system and communications
- Next-generation vehicle/robot/UAM(in-vehicle network/V2X) communications and security
- Physical layer security technologies including RF scanner, jamming/anti-jamming
- Core technologies for 5G/6G system
- Biomedical system based on brain-machine/computer interface(BM/BCI)
- Sensing/stimulation control system design for treatment of neurological disorders
- Functional brain connectivity based biomarker detection&diagnosis/screening algorithm
- Artificial five senses based on bio-mimic artificial sensors and signal processing/ AI technologies

Prof. Jae Ho Choi

Intelligent Radio Sensing

- AI+Radio
- Radio-centric AI framework
- Radar signal processing
- Next-generation wireless sensing systems
- Human perception with wireless signals
- Health monitoring with wireless signals
- Defense/Remote sensing
- Radar imaging(SAR/ISAR)
- Detection/Classification for threatening targets
- Multi-sensor fusion
- Multi-sensor(e.g., vision, lidar, radar, and IMU) signal processing and fusion

Prof. Hoon Sung Chwa

Real-Time Systems/Cyber-Physical Systems

- Advancing multi-core scheduling for real-time embedded systems
- Heterogeneous multi-core scheduling for smartphones
- Parallelism-oriented real-time multi-core scheduling for embedded systems
- Optimal real-time multi-core scheduling techniques
- Supporting real-time AI services for safety-critical systems
- Real-time scheduling platform design for multi-DNN real-tme inference in embedded systems
- Developing new computing resource management for cyber-physical systems
- Physical-state-aware dynamic cyber resource management for mixed-criticality systems
- Control-schedule co-design and new task model for cyber-physical systems
- Developing new thermal management for automotive systems
- Context-aware thermal management for automotive vision systems
- Thermal-aware adaptive resource management for real-time automotive systems

Prof. Yong Soon Eun

Cyber-Physical Systems and Feedback Control

- We carry out research on modeling of dynamic systems, advancing control theory and the applications to cyber-physical systems(CPS)
- Resilient CPS design methods
- Controls for systems with nonlinear actuators and sensors
- Geometric Control of UAVs
- Networked Control Systems
- City metro precision stop control

Prof. Jae Youn Hwang

Advanced Multimodal Biomedical Imaging System/Analysis and Mobile Healthcare Systems

- Multimodal biomedical imaging and Mobile Health-care Systems
- Mobile health-care systems and image/bio-signal processing
- Smart phone-based imaging system and image analysis for early detection of various diseases
- Wearable sensor systems and signal processing for mobile healthcare
- Advanced Multimodal imaging system and image analysis for detection of various diseases
- High-frequency ultrasound imaging system and signal processing
- Biomedical optical imaging system and image analysis

Prof. Sung Hoon Im

Computer Vision and Machine Learning

- 3D Computer Vision and Scene understanding
- 3D reconstruction: Mutli-view stereo, SLAM, Sensor fusion etc.
- Scene understanding: Segmentation, Optical flow, Motion estimation etc.
- Image&Video Generation&Editing
- Diffusion-based Generation&Editing
- AutoRgressive-based Generation&Editing
- Vision-Language Model
- Video-text Alignment
- Text-driven Image/Video Reasoning
- Vision-Language-Action Model
- Machine learning for computer vision
- Unsupervised/Weakly-supervised learning
- Transfer learning
- Multi-task learning

Prof. Jae Eun Jang

Advanced Electronic Devices

- Advanced transistor structure
- High performance tunneling transistor
- Next-generation vertical transistor structure
- Electronic devices for bio-applications
- Artificial tactile system
- Electronic nose system
- Artificial Intelligence(AI) devices
- Neuromorphic device based on ferroelectric materials
- Flexible neural probe
- Wireless transmission with micro-antenna

Prof. Baek Gyu Kim

High Assurance Software Systems

- Foundation of Systems and Software Assurance
- Model-based development
- Software Verification
- Automatic code and test generation
- Virtual Environment-Based Autonomous System Development
- Virtual test scenario generation
- Hardware/software interface design for virtual-in-to-loop test
- Automatic code and test generation
- QoS-Aware IoT Service Software Development
- Distributed computation models
- Workload characterization for Resource provisioning
- Fault-tolerance systems

Prof. Ga In Kim

Communication Circuits/Hardware Accelerator/FPGA

- Wireline/wireless communication circuits
- Low-power ultra-high-speed wireline transceivers for chip-to-chip interfaces
- High-performance 6G digital baseband modem
- Design of new modulation scheme for wireline transceivers
- Crosstalk cancellation for ultra-high-bandwidth chip-to-chip dense interconnects
- High-performance ADC design for wireline and wireless communications
- Multi-chip Hardware accelerators
- System architecture and circuit design for scalable multi-chip AI accelerators
- Design framework and compiler design for multi-chip AI accelerators
- Programmable System-on-Chip(SoC), FPGA
- Design automation of embedded FPGA for programmable SoC
- Beyond 5G/6G baseband modem design
- Real-time lost signal reconstruction algorithm and its design for wireless communications
- Programmable accelerator for homomorphic encryption

Prof. Kyoung Dae Kim

Autonomy/Reliability/Cooperation of Cyber-Physical System

- Cyber-Physical Transportation System
- Control theories and computational methods for autonomous driving and navigation
- Reinforcement learning for reliable and cooperative autonomous driving decision
- Collision-free and higher throughput intelligent intersection management.
- Planning and control of autonomous vehicle for high speed racing
- Robotics and Autonomous Multi-Agents Systems
- Theories for cooperative decision making of multi-agents system.
- Motion planning and control for cooperative collision avoidance of multi-agents system
- Modeling, analysis, and control for acrobatic and high speed maneuvers of UAV.
- Software framework for distributed realtime control system

Prof. Sun Jun Kim

Human-Computer Interaction and Interfaces/Smart Input Devices

- Quantitative performance measurement for Human-computer interaction system
- Performance metric development and measurement for human input/output interface devices
- Information throughput measurement methodology between human and computer systems based on information theory
- Smart interface optimization
- Design and implementation of interfaces with plasticity
- Optimization algorithm design concerning human factors
- Context-aware and personalized user interface performance optimization

Prof. Ye Seong Kim

Next-Generation Embedded Systems/HDComputing for Cognitive learning/Machine Learning

- Next-Generation Embedded Systems
- Efficient machine learning and applications for the Internet of Things(IoT) systems
- Self-learning embedded systems using reinforcement learning
- Hyperdimensional(HD) Computing
- Machine learning algorithms based on brain-inspired HD(High-Dimensional) computing
- Hardware acceleration using parallel computing platforms
- Low-power, high-efficiency intelligence systems based on cognitive science
- Machine Learning
- Deep learning acceleration using emerging computing technologies(e.g., processing in-memory, approximate computing)
- Performance/power prediction of learning algorithms on heterogeneous platforms
- HW/SW Co-design of Secure&Fault-Tolerant Computer Systems

Prof. Young Sik Kim

Applied Cryptography/AI Security/Privacy Enhancing Technologies/Smart Car Security

- Applied Cryptography
- Post-Quantum Cryptography(Lattice/Code-based) Design and Cryptanalysis
- Efficient Implementation of Post-Quantum Cryptography(SW/HW/PIM)
- Side-Channel Attack and Countermeasures
- Quantum Cryptography
- AI Security
- High-speed Implementation of Fully Homomorphic Encryption and Libraries
- Efficient Computation of Fully Homomorphic Encryption
- FHE-based AI(CNN/Transformer) Inference and Training
- FHE-MPC hybrid AI Security
- Privacy Enhancing Technologies
- Secure multi-party Computation and Secret Sharing
- Zero-knowledge proof
- Smart Car Security
- Vehicular Intrusion Detection/Tolerance Technology
- Security of Next Generation Vehicular Networks

Prof. Hyuk Jun Kwon

Next Generation Electrical Devices and Sensors/Pulsed Light Process/Flexible and Wearable Electronics

- Next Generation Devices and Sensors
- High performance transistors by using new materials(e.g.2Dmaterials)
- Sensors to augment human's five senses
- Intense Optical Pulsed Process
- New advanced fabrication process through ultra short pulsed light for nanoscale electrical devices(e.g. memory)
- Thermal analysis of the pulsed light process and their applications
- Flexible and Wearable Electronics
- Flexible/wearable and multi-functional monitoring system in real time
- Electrically and mechanically robust flexible platform
- Artificial Intelligence(AI) Devices
- Neuromorphic devices

Prof. Byeong Moon Lee

Skin Electronics/Intelligent Prosthetic&Bioelectronics/Additive Manufacturing

- Skin Electronics
- Functional soft nanocomposites
- Skin-like, implantable circuits and electronics
- Skin-like energy materials and devices
- Freeform display devices
- Intelligent Prosthetic&Bioelectronics
- Intelligent prosthesis based on machine learning for unconscious perception
- Neuromorphic sensorimotor systems
- Neural and bio-interfaces
- Additive Manufacturing
- Additive manufacturing for advanced semiconductor packaging
- Personalized skin electronics tailored for organs

Prof. Byung Kun Lee

Computational Optics and Biophotonic Imaging

- 3D wide-field/super-resolution/real-time laser imaging system
- Ultrahigh-speed wavelength-swept laser source
- Scan optics and scan patterns for blood flow imaging
- RF interference signal acquisition and digitization
- Three-dimensional complex-valued image processing
- 3D k-space image processing: computational defocus and aberration correction, aperture synthesis, angular compounding
- Spectral estimation for super-resolution
- Improving 3D k-space image processing speeds with machine learning
- Human and animal studies
- Retinal diseases: age-related macular degeneration, diabetic retinopathy
- Studying neurodegenerative diseases through retinal ganglion cells

Prof. Jung Hyup Lee

Integrated Circuits and Microsystems

- Analog&mixed-signal circuits and systems
- High-resolution, low-power ADC systems
- On-chip reference frequency generation systems
- Smart sensor interface ICs
- Low-power, high-precision current and voltage references
- Low-power biomedical microsystems
- Brain-computer interface microsystems
- Wearable biomedical devices
- Low-power, high-efficiency Bio-application AI systems
- Spiking Neural Network(SNN)-Based Neuromorphic Systems
- Analog-Based Neuron-Mimicking Circuit Design

Prof. Ki Joon Lee

Quantum and Biomedical Optics

- Noninvasive Deep Tissue Imaging and Spectroscopy
- Diffuse Optical Tomography, Functional Near-Infrared Spectroscopy
- Diffuse Correlation Spectroscopy, Diffuse Speckle Contrast Analysis
- Nonlinear Optics
- Random lasing and coherent backscattering in highly scattering medium
- Stimulated Raman Scattering, Spontaneous Parametric Down-Conversion
- Complexity Analysis of Biosignal
- Use of Sample Entropy for vascular health assessment
- Quantum Optics
- Use of Entanglement in Optical Coherence Tomography
- Fundamental study of Bell-type inequality violation

Prof. Kyoung Tae Lee

Integrated circuit based sensor circuits and systems

- Implantable sensors
- Wireless power transfer and communication algorithm and system
- Mm-scale in vivo dosimeter for cancer radiotherapy
- CNTFET-based single molecule sensor array IC design
- Li-ion battery monitoring and managing system
- Optimal charging/discharging scheduling and protocol
- Mm-scale Li-ion battery monitoring and controlling IC
- Li-ion lifetime maximization algorithm
- Hyper-dimensional Computing(HDC) IC
- Hardware-friendly HDC algorithm
- HDC accelerator digital IC design

Prof. Kyung Joon Park

Cyber-Physical Systems/Industrial Robots/Physical AI/Smart Manufacturing

- Physical AI
- Integration of Physical AI and industrial robots with industrial and military constraints
- Physical AI that enables multi-robot collaboration in wireless network environments
- Training and validating the reliability of Physical AI using digital twin platforms
- Robot Software
- Algorithms for mapping, localization, and path planning of Autonomous Mobile Robots(AMRs) in dynamic environments
- Software-based performance optimization of robotic systems to overcome the limitations of low-cost hardware
- AI-focused robot software architectures ensuring both stability and sustainability
- Robot Network
- Robot Operating System(ROS 2) utilized for Physical AI implementation
- Industry-oriented robot network optimization grounded in theoretical analyses of ROS 2
- Enhancing ROS 2 data distribution services for multi-robot and swarm drone systems
- Smart Manufacturing
- Real-time optimization and autonomous production lines utilizing autonomous robots and AI
- Predictive maintenance and process automation achieved through digital twin technologies
- Next-generation manufacturing solutions meeting safety, reliability, and sustainability

Prof. Dae Hee Park

Decision making AI/Multimodal AI

- Perception and prediction of surrounding environments
- Understanding environments using vision sensor data
- Anticipating future risks through predictive technologies
- Action planning
- Developing decision-making methods based on imitation/reinforcement learning
- Application to intelligent systems such as autonomous cars and robotics
- Multimodal learning
- Integrating visual, language, and motion data
- Researching applications using foundation models(LLM/VLM/VLA)

Prof. Dae Won Seo

Machine learning/statistical inference/information theory

- Machine learning theory
- Theoretical analysis of machine learning and deep learning systems
- Social learning theory
- Decision-making process over networks using statistical inference and information theory

Prof. Dong Hoon Shin

Theory of Computation/Networks/Security

- Theory of Computation
- Research on efficient algorithms with performance guarantees based on graph theory and computational geometry: Applying to various application fields(networks, security, graphics, etc.)
- Wireless Sensor Networks
- Research on improving network performance using the geographical characteristics of wireless sensors in Home IoT, Smart Factories, and Smart Cities
- Security for Critical Infrastructure
- Standardization for CIIP(Critical Information Infrastructure Protection) and research on security technologies

Prof. Jin Hyun So

Distributed AI/Federated Learning/On-device AI

- Federated Learning
- Federated learning for parameter efficient fine-tuning of foundation models
- Federated learning framework for multiple AI agents
- Federated continual learning
- On-device AI
- AI Model Compression/pruning
- Efficient ML for on-device learning
- Multi-modal AI
- Hallucination detection and correction framework for vision-language model
- Multi-modal representation learning for Bi-directional olfactory system

Prof. Min Young Song

Wireless Integrated Circuits and Systems |

Analog/RF/Mixed-Signal Integrated Circuits

- Design of Low-Power/High Energy-Efficient RF Integrated Circuits(ICs)
- Ultra-Low-Power RFIC design for Short-Range Radios(Bluetooth, WiFi, UWB)
- Energy-Efficient Wireless Transceiver IC Design
- IC Based High Integrated Wireless System Design for Internet-of-Things(IoT) and Biomedical Applications
- Research on Next-Generation Low-Power Wireless
- Communication System
- High Integration and System Miniaturization for Wireless Systems
- Radio Miniaturization for Tiny Sensor Nodes and Bio-Implanted Sensors
- Optimization of Communication Links in Various Environments
- Antenna-IC Co-Design
- Highly Efficient Wireless Power Transfer
- Analog/RF/Mixed-Signal Core Circuit Design
- Design of Oscillators, Clock Generators and Frequency Synthesizers
- Design of Low-Noise Amplifier(LNA), Mixers, Power Amplifier(PA), Filters

Prof. Jong Hyeok Yoon

Intelligent Integrated Circuits and Systems Lab

- Circuits for artificial intelligence(AI) systems
- Neuromorphic circuits and systems for automotive navigation
- Energy-efficient computing circuits for edge intelligence and tinyML
- Processing-in-memory(PIM) circuits and systems
- Resistive RAM(RRAM)-based compute-in-memory(CIM) circuits and systems
- Mixed-signal circuits for MAC accelerators
- High-speed wireline transceiver designs
- Multi-standard clock and data recovery architectures for backward compatibility
- Transceivers to support forthcoming Ethernet standards

Prof. Won Seok Choi

Cryptography/Distributed Computing/Privacy Enhancing Technologies

- Cryptography
- Symmetric-Key/Public-Key Cryptography
- Quantum/Post-Quantum Cryptography
- Secure Multi-Party Computation
- Distributed Computing
- Byzantine-Fault Tolerance
- Blockchain and Cryptocurrency
- Privacy Enhancing Technologies
- Differential Privacy in AI/ML

Faculty



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Career&Major achievements: Chair of The Interdisciplinary Studies of Artificial Intelligence and Super-Computing AI Education-Research Center | Professor, Chosun University | Senior Engineer, Samsung System LSI Division | Leader of Future Technology, National Academy of Engineering of Korea | The recipient of Prime Minister's Commendation(2024)



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Degree: Ph.D., Brown University, USA
Research interests: Predictive control | Time-delayed system | Industrial applications of digital control
Career&Major achievements: Korea Highest Scientist Award(2007) | Vice-President of Korean Academy of Science and Technology | President of IFAC | Vice-President of National Academy of Engineering of Korea | President of the Korean Institute of Electrical Engineers | Fellow of IEEE, TWAS, IFAC



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Research interests: Next Generation Electrical Devices and Sensors | Laser Process | Flexible/Wearable Electronics
Career&Major achievements: Process Engineer, Lam Research, USA | Postdoctoral Fellow, UC Berkeley, USA | R&D Staff, Samsung Advanced Institute of Technology(SAIT) | Gold Award, IMID(2013) | Outstanding Contribution Award, Samsung Electronics(2010)



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Degree: Ph.D., EPFL, Switzerland
Research interests: Wired/Wireless Communication Circuit | Hardware Accelerator | Reconfigurable Semiconductor Circuit
Career&Major achievements: chievements. Postdoctoral Researcher, KAIST | Senior Researcher, Samsung Research | IEEE CASS Pre-doctoral scholarship Award(2018)



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Degree: Ph.D., University of Illinois at Urbana-Champaign
Research interests: Autonomy | Reliability | Cooperation of Cyber-PhysicalSystem
Career&Major achievements: Assistant Professor, University of Denver, USA | Postdoctoral Research Associate, Texas A&M University, USA



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Research interests: Embedded Software | Software Verification | Autonomous Systems
Career&Major achievements: Principal Researcher, Toyota Motor North America R&D | Top Inventor Award, Toyota InfoTechnology Center, U.S.A | SAE Vincent Bendix Automotive Electronics Engineering Award(Best Paper Award)



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Research interests: Human-Computer Interaction(HCI)
Career&Major achievements: Postdoctoral researchers in Aalto University, Finland | ACM CHI honorable mention awards(2013, 2018) | ACM ISS best application paper(2018) | NAVER Ph.D. fellowship(2016) | ACM UIST student innovation contest awards(2011, 2012, 2014)



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Career&Major achievements: Samsung Research America | Intel, USA



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Research interests: Cyber-Physical Systems | Industrial Robots | Physical AI | Smart Manufacturing
Career&Major achievements: Senior Engineer, Samsung Electronics | Postdoctoral Research Associate, UIUC | Associate Editor, IEEE Trans on Industrial CPS | Top 100 Outstanding Achievements in National R&D(2023)



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Degree: Ph.D., KAIST
Research interests: Decision-Making AI | Multimodal AI | Autonomous Systems
Career&Major achievements: Ph.D. Research Intern, Qualcomm Autonomous Driving Research(2024) | Ph.D. Research Intern, NAVER LABS(2021) | IPIU Best Paper Awards Grand Prize(2022) | Qualcomm Innovation Fellowship(2024)



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Degree: Ph.D., University of Illinois Urbana-Champaign, USA
Research interests: Artificial Intelligence | Social networks | Information theory
Career&Major achievements: Postdoctoral Researcher, USC | Postdoctoral Researcher, UW-Madison



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Degree: Ph.D., University of Southern California, USA
Research interests: Distributed AI | Federated Learning | On-device AI
Career&Major achievements: Staff Research Engineer, Samsung Cellular&Multimedia Lab, USA(2022-2024) | Ph.D. Research Intern, Microsoft Research, USA(2021) | Engineer, Samsung Model Development Team, South Korea(2013-2017) | Best Paper Award, 2020 NeurIPS Workshop



Sang Hyuk Son Chair Professor

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Research interests: Real-time systems | Wireless sensor network | Cyber physical system | Data and event services | Information security
Career&Major achievements: IEEE Fellow | The President of Korean Computer Scientists and Engineers Association | Chair of the IEEE Computer Society Technical Committee on Real-Time Systems | WCU Chair Professor, Sogang University | Outstanding Contribution Award, IEEE RTCSA | Outstanding Contribution Award, ACM/IEEE Cyber Physical Systems Week | Professor, Department of Computer Science at the University of Virginia, USA(1986-2012) | DGIST 3rd President(2017-2018)



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Degree: Ph.D., Korea University
Research interests: Low-Power Wireless Integrated Circuits and System for IoT and Biomedicines(Communication and Radar) | Low-Power, High-Performance Analog/RF Core Circuit Design
Career&Major achievements: IEEE Senior Member | Researcher, imec, Europe(Tech. lead of low-power RFIC design) | Senior Engineer, Samsung System LSI Division | 2022 IEEE Brain and Solid-State Circuits Joint-Society Best Paper Award Honorable Mention



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Research interests: Theory of Computation | Networks | Security
Career&Major achievements: NHNKP | Senior Researcher, National Security Research Institute



Jong Hyeok Yoon Associate Professor

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Degree: Ph.D., KAIST, Rep. of Korea
Research interests: Edge intelligence | Processing-in-memory(PIM) architecture | Clock and data recovery | Mixed-signal circuit design
Career&Major achievements: Postdoctoral fellow, Georgia Institute of Technology



Yong Soon Eun

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Research interests: Control theory for cyber-physical systems | Resilient cyber-physical systems | Control systems with nonlinear sensors and actuators | Cyclic control | Performance improvability of control systems | Variable structure control
Career&Major achievements: Senior Research Scientist, Xerox Research Center Webster, Xerox Corporation | Co-author of the book <Quasilinear control>(2011) | Xerox Innovation Group Excellence in Research and Technology Award(2011) | 2nd Asian Control Conference Young Author Award(1997)



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Research interests: Biomedical sensor system design | Low power sensor IC design | Li-ion management system design
Career&Major achievements: Researcher, KAIST IT Convergence Center | Postdoctoral researcher, University of California San Francisco



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Research interests: Biosignal Processing and Bio Imaging | Diffuse Optical Tomography | Diffuse Correlation Spectroscopy
Career&Major achievements: Postdoc at Univ of Pennsylvania | Assistant Professor in Bioengineering at Nanyang Technological University, Singapore | Best Teaching Award at DGIST(2015)



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Research interests: Biomedical Optical Imaging Systems | Computational Imaging | AI-Based In Vivo High-Resolution Imaging
Career&Major achievements: Postdoctoral Researcher, KAIST | BK21 Fellow



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Research interests: Skin Electronics/Intelligent Prosthetic&Bioelectronics/Additive Manufacturing
Career&Major achievements: Postdoctoral Scholar, KIST | Postdoctoral Scholar, Stanford University | Samsung Humantech Paper Award(2020) | Doyeon Academic Paper Award(2021) | Sejong Science Fellowship(2021) | MRS Best Oral Presentation Award(2023)



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Research interests: Recommendation Systems | Social Network Analysis | Machine Learning | Smart Factory
Career&Major achievements: Postdoctoral Researcher, Computer Science Dept., Carnegie Mellon Univ. | Senior Data Scientist(Researcher), Bigdata Analytics Team, Hyundai Heavy Industries



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Research interests: Integrated circuits and microsystems | Analog&mixed-signal circuit design | Brain-computer interface ICs
Career&Major achievements: Scientist, A*STAR, Singapore | IEEE ISSCC TPC | Silver prize(2024, 2023), Participation prize(2022), Samsung HumanTech Paper Award | Prime Minister's Award(2023), Minister's Award(2024), Korea Semiconductor Design Contest | DGIST Outstanding Scholar Award(2019) | Best paper award(2019, 2018), Korea Conference on Semiconductor | Best design award(2018), IEEE/ACM ASP-DAC



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Career&Major achievements: Vising Scholar, Carnegie Mellon University, USA | Microsoft Research Asia Fellow(2018) | Samsung HumanTec Paper Award(2016, 2022, 2024) | Qualcomm Innovation Award(2016) | The Electronic News ICT Paper Competition Grand Prize(2024), Excellence Prize(2023) | AFCV best robot vision paper(2023) | IEIE Outstanding New Researcher Award(2024)



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Research interests: Nanotechnology applications for advanced electrical devices
Career&Major achievements: Principle Senior Researcher, Samsung Advanced Institute of Technology | Outstanding Paper Award, IMID(2010) | Innovative Invention Award, Samsung Electronics(2009) | Samsung Best Paper Award(2008)



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Research interests: Medical Ultrasound Imaging&Therapy
Photoacoustic Imaging Ultrasound Sensors Biomedical Signal&Image Processing
Career&Major achievements: Postdoctoral Research Associate, NIH UTRC Center, USC | Associate Editor of IEEE TUFFC | IEEE IUS TPC | Board Member, Korea Engineering Deans Council | Board Member, the Institute for Promotion of Engineering and Science of Korea | Board Member, Daegu National Science Museum | Review Board, National Strategic R&D Programs, National Research Foundation of Korea | Medical Device Review Committee, the Ministry of Food and Drug Safety, Korea | Board Member, the Korea Society of Medical&Biological Engineering | Board Member, the Korean Society for Therapeutic Ultrasound | Board Member, the Acoustic Society of Korea | 2024 Award, Minister of Science and ICT of Korea | 2023 Best Paper, The Korean Society for Therapeutic Ultrasound | 2018 Best Paper, The Korean Society of Medical&Biological Engineering



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Research interests: Real-Time Systems | Cyber-Physical Systems | Real-Time AI Services | Mobile Systems
Career&Major achievements: Research Fellow, University of Michigan, USA | Best Paper Award, IEEE RTSS 2012 | Best Paper Award, IEEE CPSNA 2014



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Research interests: Quantum and Post-Quantum Cryptography | Distributed Computing and Blockchain Applications | Privacy Enhancing Technologies and AI/ML Applications
Career&Major achievements: Postdoc, Purdue Univ. and GeorgiaTech | Postdoc, KIAS | Sejong Science Fellowship(2023) | Korea Crypto Contest Grand Prize(2020, 2018) and First Prize(2023, 2022, 2021, 2020)



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Degree: Ph.D., POSTECH, Rep. of Korea
Research interests: AI+Radio | Radar Signal Processing | Wireless Sensing System | Sensor Fusion
Career&Major achievements: Postdoctoral Researcher, Stanford University, USA(2023-2024) | Postdoctoral Researcher, Next-Gen. Defense Technology Research Center, POSTECH(2023)



Ji Woong Choi Professor, Director of Brain Engineering Convergence Research Center(BCC)
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Degree: Ph.D., Seoul National University, Rep. of Korea
Research interests: Communication theory and signal processing/machine learing techniques for wired and wireless communication systems | Bio-medical signal processing for brain machine/computer interface(BMI/BCI)
Career&Major achievements: Staff Engineer, Marvell Semiconductor, CA, USA | Postdoctoral Researcher, Stanford University | IEEE Senior Member | DGIST 20th Anniversary Award(2024) | Minister's Award(2023) | Silver Award, Samsung Human-Tech Paper Competition(2005) | Executive Director, Korean Institute of Communications and Information Sciences | Co-EIC and Director, The Korean Association of Mobility Studies | Director, The Korean Society of Automotive Engineers | Delegate, The Korean Society for Brain and Neural Sciences | Board Member, Hansol Technics | VSI Cofounder(acquired by US fabless company, 2024) | Journal Editor of IEEE TMBMC and JCN | RB Member, KRF



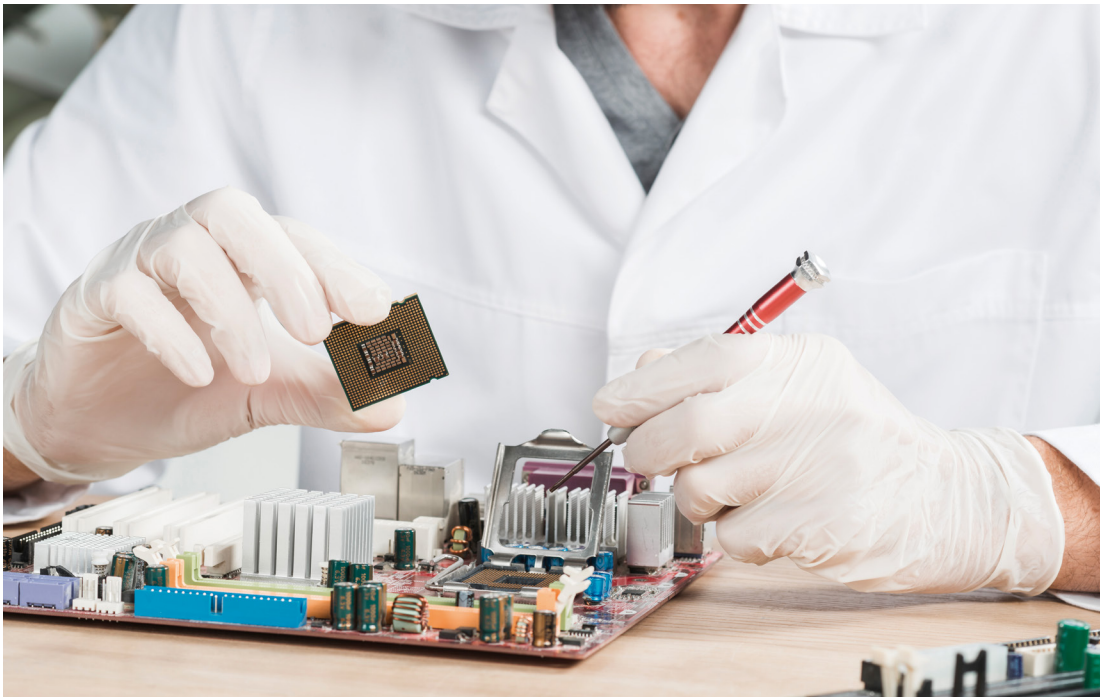
Kyu Young Whang Distinguished Chair Professor
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Degree: Ph.D., Stanford University, USA
Research interests: Intelligent · Information Service | Database | Search Engines
Career&Major achievements: Senior Engineer, Agency for Defense Development(ADD), Korea | IBM T.J. Watson Research Center, Research Staff Memeber | Chairman, Computer Science Department, KAIST | Director, Academic Information Management, Computing, and Science Library, KAIST | Director, Advanced Information Technology Research Center(AITrc)-an Engineering Research Center(ERC) of Excellence supported by Korea Science and Engineering Foundation(KOSEF) | Professor, Computer Science Department, KAIST | KAIST Distinguished Professor



Jae Youn Hwang Professor
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Degree: Ph.D., University of Southern California, USA
Research interests: Biomedical devices | Brain-computer interfaces | Integrated circuits and microsystems
Career&Major achievements: Scientist, Institute of Microelectronics, A*STAR, Singapore | IEEE ISSCC TPC Silver prize(2024, 2023), Participation prize(2022), Samsung HumanTech Paper Award | Prime Minister's Award(2023), Minister's Award(2024), Korea Semiconductor Design Contest | DGIST Outstanding Scholar Award(2019) | Best paper award(2019, 2018), Korea Conference on Semiconductor | Best design award(2018), IEEE/ACM ASP-DAC



Arup K. George Research Professor
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Degree: Ph.D, Nanyang Technological University, Singapore
Research interests: Analog and Mixed Signal Design | Ultra Low Power Sensor Interface Circuit Design
Career&Major achievements: Sr. Engineer, Nvidia Graphics | Postdoctoral Researcher, DGIST | Analog and Mixed Signal Design Engineer, Morse Micro



Interview

The scope of the field of view is broadened by convergence research with researchers in various fields.



Bahareh Behboodi

Department and Program |
Electrical Engineering and Computer Science, M.S
Nationality_ Iran
Assigned Lab | Lab of Communication and Signal Processing
(Prof. Ji Woong Choi)

Q — What are you planning to do after graduation?

My goal is to become an expert in my field of research. For this reason, I would like to pursue further education. After I graduate from DGIST, I would like to find a Ph.D. position and continue my research in the area that I am studying now.

Q — Please advise our applicants.

As a friendly suggestion, for attending DGIST, first you need to find a laboratory with a research field compatible to yours, then just make contact with its supervisor. Supervisors at DGIST have strong backgrounds in their fields and kindly consider international attendees as well as Korean students. I hope you will find the most suitable laboratory for your study and get scholarship benefits at DGIST.

Q — Welcome. Please introduce yourself.

The most important considerations were finding scholarships and an open position in a laboratory whose research focus is aligned with my interests. DGIST was a suitable option for me as I got a fully funded Master student position that covered both my tuition and living expenses. These days, it is getting increasingly difficult to find funded master degree positions in many parts of the world. Furthermore, I was lucky to find a laboratory in neuroimaging, which is a field that I love. In a nutshell, I had a fully funded position in a field I loved, so I just went for that and applied to DGIST.

Q — What are the strong points of DGIST and the department of Electrical Engineering and Computer Science?

DGIST has a great amount of available facilities. At DGIST, you can easily have access to any device that you may need in your filed of research. Especially, in the lab I am working in, we have a yearly allocated budget for buying new devices that we need for research. We are encouraged to submit papers to reputed international conferences and journals. If our papers are accepted, we get the opportunity to attend that conference, all expenses paid. I had a chance to attend a conference in Paris in the first year I joined DGIST and it was an amazing learning experience.

Q — Explain your research field and purpose at DGIST.

My background is in biomedical engineering and my research interest is neuroimaging using functionalmagnetic resonance imaging(fMRI) as well as functional near-infrared spectroscopy(fNIRS). At DGIST, I am working on signal processing of fNIRS based brain computer inter faces(BCI), which is a promising neuroimaging modality useful for patients suffering from motor impairments.

III. Robotics and Mechatronics Engineering

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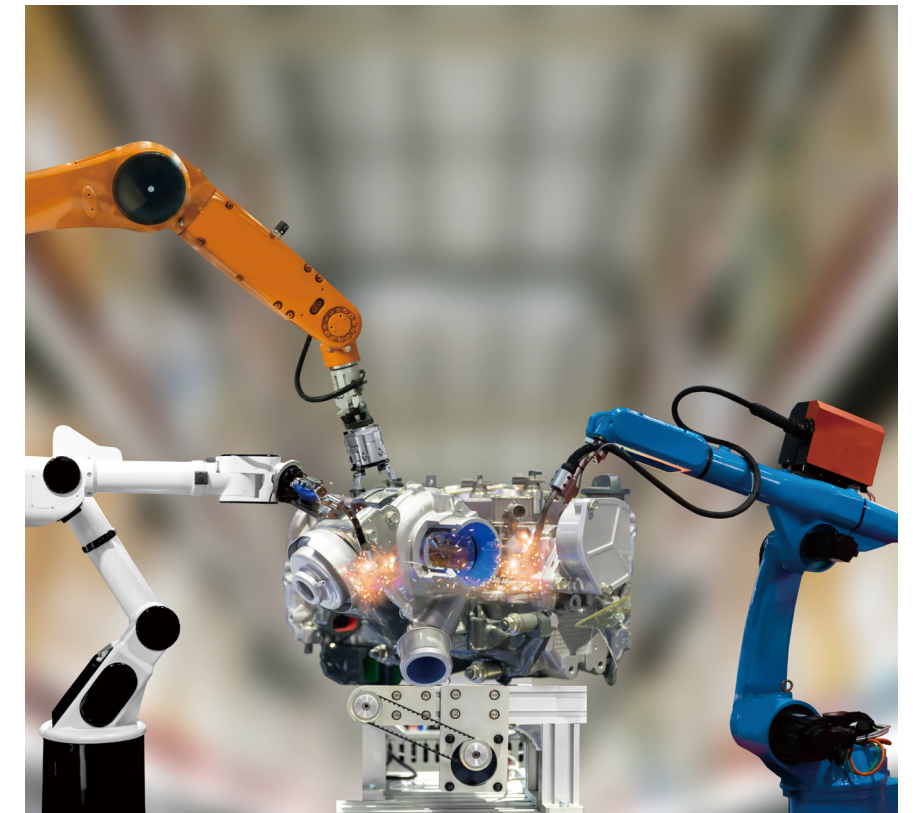
Department of Robotics and Mechatronics Engineering focuses on conducting field-leading researches as well as educating highly motivated students with strong multifisciplinary fundamentals. We cover a broad range of research areas in Robotics, Electrical and Mechanical engineering, Materials science, and Biomedical engineering. Our goal is to develop new technology that can impact our daily lives. Robotics and Mechatronics Engineering is a multidisciplinary field of study that converges core technologies from Mechanical, Electrical, Biomedical, and Computer Science and Engineering. Our research topics ranges from intelligent robots to nano technology with various applications areas. Of course, our strength also lies on biomedical applications as well as artificial intelligence.

Vision

“Pioneering the Future of Robotics: Where Humans and Technology Evolve Together”
At DGIST RME, we envision a future where robots are not just machines, but intuitive partners—thinking, sensing, learning, and evolving alongside us. Robots are the ultimate embodiment of artificial intelligence, bridging the digital and physical worlds with unmatched precision and adaptability.
Our research breaks through the boundaries of disciplines—uniting mechanical and electrical engineering, computer science, biomedical technology, and beyond. Through this convergence, we create next-generation robots that are more intelligent, more responsive, and more human-centered than ever before. We are building a world where robotics expands the limits of human potential, transforms industries, enhances healthcare, and leads us toward a more sustainable, intelligent future. Join us at DGIST RME—where the future of human-robot symbiosis begins.

Educational and Research Framework

“Robotic Mechanics + Robotic Electronics + Robotic Intelligence”
Our program is dedicated to advancing next-generation robotics by conducting integrated research across scales—from nano and micro systems to full-scale robotic platforms.
✓ Education: We provide a multidisciplinary curriculum that fuses mechanical engineering, electrical engineering, and computer science. Students develop the ability to synthesize diverse engineering knowledge and apply it to real-world, problem-solving scenarios.
✓ Research: We offer a collaborative research environment that supports convergence across robotics domains. Through active partnerships with leading global institutions, we are building a world-class research network, fostering the development of future robotics leaders with a truly international outlook.



Specialized
Research Fields

At the Department of Robotics and Mechatronics Engineering, we pursue core technologies in robotics-including mechanism design, motion control, precision sensing, intelligent perception, and biomechanical integration. Beyond these foundations, our research extends into diverse application fields such as biomedical engineering, materials science, semiconductor technologies, and autonomous systems. Through this multidisciplinary approach, we aim to pioneer next-generation integrated robotics that drive innovation across future industries.

- ✓ The Muscles and Skeleton-Structure and Actuation

- Robotic mechanism design and manipulation

- Bio-inspired locomotion systems

- Soft actuators and sensors

- Mechatronic integration

- Surgical and rehabilitation robots
- ✓ The Brain and Nerves-Intelligence and Autonomy

- AI-based motion control systems

- Physical AI and embodied intelligence

- Autonomous navigation and flight control

- Brain-machine interfaces(BMI) and neural links

- Neuromorphic and intelligent devices
- ✓ The Eyes-Vision and Perception

- Advanced imaging and sensing systems

- Intelligent vision for robotic perception

- Perception/Decision-making/SLAM

- Ultrasound and medical imaging
- ✓ The Cells-Miniaturized and Autonomous Robotics

- Micro/hano robotic systems

- Bio-opto-mechatronics

- Biomedical microsystems
- ✓ The Skin-Sensing and Interaction with the World

- Flexible and stretchable sensors

- Electronic skin and smart sensing materials

- Tactile intelligence and feedback systems
- ✓ The Materials-Functional Robotic Components

- Advanced materials for flexible electronics

- Quantum and optoelectronic devices

- Microfluidic robotic systems
- ✓ The Whole Body-Humanlike Integration

- Dual-arm, quadruped, and biped robots

- Full-body humanoid platforms

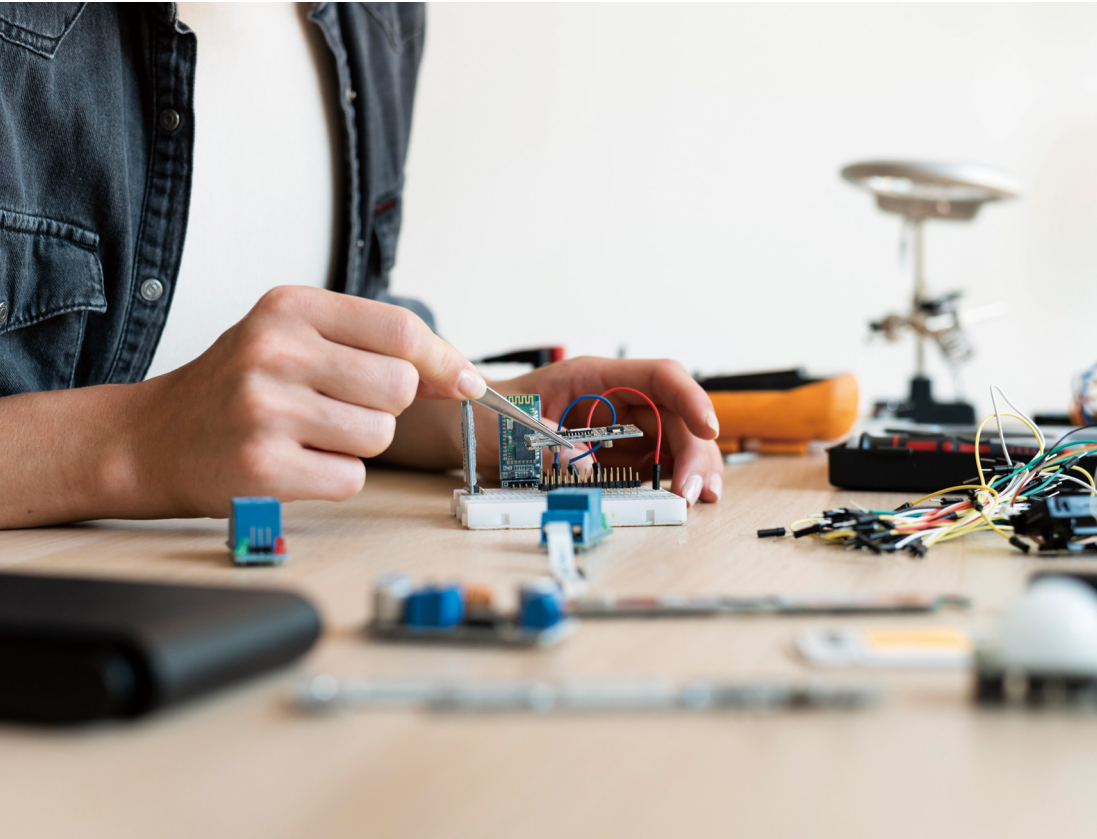
- Human-robot interaction and co-adaptation

Convergence
with Other
Departments

- ✓ Although DGIST is still at its growing stage, the Robotics and Mechatronics Engineering Department will conduct an international education-research program called "Global Alliance Program" that collaborates with world leading universities
- ✓ The department will invite world renowned professors to give lectures, co-supervise student thesis, and conduct cooperative research
- ✓ The department will promote exchange of visits at the level of professor/research staff, and students internship programs in order to encourage thir international experience

The interview
Contents

- ✓ Questions on fundamental knowledge of the robotics related subjects or courses, enthusiasm for research, potential ability to be a scholar, communication ability, etc. in both English and Korean
- ✓ A short presentation in English on the research experience, achievements, research plan, etc. for about 3 minutes and 5 minutes for M.S. and Ph.D. respectively
- ✓ Online interview can be arranged for students residing outside Korea, upon early request



Who should
apply to graduate
studies in the
department of
Robotics and
Mechatronics
Engineering?

The field of robotics and mechatronics engineering is very broad and multidisciplinary. This is why our department members are from many different majors, such as mechanical, electrical, and biomedical engineering, as well as computer science and materials engineering. Even though the student is from different majors or has less-experience in robotics and mechatronics, our department offers a wide range of courses to bolter your academic basics. If you are a type of person who enjoys an active collaboration and wants to work on real-life problems, the department of Robotics and Mechatronics is the right place to be.

Why DGIST
Robotics and
Mechatronics is
the right career
decision?

Our department offers very competitive financial support to graduate students, including full tuition waiver, monthly stipend, national scholarships, and department fellowships. In addition, our department owns one of the best research facilities for manufacturing, microfabrication, robot prototyping, etc. Many students attend international conferences to present their work. After graduation, our alumni became faculty members in top level universities around the globe. Also, many students went to national research labs as well as companies, including Samsung, Hyundai, SK, etc.

Faculty



Se Hoon Oh Department Chair

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Degree: Ph.D., University of Tokyo
Research interests: Motion control | High precision control and application | Electric vehicle control | Novel Actuator and control | Learning and control of manipulator | Quadruped robot and control
Career&Major achievements: Project Assistant Professor, University of Tokyo | Visiting Scholar, University of Texas at Austin | Senior Engineer, Samsung Heavy Industries | Guest Professor at Osaka University | IEEE IES AdCom member | Best paper award(IEEE TIE)

Motion Control Lab

- Robot Control
 - Development and control of manipulators and quadruped robots
 - Dynamic model analysis and multi-degree-of-freedom control using these models
- Vehicle Mechanism Control
 - Development and control of new suspension systems, steering systems, and braking systems
 - Control strategies to enhance vehicle safety, improve ride comfort, and achieve a fun-to-drive experience
- Precision Control
 - Vibration suppression control for industrial robots
 - Precision position control for semiconductor equipment and machining tools
 - Data-driven controller design



Yong Seob Lim Associate Professor

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Degree: Ph.D., University of Michigan-Ann Arbor
Research interests: Autonomous driving and mobile robotic systems and control | Intelligent Mechatronic systems and control
Career&Major achievements: Principle research engineer, Samsung/HanwhaTechwin | Research engineer, Hyundai Motor Company | UGRP Best Research Project Award, DGIST | Robert M. Caddell Memorial Award for Research, University of Michigan

Autonomous Systems and Control Lab

- Artificial intelligence(AI)-based perception, decision and control for autonomous driving and mobile robotic system
- Development of perception network models based on vision, LiDAR and Radar sensor fusion using deep learning
- Study of control algorithm based on autonomous driving system dynamics using deep learning
- Development and theory verification research with real-world self-driving car and autonomous mobile robot platforms



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Degree: Ph.D., KAIST
Research interests: Mobile Robotics | SLAM(Simultaneous Localization and Mapping) | Sensor Fusion | Autonomous Driving
Career&Major achievements: Research Scientist, Naver Labs(2021-2024)

Autonomy and Perceptual Robotics Lab(APRL)

- Sensor fusion and SLAM(Simultaneous Localization and Mapping) research for robots
- Development of robust SLAM and autonomous navigation techniques capable of operating in ultra-large-scale indoor/outdoor environments, complex indoor spaces, and extreme conditions
- State estimation and Mapping algorithms for Wheeled and Humanoid robots
 - SLAM 2.0 for Robot Web era
 - Neural Map Representations
- Semantic and Social context-aware Visual Language Navigation
- AI in the Physical World
 - Reasoning Capabilities for Robots
 - World Models in AI
- Overcoming Challenges in Reinforcement learning for Autonomous Navigation



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Degree: Ph.D., KAIST
Research interests: Bio-integrated/Inspired elctronics | Three-dimensional(3D) electronic devices | Two-dimensional(2D) nanomaterials
Career&Major achievements: University of Illinois at Urbana-Champaign, Postdoctoral Researcher(2013-2016) | Northwestern University, Postdoctoral Researcher(2016-2019) | Soongsil University, Assistant Professor(2019-2022)

Future Electronics Devices Lab

- Next-generation electronic devices, Robotics, Healthcare
 - Soft electronics, Internet of Things(IoT) devices, Bio-inspired/integrated electronics
 - Micro-flying vehicles, Ultra-small flying robots
 - Biomedical devices for neonatal intensive care units(NICU)
- Nanomaterials and energy devices
 - Smart energy devices
 - 1D/2D/3D nanomaterials



So Hee Kim Professor/Associate Vice President for Admissions and Student Affairs

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Degree: Ph.D., University of Saarland, Germany
Research interests: Neural interface | Brain interface | Bio MEMS | Soft bioelectronics | Zebrafish electrophysiology
Career&Major achievements: Researcher, Fraunhofer Institute for Biomedical Engineering Germany(2001-2005) | Postdoctoral Researcher&Research Assistant Professor, University of Utah(2006-2009) | Assistant&Associate Professor, Gwangju Institute of Science and Technology(2009-2015) | Review Board, Division of Neuroscience and Advanced Medical Technology at National Research Foundation of Korea(2019-2022) | Member, Committee of Bio&Medical Technology Development Program, Ministry of Science and ICT of Korea(2021-2026)

Neural Interfaces and MicroSystems Lab

- Brain interface and neural interface
 - Brain interfaces and peripheral nerve interfaces toward BMI/BCI
 - Long-term reliable implantable interface technology
- Soft bioelectronics
 - High-resolution patterning technology based on soft and flexible materials
 - Soft-actuation-based bioelectronic devices, such as neural interfaces and drug delivery devices



Hoe Joon Kim Associate Professor/Associate Vice President for Global Engagement

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Degree: Ph.D., University of Illinois at Urbana-Champaign
Research interests: Microfabrication | MEMS/NEMS | Robotic Sensors&Interfaces | 3D Printing | Energy Harvesting | Smart Manufacturing
Career&Major achievements: Carneige Mellon University Postdoctoral Researcher(2015-2016)

Nano Materials&Devices Lab

- Semiconductor Devices and Microfabrication
 - Advanced micro/nano-manufacturing for MEMS/NEMS
 - Piezoelectric resonators: sensing, RF, energy, and wireless communication
- Smart Manufacturing
 - Additive manufacturing(3D printing) of functional materials
 - Mechanical metamaterials for robotics and physical systems
 - AI-driven structure design and optimization



In Kyu Moon Professor

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Degree: Ph.D., University of Connecticut, USA
Research interests: Image Processing&Optical Imaging | Deep Learning | AI-based Cryptography/Cryptanalysis
Career&Major achievements: Adjunct Faculty, Univ. of Connecticut | Professor&Director,Chosun University | Exchange Professor Program Award, LG Yonam Culture Foundation | Director of Global Research Lab(GRL) Program, National Research Foundation of Korea | Nomination for Distinguished Alumni Award, Univ. of Connecticut | Director of BK21 Four Program | Ministry of Science and ICT Award

Intelligent Imaging&Vision Systems Lab

- Biomedical Imaging Systems
 - AI-based Multimodal Holographic Imaging Systems Design
 - AI Models Design in Biomedical Image Analysis&Processing
 - AI-based Automated Phenotypic Analysis of Live Cells
- Image Security&Cyber Security
 - Privacy Preserving Image Data Analysis&Captioning
 - Optical Cryptosystems Desin&Image Integrity Verification
- Generative AI Security&AI-based Cryptanalysis



Jeon li Moon Adjoint Professor

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Degree: Ph.D., Syracuse University, USA
Research interests: Bio-Signal based Rehabilitation Robotics | Tele-operation Robotics | Embedded Control&Intelligence Control
Career&Major achievements: President's Award [Semiconductor Design Contest 2005] | Head of LG Industrial systems Research Center(2004-2006) | Dean of Robotics Engineering Department(2007-2010) | Chairman of KOROS(Korea Robot Standard) Medical Robot Committee(2010-present) | Korean Delegation of ISO Medical Robot Standardization(2009-present)



Kyung Seo Park Assistant Professor

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Degree: Ph.D., KAIST
Research interests: Robotics | Physical Human-robot Interaction | Tactile perception system
Career&Major achievements: Postdoc, University of Illinois Urbana-Champaign(2022-2023) | Visiting Researcher, Max Planck Institute for Intelligent System(2018)

Interactive Robot Lab

- Next-Generation Human-Robot Interaction
- Development of whole-body multi-modal robot skin
- Hyper-sensory integrated humanoid robot
- Autonomous Robot System based on Multi-modal Perception
- Environment perception based on audio-visual and tactile data
- Artificial intelligence to infer physical and social contexts



Sang Hyun Park Associate Professor

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Degree: Ph.D., Seoul National University
Research interests: Medical image analysis | Computer vision | Machine learning
Career&Major achievements: SRI International at Menlo Park, Postdoctoral fellow(2016-2017), University of North Carolina at Chape Hill, Postdoctoral fellow(2014-2016)

Medical Image and Signal Processing Lab

- Medical Imaging and Signal Analysis
- Medical image classification, segmentation, enhancement, and registration
- Biosignal analysis and recognition
- Artificial Intelligence and Computer Vision
- Weakly and semi-supervised learning
- Computer vision and anomaly detection



Suk Ho Park Professor

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Degree: Ph.D., KAIST
Research interests: Biomedical Micro/Nano Robotics | Biomedical Devices and Instruments
Career&Major achievements: LG Electronics Production Research Center, Senior Reseacher | KIST Microsystem Center, Senior Researcher | Chonnam National University, Mechanical Engineering, Professor

Multiscale Biomedical Robotics Lab

- Biomedical Micro/Nano Robots
- Diagnostic and Therapeutic Capsule Robots for Gastrointestinal Tract
- Magnetically Actuated Therapeutic Cell/Drug Delivery Micro/Nano Robots
- Soft Micro Robots(Magnetically Actuated Guidewire and Cilia etc.)
- Biomedical Macro Robots and Devices
- Diagnosis and Therapy Technology for Robot-assisted Minimally Invasive Surgery(RMIS)
- Medical Devices(Position Sensing of Catheter, Haptic Sensing Device, etc.)



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Degree: Ph.D., Columbia University(New York, NY)
Research interests: Wearable devices | Assistive Robots | Rehabilitation Engineering
Career&Major achievements: University of Central Florida(Orlando, FL), Assistant Professor(2019-2024), US Army Research Lab(Aberdeen, MD), Research Associate(2016-2019)

Wearable Engineering and Assistive Robots(WEAR) Lab

- Wearable devices
- Wearable devices to assist visual, hearing, mobility deficiencies of aged and disabled
- Exoskeletons/exosuits for gait assistance
- 3D printed thin flexible structures for efficient and safe wearable interface
- Assistive Robots
- Integration of sensing, actuation and controls into wearables to aid bimanual and mobility tasks
- Patient transfer robots
- Assistive robots for wheelchair users and patient care at home or hospitals
- Rehabilitation Engineering
- Movement biomechanics study using various biomechanics and physiologic sensors
- Clinical study design, data collection and analysis
- Collaboration with clinicians and practitioners



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Degree: Ph.D., Carnegie Mellon University(US)
Research interests: Bioinspired materials | Soft robots | Biomedical devices
Career&Major achievements: Group leader at Swiss Federal Laboratories for Materials Science and Technology(Empa), Switzerland(2022-2024) | Postdoctoral researcher at EPFL, Switzerland(2017-2021) | Research assistant at Max Planck Institute for Intelligent Systems, Germany(2015-2017) | Engineer at Samsung Electro-Mechanics, Co., Ltd.(SEMCO), South Korea(2007-2011)

Adaptable Soft Machines Lab(Adapt-Lab)

- Bioinspired Materials
- Bioinspired adhesion mechanisms inspired by geckos and octopuses in nature
- Adhesion-based robotic manipulators for advanced semiconductor manufacturing
- Soft Robots
- Universal soft grippers for diverse real-world objects with roughness
- Integration of versatile soft grippers with Micro Aerial Vehicles(MAVs)
- Biomedical Devices
- Robotic bioelectronic devices incorporating soft sensors and actuators
- Deployable neural interfaces for minimally invasive implantation



Cheol Song Associate Professor

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Degree: Ph.D., KAIST
Research interests: Metaverse human-rotot interaction | Intelligent mechatronics system | Intelligent biomedical system
Career&Major achievements: KAIST Postdoctoral Researcher | Johns Hopkins University Postdoctoral Researcher | KROS Young robot scientist award(2016) | KROS Best paper award(2021)

Intelligent Bio-Opto-Mechatronics Lab

- AI based Robot and Biomedical System
- Camera Vision based Robot Motion Study
- Bio-Signal/Imaging based Optical-Medical System
- Precision Robot, Commercial Robot, Human-Robot Interaction



Jae Sok Yu Assistant Professor

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Degree: Ph.D., University of Pittsburgh
Research interests: Biomedical multimodal ultrasound and photoacoustic molecular imaging system and technologies | Ultrasound and photoacoustic based therapeutics | Translational research towards a clinical utility
Career&Major achievements: Postdoctoral Fiellow, Georgia Institute of Technology&Emory University | Predoctoral Fellow, University of Pittsburgh Medical Center&University of Pittsburgh | Cover for August issue of IEEE Transactions of UFFC(2017) | The Alavi-Mandell Award, Society of Nuclear Medicine and Molecular Imaging(2018)

Advanced Ultrasound Research Lab

- Functional Imaging and Therapeutic Technologies for Brain Disorders and Cerebral Blood Flow
- High-sensitivity cerebral blood flow imaging techniques
- Skull-penetrating ultrasound technologies
- Sonogenetics-based brain stimulation therapy
- Next-generation Ultrasound Imaging Systems
- AI-based image reconstruction and diagnostic technologies
- 3D imaging system development
- Si-Photonics-based ultrasound sensors
- GPU-based parallel computing technology development
- Robot-assisted imaging platform development



Dong Won Yun Associate Professor

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Degree: Ph.D., KAIST
Research interests: Biomimetic Robot | Soft Robotics | Robot elementary technology: Sensors and actuators | Study on the medical application | Study on the industrial application
Career&Major achievements: Researcher, Agency for Defence Development(ADD) | Senior researcher, Korea Institute of Machinery and Material(KIMM) | Post-doc,UC Berkeley | KSME conference Paper Award(2007) | KSME conference Poster Award(2010) | KSPSE conference Paper Award(2015) | KIMM Achievement Award(2008, 2015) | KIMM Academic Award(2015)

Biorobotics and Mechatronics Lab

- Bio-Inspired Robotics
 - Developing innovative robots inspired by observing and mimicking nature
 - Researching novel robots that emulate the structure and motion of animals
- Soft Robotics
 - Investigating soft robotics technology utilizing flexible materials and structures.
 - Developing various soft robots such as robotic hands and robotic legs
- Sensors and Actuators Research
 - Conducting research on sensors and actuators, the core components of robotics
 - Developing sensors and actuators leveraging electromagnetic principles
 - Utilizing polymer and additive manufacturing technologies for sensor and actuator development
- Robotics Applications Research
 - Exploring application technologies by integrating robotic components and existing robotics technologies
 - Studying robotics applications across diverse fields, including industrial, medical, and military sectors



Sang Hoon Lee Associate Professor

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Degree: Ph.D., National University of Singapore(NUS)
Research interests: Advanced Neuro/muscle Interface for Neuroprosthetics | Implantable Neuro/bioelectronics | Neural devices for Neuromodulation | Next generation of Neuro-interfaced Robotics
Career&Major achievements: Postdoctoral Research Fellow, Singapore Institute for Neurotechnology(SINAPSE) (2017-2018) | NUS Best Student Award(2014) | KSEASG Best Paper Award(2015) | Cover for March issue of Nano Energy(2017)

Neuro-Interfaced Robotics(NIRO) Lab

- Peripheral Nerve Interface(PNI)
 - Design and fabrication of neural interface
 - Characterization of neural interface
 - Packaging for long-term implantation
- Peripheral Neuromodulation
 - In-vivo physiological experients for neural recording and stimulation(Rat, Rabbit)
 - Neuromodulation via electrical, ultrasound, and magnetic stimulation
- Mechano-neuromodulation technology
 - Neuromodulation via energy harvesting device (ex)Triboelectric Nanogenerators
- Advanced Neuromuscular interface for bionic limb applications
 - Advanced muscle interface for lower extremity prosthetics
 - Hybrid bionic nerve interface(RPNI+PNI) for bionic limbs



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Degree: Ph.D., KAIST
Research interests: Medical image processing/ reconstruction/analysis | Photon counting CT | Functional brain imaging | Algorithm development | Deep learning/ machine learning
Career&Major achievements: Researcher, KAIST(2014-2015) | Research Fellow, Johns Hopkins University(2015-2016) | Research Associate, Johns Hopkins University(2016-2018)

Next-generation Medical Imaging Lab

- Medical Image/Signal Processing
 - Signal processing/reconstruction/analysis
 - Photon-counting CT/fNIRS/functional brain imaging
- Algorithm Development
 - Novel algorithm and methodology development for the medical image/signal processing
 - Deep learning/machine learning-based image/signal processing



Jae Hong Lee Associate Professor

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Degree: Ph.D., Yonsei University
Research interests: Fiber-based soft sensor/electronic devices | Implantable soft sensing system for healthcare applications | Textile-based wearable electronics | Wearable robotics based on soft sensors and actuators
Career&Major achievements: ETH Postdoctoral Fellow (2018-2020) | Seal of Excellence of Marie-Curie Actions (2018) | Several cover papers featured in many international prominent journals

Soft Bioelectronics Lab

- Fiber-based(1D) soft electronics
- Wearable sensors
- Electronic textiles and Human-machine interfaces
- Implantable/Healthcare sensors
- Soft sensors for robotic applications



Kyung In Jang Associate Professor

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Degree: Yonsei University
Research interests: Skin-mountable and body implantable health care system | Embedded system for wireless power transmission, communication, and bio-signal processing | Smart cloth with artificial intelligence
Career&Major achievements: University of Illinois at Urbana-Champaign Postdoctoral Researcher(2011-2016) | Frontispiece for October issue of Advanced Functional Materials(2016) | Cover for June issue of Advanced Functional Materials(2015) | Feature image for the September issue of Nature Communications(2014)

Bio-Integrated Electronics Lab

- Neural engineering
 - Neural signal recording and treatments
- Wearable sensor
 - Skin-and cloth-integrated biosensor



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Degree: Ph.D., Seoul National University
Research interests: Microfluid mechanics, Soft matter physics, Biomimetics
Career&Major achievements: BK Assistant Professor, Seoul National University(2022-2023)

Fluid and Soft Robotics Laboratory

- Development of Soft Matter Physics-Based Robots
 - Fundamental research on fluid-induced deformation of soft matter
 - Design and fabrication of soft robotic systems
- Development of Fluid Mechanics-Based Application Systems
 - Fundamental study of microfluidic phenomena
 - Optimization of microfluidic-related manufacturing technologies



Hong Soo Choi

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Degree: Ph.D., Washington State University, USA
Research interests: Micro/nano robot | Neural prostheses | MEMS | BioMEMS | BMI
Career&Major achievements: Prime Minister's Commendation(2020), Co-chairman's award by Presidential Council on Intellectual Property of Korea(2019), Prize of The State of Geneva at the 47th Internatbnal Exhibition of Inventions of Geneva, Switzerland(2019), Best Preclinical Manuscript Award, SCRN, France(2019) | Post Doctoral Researcher, University of California, Davis, Nov.2007-Feb.2009 | Senior Researcher, Korea Institute of Machinery&Materials, Feb.2009-Sep.2010

Bio-Microrobotics Lab

- Research on precision medicine based on micro/nanorobots
 - Micro/nanorobot system for precision medicine that can precisely deliver drugs and cell therapy to diseased areas and target areas
 - Magnetic field control system for interventional procedures
- Precision control of micro/nanorobots based on artificial intelligence



Sang Yoon Han Assistant Professor

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W. https://www.intelligent-photonics.com
Degree: Ph.D., UC Berkeley
Research interests: Photonic integrated circuits | Quantumcomputing | Photonic AI accelerators | Autonomous sensors(LIDAR, gyroscope)
Career&Major achievements: Postdoctoral researcher, KAIST(2016- 2020) | Bronze medal, Collegiate Inventors Competition at USPTO, 2015(Featured on Daily Californian) | Finalist, Corning Outstanding Student Paper Competition, 2014 | Recipient of Korea Foundation for Advanced Studies(KFAS) Scholarship(2010-2015)

Intelligent Nano-Pptonics Laboratory

- Optical Computer
 - Research on ultra-high-speed AI accelerators that perform computations using light by employing photonic integrated circuits instead of electronic circuits
- Quantum Computer
 - Research on large-scale optical quantum computers by combining photonic integrated circuits with nanomechanical systems
- Light-based Autonomous Driving Sensors
 - Research on highly sensitive, ultra-compact LiDAR and inertial sensors using photonic integrated circuits
- AR/VR Display
 - Research on ultra-compact, ultra-lightweight, and ultra-low-power AR/VR displays based on photonic integrated circuits
- Optical Ultrasound Imaging Systems
 - Development of devices that acquire ultrasound images with ultra-high sensitivity using light through photonic integrated circuits



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Degree: Ph.D., University of Tokyo, Japan
Research interests: Medical Imaging | Surgical Robot | VR and AR Visualization
Career&Major achievements: Vice-president of KSMR | Cochair of IEEE RAS TC Surgical Robotics | International network director of ASCAS | JSPS researcher of The University of Tokyo | Associate Professor of Kyushu University | Best paper awards of CARS 2011, ACCAS 2007, JSCAS 2007, etc.

Surgical Robotics&Augmented Reality Laboratory

- Flexible Endoscopic Surgery Robot
- Precise and flexible surgical robot system for reduced patient pain and shortened hospitalization
- Master-slave robot system for radiation-free, remote and emergency medical support
- Medical Imaging and Surgical Navigation based on Virtual/Augmented Reality
- Visualization for internal organs using virtual/augmented reality and digital twin technology
- Image processing and simulation for real-time tracking of organ in deformation
- High-magnification microscope calibration using deep learning and artificial intelligence



Min Ho Hwang Assistant Professor
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Degree: Ph.D., KAIST
Research interests: Robot Grasping and Manipulation | Robot/AI-Assisted Surgery | Next Generation of Surgical Robot System | Robot Learning and Control
Career&Major achievements: Postdoctoral Fellow, University of California, Berkeley(2019-2021) | Top 10 Mechanical Engineering Technology of Korea(2019) | Overall winner and Best Application Award at International Surgical Robot Challenge(2018) | Best Paper Award at ACCAS(2018) | Best Paper Award at ISCAS(2015) | Finalist for the Best Paper Award at ACCAS(2013)

Surgical Robotics and Robotic Manipulation Lab(SurGLab)

- Precise Object Manipulation using Robot Hands/Arms
- Automating precision tasks such as surgical suturing, knot-tying, part assembly
- AI-based teleoperation/shared-control
- Continuum Robotics
- Miniaturized/flexible joint mechanism
- Hysteresis compensation algorithm
- Learning-based robot control
- Visual-servoing Control
- Force-servoing Control
- Imitation learning/Reinforcement learning for robots

Interview

Graduate School with strong environmental and institutional support to focus on research.



John David Prieto Prada

Department and Program |
Robotics and Mechatronics Engineering Ph.D.
Nationality | Colombia
Assigned Lab | Intelligent Bio-optomechatronics Lab.
(Prof. Cheol Song)

Q — What made you choose DGIST?

I was attracted to DGIST based on both its academic reputation as well as a well-rounded education. I have found that with the DGIST energetic purpose of research, I am able to have opportunities for personal growth and development not only academically, but also to expand beyond the classroom knowledge. Also, I wanted to enhance my skills in intelligent systems and Virtual Reality, fortunately, the Robotics and Mechatronics Engineering department was the correct choice for me.

Q — What are the strong points of DGIST and the department of Robotics and Mechatronics Engineering?

DGIST has a large number of research areas, in which is easy to find research topics where two or three departments are involved and collaborate between each other at the same time, this is thank to the convergence that DGIST supports day by day. In the Robotics and Mechatronics Engineering department, you can find any kind of lab aiming to research from macro to microrobots, software, and hardware, and the most important thing is that DGIST offers top class facilities in which is easy to grow as a researcher.

Q — Explain your research field and purpose at DGIST.

My field of research is based on virtual reality technologies. We want to minimize the involuntary tremor in microsurgeries by integrating sensor fusion techniques, virtual reality, and intelligent systems.

Q — What are you planning to do after graduation?

I want to keep growing in my research field and go for a postdoc position. In addition, I want to use my expertise to improve the quality of our society.

Q — Please advise our applicants.

I invite all the applicants that have a passion to grow and learn academically to come and join us and work as a team. Our department has multiple fields and together we can improve our skills and enrich knowledge.



The limited supply and detrimental environmental effects of fossil fuels is seriously intimidating human survival. In order to solve such issues, ESE pursuits the education and research for the next generation sustainable energy sources and their applications.

IV. Energy Science and Engineering

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Introduction to the department

Securing sustainable and environmentally friendly energy resources is an important task to accomplish human survival in future. Frontier science and technology are extensively searching for such power sources as well as systems utilizing the renewable energies. With this wide range of social movement, it is required to shift the conventional education paradigm innovatively to have students handle new forms of the energies. The Department of Energy Science&Engineering in DGIST aims at educating graduate students to contribute to the new generation of renewable energies with the creative mind.

- Vision**
- ✓ Advanced courses fostering competent scientists and engineers for the beyond conventional energy sources
 - ✓ Creation of core academic areas and policies for future green energy society
 - ✓ Education of graduate students for future-oriented and creative R&D capability

- Research and Education Focus**
- ✓ Cultivation of international leaders or the convergence energy devices through closely interconnected interdisciplinary system of DGIST
 - ✓ International exchange(including double-degree program) and team projects with global top institutes
 - ✓ Solution searching education and research experiences to technical challenges

- Specialized Research Fields**
- ✓ Key materials and system design for the advanced hydrogen and bio fuel cells
 - ✓ Production and storage of hydrogen and practical applications of renewable energy systems
 - ✓ Core-material and fabrication technology for the next generation photovoltaic cells
 - ✓ Photo-electrochemical water splitting and recycle of the waste products such as CO2 and waste water
 - ✓ New materials for high energy density Li secondary batteries
 - ✓ Post-Li batteries including multivalent(Mg, Zn, Ca) ion, metal-air batteries
 - ✓ New materials for low-energy-consumption electronic devices
 - ✓ Multi-scale molecular modeling of materials for clean energy
 - ✓ Energy harvesting materials and devices

- Convergence with other Departments**
- ✓ Electrical Engineering and Computer Science: Electricity storage devices and sensor network system for smart grid to improve the efficiency of renewable energies
 - ✓ Robotics and mechatronics Engineering: Small batteries for micro-robots for medical application and large batteries for human care/industrial robots
 - ✓ Brain Sciences/New Biology: Bio-energy systems for the treatment of brain signals and processing and biocompatible power sources

- Career paths**
- ✓ Academia: Ph.D. program(domestic and foreign universities), Ph.D. Research Institute, professor
 - ✓ Government-Funded Institutions: Korea Institute of Energy Technology, Korea Research Institute of Chemical Technology, KIST, Korean Intellectual Property Office, KIMS Materials Research Institute, Korea Institute of Machinery and Materials, Korea Institute of Standards Science, and Electronic Components, etc.
 - ✓ Industry/Start-Up: Large and medium-sized enterprises in the fields of energy, chemical, materials, and electrical and electronics

- The interview process**
- ✓ Personal interview in English with the concerned professors
 - ✓ Self-introduction(5 Min. presentation)
 - ✓ Questions on fundamentals and specialized knowledge about application of Energy Science and Engineering such as Physics, Chemistry, Mathematics, Biology, Thermodynamics and Transfer phenomenon according to the applicant's specialty background and on culture, personality and vision as engineering students
 - ✓ Online interview can be arranged for students residing outside Korea, upon early request

What topics are studied in the Department of Energy Science and Engineering?

What are we going to study in the Department of ESE?

The Department's core courses are thermodynamics, electrochemistry and fundamentals of materials science&engineering. After completing the core courses, students are supposed to choose a major track among solar cell, fuel cell, battery, and molecular modeling and battery and take the in depth courses within the track. In addition, you will extend your textbook knowledge through various R&D activities in the relevant research sectors in DGIST. You will be trained to be a creative and challenging personnel to lead the global future energy fields.

Specific subject of each track?

The R&D fields of the major tracks are as follows :

- Solar cell: Core-materials and fabrication technology for the next generation photovoltaic and catalysts
- Fuel cell: Key materials and system design for the hydrogen/bio/solid-oxide fuel cells.
- Battery: Mastering the present Li-ion battery technologies and exploring the innovative post-Li chemistry
- Molecular modeling(computational chemistry): Virtual experiments using supercomputers(complementary

to real world synthesis, fabrication, and measurements) to get the basic understanding of molecular-level mechanisms and design principles underlying the above three tracks
I'm worried about my English skills and hesitate to apply for DGIST since all the classes are delivered in English. English communication skill is a prerequisite for the "World Top Class" university that DGIST aims at. Our Department is providing various English education programs to improve the students' English proficiency. With those courses you are encouraged to substantially mature your English communication capability.

Possible career path after graduating the Department of ESE?

- I want to keep growing in my research field and go for a post-doc position. In addition, I want to use my expertise to improve the quality of our society.
- Private R&D institutes(Samsung, LG, SK, Hyundai, POSCO, BASF, etc.)
 - Universities and Government R&D institutes
 - Renewable energy fields(solar&hydrogen fuel cells)
 - Battery and energy conversion
 - Energy and environment policy

International network being built so far?

The world's greatest scholars are invited to offer the firm background and the world class education on the future energy issues to DGIST students. We have, at present, Professor J. Caton at the Mechanical Engineering in Texas A&M University, Nobel laureate Professor J. Byrne at the Energy&Environmental Policy in University of Delaware, world leading Professor M. Watanabe in Yamanashi University in the fuel cell. We are also collaborating with world renowned research groups(e.g., Waseda university, Uppsala university). In addition, the department will continue to invite outstanding full-time Professors from all over the world and take off to the "WorldTop Class" Department in the future energy field.

Faculty

**Su li In** Professor/Chair Professor

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Degree: Ph.D.(Chemistry), University of Cambridge, UK
Research interests: CO2 conversion to hydrocarbon fuels | Water splitting for hydrogen generation | Microbial fuel cell | Nuclear battery | Biomedical devices
Career&Major achievements: Visiting scholar, University of California. Berkeley, USA | Postdoctoral associate, Technical University of Denmark&Pennsylvania State University, USA

**Seo Jin Ko** Assistant Professor

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O/L. E6-413/402/517-518

Degree: Ph.D.(Energy Engineering), UNIST(2015)
Research interests: Organic optoelectronic materials and devices research | Next-generation organic semiconductor sensor research | Organic-inorganic hybrid tandem device research | Next-generation solar cell core materials and devices research
Career&Major achievements: Postdoctoral Researcher, University of California, Santa Barbara(-2018. 11) | Principal Researcher, Korea Research Institute of Chemical Technology(-2025. 01)

**Seung Hyeon Kim** Assistant Professor

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W. <https://sites.google.com/view/seunghyeonkimlab>
Degree: Ph.D.(Chemical Engineering), Massachusetts Institute of Technology, USA
Research interests: Polymer photocatalysts | Sustainable Chemistry | Solar Fuel Production
Career&Major achievements: Postdoctoral Researcher, Max Planck Institute for Polymer Research(MPI-P)

**Un Hyuck Kim** Assistant Professor

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O/L. E6-312/302/321A
Degree: Ph.D.(Energy Engineering), Hanyang University
Research interests: Cathode materials for LiBs | All-solid-state batteries | Elucidation of Battery degradation mechanisms
Career&Major achievements: Postdoctoral Researcher, Pacific Northwest National Laboratory(PNNL)

**Jin Soo Kim** Assistant Professor

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O/L. E6-303/315/322
Degree: Ph.D. Seoul National University(2016)
Research interests: Next-generation battery design and processing
Career&Major achievements: Korea Institute of Energy Research, Senior Researcher(2019-2024) | Lawrence Berkeley National Laboratory, Postdoctoral Scholar(2019) | Hyundai Motor Company, Senior Research Engineer/Research Engineer(2016-2019)

**Chan Yeon Kim** Assistant Professor

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O/L. E6-511/503/516
Degree: Ph.D.(Chemical and Biomolecular Engineering), KAIST, Korea.
Research interests: Heterogeneous Catalysis, CO2 conversion for Sustainable Chemical&Fuel Production, Electrosynthesis, Design of Catalytic Microenvironment.
Career&Major achievements: Postdoctoral Research Fellow, Lawrence Berkeley National Laboratory(LBNL). Postdoctoral Researcher, Korea Institute of Science and Technology(KIST)

**Ha Suck Kim** Visiting Chair Professor

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Degree: Ph.D.(Chemistry), University of Illinoisat Urbana-Champaign, USA
Research interests: Electrochemistry | Fuel cell Electrochemiluminescence
Career&Major achievements: Vice-president, Seoul National University | President, International Society of Electrochemistry | Chairman, Korean National Research Resource Center | Fellow, International Society of Electrochemistry

**Chi Young Park** Associate Professor

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O/L. E6-512/504/519A
Degree: Ph.D.(Polymer Science and Engineering), Inha University
Research interests: Green electronics and energy materials | Carbon and supramolecular photocatalyst | Electrolytes | Polymer mechanochemistry
Career&Major achievements: Macromolecular Research, Publishing Editor | Assistant Professor, Pukyong National University | Senior Researcher, Korea Institute of Science and Technology

**Ji Woong Yang** Associate Professor

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O/L. E6-514/502/520A
Degree: Ph.D.(Chemical&Biological Engineering), Seoul National University
Research interests: Nanomaterials chemistry | Quantum dot solar cells | Quantum dot displays | Liquid-phase transmission electron microscopy | Wearable electronics
Career&Major achievements: Postdoctoral researcher, Lawrence Berkeley National Lab., USA



Jong Sung Yu Visiting Chair Professor

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Degree: Ph.D.(Chemistry), University of Houston, USA
Research interests: Materials chemistry | Nanomaterials | Electrochemistry | Carbon and porous materials | Fuel cell | Battery | Water splitting photo-&electrochemical catalysts | Supercapacitor | Sensor
Career&Major achievements: Professor, Korea University | Research Associate, Northwestern University&Pennsylvania State University, USA



Youn Gu Lee Professor

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Degree: Ph.D.(Chemistry), University of Chicago, USA
Research interests: Organic Solarcell | OLED | Printed Electronics
Career&Major achievements: Senior Engineer, Samsung Electronics | King Sejong Patent Award(2004) | Research Scientist, LG Chem Research Park(OLED R&D)



Jong Min Lee Associate Professor

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Degree: Columbia University, Chemical Engineering
Research interests: Sustainability and Energy
Career&Major achievements: Nanyang Technological University and publications



Jong Soo Lee Professor/Dean of Graduate School

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Degree: Ph.D.(Metallurgical Engineering), Chonbuk National University
Research interests: Synthesis and Surface Engineering of Nanomaterials | Display and QLED based on Quantum Dots | Optoelectronic Devices | Photo and Image Sensors | Nanodevices based on 2D Nanomaterials.
Career&Major achievements: Research Specialist, University of Chicago,USA | Postdoctoral Researcher, Lawrence Berkeley National Lab.&University of California, Davis, USA | Research Assistant Professor, Korea University



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Degree: Ph.D.(Nano Engineering), Sungkyunkwan, University
Research interests: Piezoelectric/Triboelectric based energy harvesting materials and device | Hybrid energy generator | Biocompatible energy materials
Career&Major achievements: Postdoctoral researcher, University of California, Berkeley



Yun Hee Jang Professor

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O/L. E6-313/304/323
Degree: Ph.D.(Chemistry), Seoul National University
Research interests: Multiscale molecular modeling | Quantum mechanics | Molecular dynamics simulation | Material design at the molecular level
Career&Major achievements: Associate professor, GIST | Visiting professor, ENSCP&University of Tours, France | Postdoctoral scholar, Caltech, USA



Ho Chun Lee Professor

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Degree: Ph.D.(Chemistry), KAIST, Korea
Research interests: Next generation Batteries | Battery Electrolytes | Electrochemistry
Career&Major achievements: LG Chem Battery R&D | Postdoctoral scholar, Brookhaven Nat'l Lab, USA



Seung Ho Choe Associate Professor

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Degree: Ph.D.(Physics), Yonsei University
Research interests: Membrane Proteins Structure&Function | Protein-lipid Interactions | Biopolymers, Polyelectrolytes | Light-harvesting&Energy Transfer | Quantum Information
Career&Major achievements: Postdoc, Univ. of Pittsburgh, USA | Postdoc, Univ. of Michigan, USA | Postdoc, Johns Hopkins Univ., USA



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Degree: Ph.D.(Chemical Engineering), POSTECH
Research interests: Multifunctional Energy&Electronic Materials | Metal Oxides Nanomaterials | Quantum Dot&Perovskite Solar Cells | Catalytic& Environmental Materials
Career&Major achievements: Postdoctoral Researcher, University of Toronto



Dong Hae Ho Assistant Professor

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Degree: Sungkyunkwan University, PhD in Engineering
Research interests: Energy Harvesting | Soft Electronics | Liquid metal-Polymer Composite System | Ionic Polymer-based Soft Electronics | Neuromorphic Electronics | Ionic Thermoelectric Generator
Career&Major achievements: Virginia Tech Postdoctoral Researcher



Seung Tae Hong Professor

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O/L. E6-310/306/319
Degree: Ph.D.(Chemistry), Seoul National University
Research interests: All-solid-state batteries/Ca, Mg, Zn-ion batteries/solid state chemistry/crystallography
Career&Major achievements: Project Leader of Innovative Battery R&D team, LG Chem Research Park | Research Associate, Iowa State University&Oregon State University, USA



Sangaraju Shanmugam Professor

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O/L. E6-314/305/320
Degree: Ph.D.(Chemistry), Indian Institute of Technology Madras, India
Research interests: Fuel Cells | Metal-Air batteries | Biosensors | Multifunctional Magnetic materials
Career&Major achievements: Assistant professor, Waseda Univ.Japan | Guest Scientist, RWTH Aachen Univ. Germany | Postdoctoral Fellow, Bar-Ilan Univ. Israel | Best Ph.D. thesis Award(2005), Chemistry, IIT Madras, India



Interview

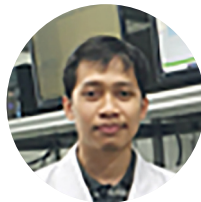
Q — What made you choose DGIST?

Being involved in technology and innovation growth, particularly as a scientist, is a dream for such motivated students. DGIST has been considered as one of the best young universities globally, which uniquely prioritizes scientific discoveries, innovations, and convergence in its education system. There are world-renowned professors whom I can share and expand my scientific ideas with to be directly involved in technology development globally. Additionally, the institution is also full of cultural diversity judging from its international community, allowing us to gain unforgettable experiences.

Q — What are the strong points of DGIST and the department of Energy Science and Engineering?

DGIST has a clear vision regarding its education system, which focuses on convergence. It trains students to not only innovate in one particular area but also be able to grab some aspects from other related areas through collaborations. Many notable alumni are recognized and have been involved directly in the technology commercialization in industry and academia. In particular, the Department of Energy Science and Engineering has a solid mission to lead in energy innovation with a future-oriented education system. It consists of reputable faculty members worldwide known for their experiences and publications. Many collaborations with industries also allow students to face real challenges in technology commercialization, which is a marvelous experience.

Enjoy the moment of actively conceiving new experiments.



Setiawan Dedy

Department and Program |
Graduated Energy Science
and Engineering, Ph.D.
Nationality | Indonesia
Assigned Lab |
Discovery Lab
(Prof. Seung Tae Hong)

Q — Explain your research field and purpose at DGIST.

Ultimately, my research purpose is to pursue a new, low-cost, and sustainable battery chemistry that has the potential to surpass the theoretical energy density of the current lithiumion battery for a future electric vehicle or large-scale energy storage applications. My current research is to demonstrate the rechargeability of magnesium and calcium metal batteries, which are kind of early-birth energy storage systems. Moreover, our laboratory expertizes in advanced powder X-ray diffraction studies on battery electrode materials behavior during charge and discharge to better understand the mechanism. My group, including me, are also eager to discover new-to-the-world inorganic materials using what-so-called exploratory synthesis.

Q — What are you planning to do after graduation?

As a doctoral student, I desire to continue doing research in the field which has an enormous impact on society. Therefore, after my doctoral degree, I plan to expand my research skill in academia, particularly on battery electrode characterization. Moreover, I have set my long-term plan to contribute to the energy storage research and development in my home country either in academia or industry in the future.

Q — Please advise our applicants.

Becoming a DGISTian is a unique opportunity that does not come every time in your life. DGIST does provide high-quality education and diverse research opportunities with advanced facilities and a scholarship package to support your study and research. You will gain an unforgettable experience conducting research with sincere, enthusiastic, and highly motivated colleagues in a globally recognized environment. Therefore, I strongly believe that the experiences in DGIST ESE prepare us to beat challenges, particularly in technology development and innovation. If you want the chance to give everything you've got, with no limits on what you can achieve; If you're passionate about making a big, bold difference in science and advancing your own career; If you want to push the boundaries of what's possible, please join us!



V. Brain Sciences

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Brain science is a field of study that aims to understand the fundamental principles of the brain's structure and function at microscopic and macroscopic levels, based on neurobiological and cognitive scientific understanding of the brain's nervous system, and to apply this understanding.

The Department of Brain Sciences at DGIST strives to cultivate professionals who will conduct basic research and develop original technologies for human well-being and the overcoming of brain diseases in the face of an aging society. This is achieved by integrating research achievements and methodologies from various academic disciplines to explore new brain research methods and processes based on interdisciplinary knowledge.

Vision

- ✓ In-depth Research on Fundamental Brain Principles: Focus on clearly elucidating the core principles of the brain's nervous system
- ✓ Leading Future Convergence Technologies: Develop next-generation convergence technologies to lead brain science research
- ✓ Contributing to Overcoming Brain Diseases and Advancing the Brain Industry: Contribute to solving brain diseases and creating new brain-related industries through innovative research
- ✓ Cultivating World-Class Brain Science Talent: Foster global talent by providing an international-level education and research environment
- ✓ Center of Brain Convergence Science: Aim to become a central hub for brain science research that integrates various academic disciplines

Education and Research Focus

- ✓ Operate a creative system education, research-oriented, interdisciplinary convergence, and global network-based education and research system
- ✓ Foster experts in interdisciplinary science who will be responsible for future academic advancements by reintegrating isolated and fragmented specialized knowledge related to the brain
- ✓ Cultivate global leaders who will demonstrate international acumen and lead the commercialization of brain convergence fields based on specialized knowledge and research and development capabilities

Specialization of Education and Research

- ✓ Specialization of brain science education through a novel education system that conducts creative and convergent research topics on the subject of the brain, without major restrictions
- ✓ Specialization as a brain science education and research institution responsible for developing convergence technologies necessary for the prevention and treatment of brain-related diseases, which are increasing with the advent of an aging society and the deepening of modern material civilization, and for creating the brain industry

Key Research Areas(3 Major Research Themes)

- ✓ Understanding the Brain and Solving Challenges in Brain Science
- ✓ Overcoming Brain Diseases and Realizing a Healthy Brain
- ✓ Development of Advanced Brain Engineering Technologies and Value Creation

Convergence with Other Departments

- ✓ Brain science, which explores the mysteries of the brain, inherently possesses the characteristics of convergence science, making it readily integrated with cutting-edge science and technology fields such as physics, chemistry, NT(Nanotechnology), BT(Biotechnology), and IT(Information Technology). Therefore, we pursue a natural interdisciplinary convergence strategy through PBL(Project Based Learning) centered on the brain

Career paths

- ✓ Academic paths
 - Post-doctoral researchers: Korea's leading universities and research institutes
 - Faculty member in university
 - Domestic research institutes PI: KBRI, KIST, KRIBB
 - Overseas Research Institute PI: MPI, HHMI, Janelia
 - Domestic and foreign corporate research institutes PI: Samsung, LG, CJ, J&J, etc.
- ✓ Industrial paths
 - Bio companies: LG, CJ, Biogen, SK Biopharm
 - Healthcare Company: GE Health
 - Pharmaceutical companies: Pfizer, J&J, Amgen, Genetech
 - Healthcare Company: GE Health
 - Venture Start-up: New business related to brain and cognition
 - Research-oriented medical institution: University Hospital
- ✓ Bio-related Fields
 - Technology valuer
 - Patent attorney
 - Science and technology journalist
 - Science fiction writer
 - Science and technology government official
 - Science teacher

The interview process

- ✓ Presentation in English: Ph.D.course applicants should present their M.S.thesis work. M.S.course applicants and M.S.-Ph.D. combined course applicants should choose one option from the two options below
- Option 1. You should present one paper chosen from the provided list of recommended researchpapers(please check the papers on our website at <https://brain.dgist.ac.kr>) using PowerPoint within a 10-minute time frame(5-10 slides), followed by an additional 10 minutes for Q&A
- Option 2. You should present a research paper that has been published in renowned scientific journals(e.g., Nature, Cell, Science, Nature Neuroscience, Neuron, or other journals of similar caliber) using PowerPoint within a 10-minute time frame(5-10 slides), followed by an additional 10 minutesfor Q&A
- Personal Essay: Presentation of motivation and interests on a suggested topic
 - Online interview can be arranged for students residing outside Korea, upon early request

5 Core Education Modules



- Molecular and Cellular Brain Science**
- Applying the latest technologies of neuroscience to elucidate the core principles of neuronal and synaptic generation, degeneration, function, and plasticity at the molecular and cellular levels
 - Studying the fundamental principles of the central nervous system's development, differentiation, and cell death through molecular and cellular approaches
 - Developing new technologies to control neuropsychiatry, developmental, and neurodegenerative disorders through the discovery of molecular and cellular signaling involved in the diseases
 - Conducting research from single molecules and cells to genomics, proteomics, and metabolomics to elucidate the pathogenesis of neurodevelopmental and degenerative diseases and metabolic disorders and develop early diagnostic techniques



- Systems Brain Science**
- Interoception and behavioral plasticity
 - Neurobiological understanding and overcoming techniques of mental illness
 - Neuron-glia interactions underlying emotional behaviors
 - Circadian rhythm and behavior
 - Functional evo-devo study of locomotor neural circuits
 - Behavioral disorders and psychiatric illnesses by dysregulation of behavioral/cognitive plasticity
 - Identification of plastic-degrading bacteria and enzymes



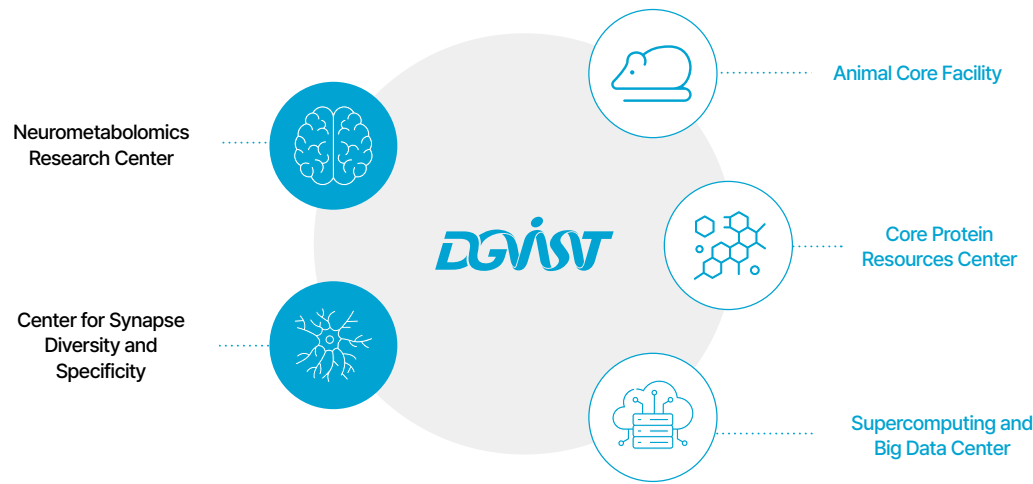
- Brain Engineering**
- State-of-the-art tools and methods for fundamental understanding of the brain
 - Large-scale brain interface and high-resolution neural imaging
 - Neural modulation techniques for manipulating brain signals
 - Brain signal processing, encoding, and decoding
 - Engineering approaches to rehabilitate, repair, and replace neurological deficits and disorders



- Cognitive Brain Science**
- Understanding the neural correlates of high-level cognition through convergent approaches of brain sciences
 - Interrogating brain mechanisms of mental processes embracing memory, attention, problem-solving, decisionmaking, inference, and language
 - Exploring the relationship of mind-brain-behavior by imaging, recording, and manipulating neural activity
 - Investigating brain maps and brain networks using brain big data



- Computational Brain Science**
- Deciphering proteomic structures and functions at an atom level through statistical and computational physics and investigation of physicochemical fundamentals of life science in Bio-Neuro-Brain system
 - Mechanisms of protein fibrillization and proteomic principle of neurodegenerative diseases
 - Supercomputing of dementia-predicting big-data and complex network analysis
 - Supercomputing-based modeling of protein structure in the brain and nervous system
 - Structure analysis of membrane proteins and receptor proteins in the view of signal transduction mechanisms through the cell membrane



What curriculums does the Department of Brain Sciences provide to the students?

- ✓ Intensive courses for the basics of physiological and pathological mechanisms of the brain
- ✓ Courses centered on the experimental methods for the study of the brain function and structure
- ✓ Internships and seminars for in-depth as well as broad knowledge and thinking
- ✓ Taking courses from other departments, such as IT, RT, and ET, as a prerequisite for brain convergence science
- ✓ Study the theoretical and computational biophysics in order to understand the fundamental physico-chemical principle behind the brain-cognitive phenomenon

What are the goals of the Department curriculums?

- ✓ To provide creative and systemic education, research focused, inter-disciplinary training, and global networking in education and research
- ✓ Individual meeting with faculty for deeper one on one conversations
- ✓ To produce global leaders who will lead application of our knowledge for mankind on the basis of professional knowledge and research ability of the brain convergence science

What is the educational philosophy of the Department?

- ✓ Integrity: responsibility and honesty in performing and reporting research
- ✓ Collegiality: scientific interactions and communications
- ✓ Collaboration: sharing of knowledge and resources for mutual development
- ✓ Collective wisdom: sharing of knowledge for the pursuit of truth
- ✓ Social responsibility: the accountability of science to society
- ✓ Translation: conduct of research for clinical and practical application
- ✓ Partnership: partnership between faculty and students

What are extracurricular activities on-going in the Department?

- ✓ Student Symposium: At this student-run annual symposium, the students invite speakers for seminar and present their research work
- ✓ Seminar: The Department invites renowned speakers for seminar
- ✓ Convergence seminar: This seminar is co-hosted with other departments to facilitate convergent research and collaboration between the departments

What topics are studied in the Department of Brain Sciences?

Prof. Hyo Sang Lee(Department Chair)

The ultimate goal of our research is to understand the neurobiology of emotional behaviors, such as pain, itch, fear, and depression. We are interested in revealing the molecular and neuronal circuit mechanisms by which those behaviors are generated in response to external stimuli, and modulated and altered by competing external stimuli and internal states.

Our approach to accomplish this goal combines molecular biology, biochemistry, histology, electrophysiology, and mouse genetics. We also use in vivo recordings and functional manipulations such as fiber photometry and optogenetics in combination with a battery of behavioral assays to measure the correlation and causal relationship between neuronal activity and behavioral changes.

Prof. Jae Won Ko

Neurons communicate with each other through synaptic transmission at specialized intercellular junctions called 'synapses'. Synapses form not only during development, but also throughout life. Synapses transmit, process, and compute neural information in the brain. During synaptic transmission, a presynaptic neuron releases a chemical neurotransmitter that is recognized by the postsynaptic neuron. Neurotransmitter release is triggered when an action potential opens voltage-gated calcium channels and calcium flows into the presynaptic nerve terminal. Released neurotransmitters elicit a postsynaptic response by binding to specific postsynaptic receptors.

My laboratory is interested in how synapses form and function during development and in adulthood. Our work focuses on (1) the role of synaptic cell-adhesion molecules in shaping synapse properties, (2) pre and postsynaptic mechanisms of synaptic development, and (3) impairments in synapse formation and function in neuropsychiatric disorders. To address these questions, my laboratory employs multiple, interdisciplinary approaches ranging from biochemical and biophysical studies to physiological and behavioral analyses of mutant mice deficient in key synaptic adhesion molecules and their associated proteins. We are currently working on problems related to social cognitive processes at synaptic and circuit levels.

- Synapse formation and function by key synaptic cell-adhesion molecules.
- Synapse formation and function by synaptic cell-adhesion associated scaffolds.
- Neural circuit mechanisms mediating complex social behaviors in mice.

Prof. Kyu Hyung Kim

The overall broad goal of my work is to investigate the circuits and molecules that integrate environmental cues with internal signals to drive specific developmental and behavioral outcomes.

- Identification of the intra and intercellular signaling pathways that transmit pheromone(an environmental cue) signals and the molecular mechanisms by which food signals are integrated with pheromone signals to regulate neuroendocrine signaling and development.
- Investigation of the mechanisms and neuronal circuits underlying proprioception. My research focuses on identifying the neuronal and molecular mechanisms that underlie proprioceptive behavior using the C. elegans model system. These studies will allow us to better understand the mechanisms and neuronal circuits in higher animals including human.

Prof. Mean Hwan Kim

Central expertise in our lab lies in the integration of advanced experimental techniques, ranging from molecular and cellular approaches to circuit-level investigations. Our goal is to uncover the principles of neuronal signaling and synaptic connectivity in both human and rodent neocortex at an individual neuron and circuit level. Ultimately, our research aims to enhance our mechanical understanding of the structure-function relationships within human cortical circuits. I believe that these combined translational methods, alongside technological advancements, will significantly impact the fields of not only basic molecular/cellular circuits neuroscience but also human neurological diseases.

Prof. Eun Kyoung Kim

The goal of my research project is to elucidate the mechanisms by which the brain regulates energy homeostasis to prevent or treat metabolic diseases such as obesity, diabetes and neurodegenerative diseases.

- Appetite control for obesity and diabetes therapies: Identification of compounds or hormones to modulate hypothalamic regulation of food intake helps understand their cellular and molecular mechanisms of action for developing therapeutic strategies.
- Autophagy in diabetes and obesity: Understanding of the role of hypothalamic autophagy and investigating the interplay between autophagy and apoptosis in the pancreatic beta-cells and neuronal cells using viral expression systems and in vivo experimental design holds the promising potential to develop new compounds targeting autophagic pathways.
- Insulin actions on obesity, diabetes and neurodegenerative diseases: Characterization of central roles of brain insulin in neuroendocrine neurons of hippocampus and hypothalamus provides new insights on linking metabolism and neurodegeneration.

Prof. Che Il Moon

My laboratory is studying the chemical senses of the brain, in particular studying the processes of the olfaction using molecular, cellular, morphological and behavioral approaches&translating these knowledges into the biomedical fields.

- Structure and functions of olfactory systems: My laboratory is trying to understand the signal processes of olfaction in the brain. This includes the detection processes at the level of odorant receptors and networking of olfaction-related neurons in the brain and the molecular mechanisms underlying the signal transduction pathways of chemical sensation.
- Translational research using olfactory systems: In this topic, we will determine the fundamental mechanisms of neuronal development by using the olfactory sensory neurons as a regeneration and neuroprotection model system and perform translational research to overcome numerous neural disorders including early detection kit development for neurodegenerative diseases, neuronal protection drugs against stroke and glaucoma etc.
- Olfactory cognition: In this topic, we are trying to understand how the brain processes various olfaction-related signals using various brain signal detection devices including the EEG device and fNIRS.

Prof. Po Jeong Park

The overarching aim of our lab is to understand the mechanisms of learning and memory at the levels of synaptic plasticity, dendritic biophysics, and neuronal ensembles. We develop molecular, optical, and computational tools for spatiotemporally mapping bioelectric activities to elucidate single-neuron computations and plasticity rules in behaving animals. These measurements will lay the groundwork to understand the molecular mechanisms of memory, with the ultimate goal of delaying or reversing memory dysfunctions. We further aim to extend these insights into the realm of brain-machine interface.

Prof. Myung In Baek

Movement is one of the key components of our lives. During movement motor neurons display rhythmic and patterned activities, which are determined by inputs to motor neurons including sensory inputs, local interneuron inputs, and descending inputs from the supraspinal centers. The local motor neuron activities are reported to higher brain centers through ascending pathways. The deeper understanding on what locomotor circuits are composed of and how the neuronal circuits become properly wired will allow us to take diverse approaches to help people with motor function defects. With this goal my research aims to :

- Identify molecular mechanisms that regulate motor circuit connectivity by testing the function of genes involved in the development of motor neuron morphology.
- Identify neuronal substrates comprising locomotor circuits and understand the role of each component in animal behaviors.
- Understand gene regulatory mechanisms underlying motor circuit development through interspecies comparative approaches.

Prof. Byung Chang Suh

My research goal is to understand the molecular mechanism and biophysical properties of ion channel modulation by membrane phospholipids in neuronal excitability and synaptic transmission, and then to examine the functional significance of membrane lipids and proteins in physiological and pathophysiological activities of neurons.

- KCNQ K+Channels and Epilepsy from Molecules to Medication: To investigate the fundamental functions of membrane phosphoinositides(PIs) in the regulation of KCNQ channels and neuronal excitability in peripheral and central nervous systems. The results will provide new insight into the physiological significance of phospholipids in the regulation of cell excitability.
- Ca2+-Permeable Channels and Pain Signaling in Nociceptive Neurons: To understand the effects of receptor-mediated modification of membrane phospholipids on nociceptive channels, such as VGCCs, TRPV1. and ASICs. This knowledge will contribute significantly to understanding the biophysical properties of lipids in pain transmission.
- Lipidomics: Modification and Functions of Phosphoinositides(PIs): To define the functional actions of PI turnover on signal transduction pathways in living cells, focusing mainly on voltage-gated ion channels. I will utilize several PI-specific modifying approaches including chemically inducible dimerization, voltage-sensitive phosphatases, and optogenetics which permit observation of PI modulation of channel activity without activating any other signaling pathways.

Prof. Yong Seok Oh

My research is mainly focused on the molecular mechanism underlying major depression and its reversal by long-term antidepressant medication. We are pursuing the specific aims as follow.

- Identification of neuronal subtypes and molecules regulating mood/ anxiety and their roles in the context of the neuronal circuit and behaviors.
- Neuro-adaptive responses to the prolonged antidepressant treatment, with a focus on cell-type specific transcriptional change.
- Serotonin-dopamine interaction and its relevance to depression and antidepressant actions.
- Exploration about molecular mechanisms underlying the comorbidity of metabolic diseases and the mood disorders.

Prof. Ji Won Um

The goal of my research is to understand the pathophysiological mechanisms underlying neurological diseases(i.e. Alzheimer's disease, autism spectrum disorders, or schizophrenia) that may be caused by various forms of synaptic dysfunctions. To better understand how synaptic genes associated with those neurological disorders impact brain functions at synaptic, cellular and systems levels, we have aspired to alter the activity of specific neuronal circuits and to evaluate the consequences on pathology, network activity, and animal behaviors. To achieve our goals, we are using a combination of protein biochemistry, cell imaging, electrophysiology and mouse genetics. Three major research programs are currently ongoing in the laboratory. First, we are investigating how mutations of synaptic genes associated with autism spectrum disorders or schizophrenia alter synaptic functions. Second, we are studying molecular and cellular mechanisms through which synapses are formed and eliminated in health and disease conditions. Third, we are exploring the role of specific synaptic signaling proteins to elucidate mechanisms underlying the maintenance of excitation/inhibition balance at various synapses and circuits.

Prof. Seong Woon Yu

My research interests are focused on neuronal cell death mechanisms in neurodegenerative diseases. A fundamental gap in our understanding of molecular mechanisms of non-apoptotic cell death and plasticity in switching between distinct cell death pathways hinders development of novel strategies for treatment of neurodegenerative diseases.

- Autophagic cell death mechanisms: The role of autophagy and its molecular mechanisms in neurodegeneration remain to be elucidated. Our study will bring to light the role of autophagy in neurodegenerative diseases, such as Alzheimer's disease, stress and psychiatric disorders.
- Neuroinflammation and microglia activation in the brain: This study will contribute to anti-inflammatory therapeutic design for neurodegenerative diseases. All these research programs will lead to a better understanding of the pathogenic mechanisms of neurodegenerative diseases, and thereby provide strategies for self-repairing of damaged human brain.

Prof. Woo Kyung Yu

My research agenda is to identify neural correlates which support highlevel cognition in humans. Main research topics are described as follows.

- Understanding the neural correlates involved in time estimation, implicit sequence learning, and cognitive control.
- Modeling human cognitive functions with neuroimaging and behavioral data
- Big data analysis of the brain network and functions.
- Methods: psychophysics, magnetic resonance imaging(e.g., fMRI, dMRI, rsfMRI), and transcranial magnetic stimulation(TMS).

Prof. Kwang Lee

Neural Dynamics Lab addresses the fundamental principles underlying the functional brain with behaviral animal. Our missions are to discover the neural dynamics from a single neuron to large-scale neural circuits in the temporal and spatial conditions.

- Brain working mechanism in behavior, emotional memory, and decision-making.
- Dynamic reconfiguration in neural population and brain network.
- Dopamine dynamics in reward and locomotion.
- Neural circuits and brain function in health and brain diseases.
- Repairing learning deficits and neurological disorders using brain signal processing and neuromodulation techniques.
- The next generation brain interface and neural imaging.

Prof. Suk Kyoo Lee

The overall broad goal of my work is to investigate biodegradation of plastics and the effect of microplastics on metabolism.

- Investigation of biodegradation of plastics includes identification of new bacterial species which can degrade plastics, and identification of genes and enzymes for plastic degradation. Plastic degrading enzymes function and structure with genetic engineering promotes development of new bacterial species for protein degradation.
- Investigation of the effect of microplastics on metabolism is to study how microplastics function inside body in vitro and in vivo. My research focuses on identifying the metabolic changes caused by absorption of microplastics in the body and developing inhibitor for microplastics absorption. These studies will allow us to better understand the mechanisms how microplastics affect human health and develop a novel strategy to prevent microplastics absorption in the body.

Prof. Sung Bae Lee

The primary goal of our research is to reveal the cellular and molecular basis of neurodegenerative diseases such as Huntington's disease and Parkinson's disease that are often associated with protein toxicity or defective intracellular organelles. Our three major questions are listed below.

- What is the "cellular basis" of neurodegenerative diseases? We aim to characterize specific neuronal abnormalities preceding cell death, such as mitochondrial defects or cytoskeletal alterations in these late-onset neurological disorders.
- How can we ameliorate the toxicity of aggregated proteins associated with neurodegenerative diseases? We are working on three possible strategies such as chaperone activation, autophagic clearance, and the use of structural inhibitors.
- What's the relationship between neuronal cellular aging and late-onset neurodegenerative diseases? It is of interest to see the changes in neuronal cellular vulnerability with aging against protein toxicity.

Prof. Yong Cheol Cho

While injuries to the central nervous system damage neurons resulting in degeneration and death, some sensory and motor neurons in the peripheral nervous system activate the axon regeneration program to regenerate axons and recover the original functions. Multiomics comparative analysis enables us to understand the molecular mechanism of the axon regeneration program for developing therapeutic applications.

- Manipulating axon regeneration program: Identifying potential players regulating axon regeneration program with understanding injury-responsive neuroepigenetics to manipulating axon regeneration program.
- Engineering regenerative potential: Screening injury-responsive factors from high-throughput in vitro axon regeneration assay platforms and developing therapeutic applications by engineering neuronal regenerative potential.
- Protecting neurodegeneration by understanding the biology of axonopathy: As axon degeneration is a hallmark of neurodegenerative disorders, identifying epigenetic players activating the axonal self-destructive program to develop methods for protecting neurodegeneration.

Prof. Han Kyoung Choe

- Control of higher brain functions by circadian rhythm and sleep.
- Innovating behavioral studies by AI-assisted behavior measurement and analysis.
- Generating mouse model of psychiatric, neurological disorders by genome editing of disease risk genes.
- Revolutionizing viral vector for optimal gene delivery in industry-academia collaboration.
- In our arsenal:
- Circadian measurement of physiology and molecular signatures, along with sleep measurement Custom behavioral rig, behavioral monitoring sensor, and AI-assisted analysis.
- Mouse genetics-stereotaxic brain surgery-opto/chemogenetics.
- Fiber photometry, in vivo microscope, Neuropixel recording.
- Circuit-specific genome editing with tailored AAV viral vector.

Prof. Jung Ho Hyun

My lab's research focuses on decision-making processes in the brain, the role of neuromodulators as well as neuronal malfunctions in psychiatric diseases. Also, my lab's research seeks to define neural mechanisms to control how internal states of the brain are reconfigured when animals make flexible decisions that use different underlying computations. To meet our goals, we use several behavioral models in rodents in combination with various cutting-edge techniques such as miniaturized micro-endoscopy(miniscope) calcium imaging with multiple in vivo recording in freely-moving animals. Main projects are described below:

- Demystifying cognitive flexibility at single cell resolution.
- Neuromodulatory role in structural learning using in vivo imaging and computational approach.
- Neural correlates of inference in rodents.
- Develop novel technology to selective labeling and control of emotion state of the intact brain.

Faculty

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Career&Major achievements: Research Specialist and Postdoctoral fellow at Brandeis University | POSCO T.J. Park Award | Published seminal papers including Science, Neuron, EMBOJ. and PLoS Biology | Editor in Current Opinion in Neurobiology&Genetics

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Career&Major achievements: Senior Scientist at the Allen Institute for Brain Science | Postdoctoral fellow at Biozentrum, University of Basel | Postdoctoral fellow at Vollum Institute, Oregon Health&Science University | Published seminal research papers including Nature, Science, Neuron, Cell Reports, Journal of Neuroscience, and eLife

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Research interests: Chemical senses | Brain convergence engineering based on olfaction
Career&Major achievements: JHU School of Med vsiting professor | Member, Society for Neuroscience | Instructor at JHU | British Overseas Students Awards | Published several seminal papers on chemical senses including Ann Rev of Physiol, Neuron, PNAS etc.

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Research interests: Molecular and optical tool development for voltage imaging, Mechanisms of learning and memory, Signal processing in dendrites
Career&Major achievements: Postdoc at Harvard University, Postdoc at Seoul National University, Postdoc at University of Toronto | Harvard Postdoc Pioneers Award(2024) | Published more than 30 papers including Nature Methods and Nature Comm

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Career&Major achievements: Postdoctoral fellow at NYU school of Medicine | Postdoctoral fellow at HHMI at NYU school of Medicine | Publications in highly respected journals in the Neuroscience field: Cell, Cell Reports, and Development

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Research interests: Lipidomics, ion channel regulation, and molecular mechanism of epilepsy and pain
Career&Major achievements: Research Assistant Professor, University of Washington-Seattle | Member, Society for Neuroscience | Young Scientist Research Promotion Award(1997), DGIST Achievement Award(2016), Citation for Distinguished Service to the Journal of General Physiology(2017) | Published seminal papers cited over 300 including Science and Neuron

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Career&Major achievements: Assistant Professor, Yonsei University College of Medicine | Postdoctoral fellow at Yale University School of Medicine | Presidential Postdoctoral Fellow(2013) | Member, Society fo Neuroscience | Published seminal papers including Nature Neuroscience, Neuron, Nature Communications&PNAS

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Research interests: Programmed cell death of neurons and neural stem cells during neurogenesis, neural development and neurodegeneration | Role of autophagy in brain function | Mechanisms of microglia activation and neuroinflammation | Pathogenic mechanisms of neurodegeneration
Career&Major achievements: Assistant Professor, Michigan State University | Post-doctoral fellow at JHU | Member, Society for Neuroscience | Raymond B. Bauer Award and other several awards | Published several seminal papers cited over 100 times including Science(1,250 times), PNAS(315)

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Research interests: Protein folding, protein dynamics and conformational change of protein, computational neuroscience
Career&Major achievements: Postdoctoral fellow at University of Chicago | Research professor at DGIST | Postdoctoral fellow and Research professor at Pusan National University | Published seminal papers including 5 PNAS papers

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Career&Major achievements: Postdoctoral fellow at Washington University School of Medicine, Assistant&Associate Professor at Department of Life Sciences in Korea University, POSCO Science Fellowship(2018), SRF(2018), Published papers including Cell, PNAS, EMBO J, Neuron



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Research interests: Neural Differentiation, Human iPS cell technology, Mechanotransduction, Bioinformatics, Brain Organoids

Q — What made you choose DGIST?

During my undergraduate studies, I engaged in research activities to investigate the impact of natural substances on brain activity. The process of proving hypotheses by using various experimental techniques appealed to me, leading me to decide to pursue graduate studies. Thanks to DGIST's stateof-the-art experimental equipment and its high reputation for excellent brain science research, I thought DGIST is the ideal environment for neuroscience research. While interning in Professor Kyu Hyung Kim's lab during the summer, I realized the utility of C. elegans as a model organism for research. C. elegans shares similarities with mammals in terms of neurotransmitters and receptors responsible for synaptic transmission, and its short lifespan and ease of genetic manipulation makes it an ideal model for neuroscience research. Taking these advantages into consideration, I decided to pursue neuroscience research using C. elegans as a model organism and joined the Neurobehavior and Neural Circuits lab in Brain Sciences Department.

Q — What are the strong points of the departmentof Brain Sciences?

The educational program offered by the Department of Brain Sciences is highly well-coordinated. It begins with introductory classes that provide a general approach to neuroscience, covering basic concepts, which is beneficial for students with minimal background knowledge. Furthermore, the advanced courses focused on specific neuroscience fields allow students to select courses aligned with their Research interests: These comprehensive curriculums facilitate the development of expertise in neuroscience. Additionally, weekly department seminars featuring renowned speakers enrich the academic experience and provide opportunities to explore new research areas. Furthermore, the department's close association with the Korea Brain Research Institute(KBRI) offers students numerous opportunities to collaborate on research projects in a diverse range of laboratories.

Q — Explain your research field and purpose at DGIST.

I am researching the molecular mechanisms of the brain's response to sensory perception and physiological changes through neuropeptides. Neuropeptides are neurotransmitters secreted by neurons to transmit signals, regulating synaptic transmission by binding to G protein-coupled receptors.

Interview

After a hard study, I'm going to show you happiness and sense of accomplishment Experience.



Eu Jeong Oh

Department and Program | Brain sciences/Integrated MS&Ph.D
Nationality | Republic of Korea
Assigned Lab | Laboratory of Neurobehavior and Neural Circuits (Prof. Kyu Hyung Kim)

As the nervous system utilizes neuropeptides to adapt and respond to physiological changes, I believe this research is essential for understanding brain function mechanism. To comprehend the brain's communication methods, I am investigating the receptors that neuropeptides bind to activate downstream signals. Based on this, I aim to deepen the understanding of the relationship between neuropeptides and receptors, elucidating the mechanisms by which the nervous system responds and adapts to external stimuli.

Q — What are you planning to do after graduation?

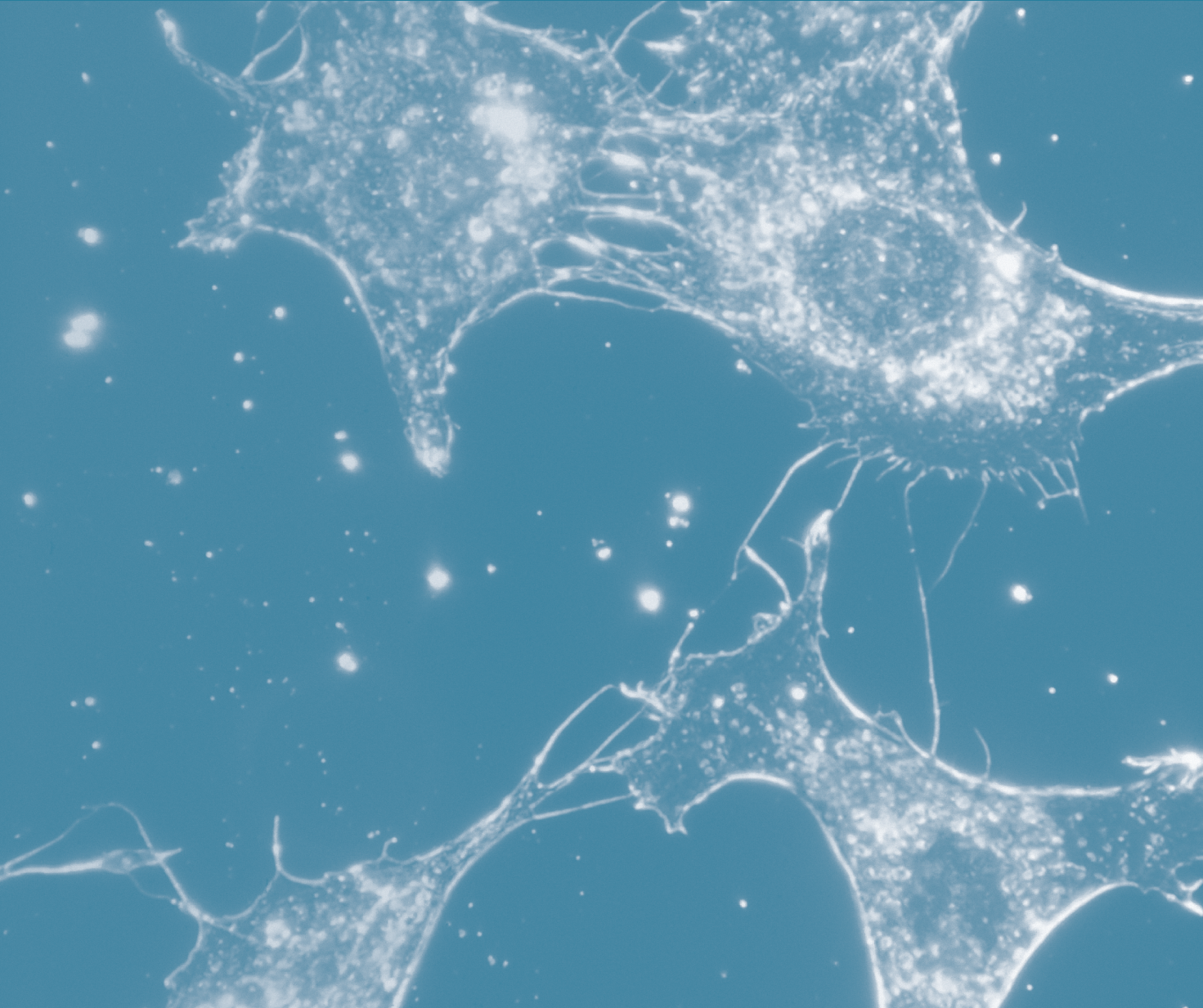
Understanding the mechanism of action of neuropeptides is crucial for uncovering how the brain operates. Based on the experimental results obtained during my master's and doctoral studies at DGIST, I plan to conduct more in-depth neuroscience research as a postdoctoral researcher. While neuropeptide research is actively conducted worldwide, there are still many challenges to be addressed. Therefore, I aim to go beyond simply elucidating the behavioral consequences of specific neuropeptide defects and strive to build a comprehensive understanding of their impact on the neuropeptide-receptor connectome within the nervous system. Ultimately, I hope to contribute to expansion of human knowledge by becoming an independent researcher based on these research experiences.

Q — Please advise our applicants.

It's important to consider one's areas of interest and the problems they wish to address through research before entering graduate school. Seeking tips from senior graduate students and professors through consultations can be helpful in making career decisions. DGIST offers a summer and winter internship program for students considering graduate school, which I personally participated in and highly recommend. Additionally, through the open lab program held in each graduate department, you can take lab tours and consult with professors and graduate students. Participating in these programs can provide valuable indirect experience in labs that interest you. While conducting research, there may be times when positive results are not achieved, but overcoming challenges and exploring more effective ways to validate hypotheses brings great satisfaction during graduate school. I am confident that by making careful decisions, you will experience the sense of accomplishment that I felt during the research program.

VI. New Biology

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New Biology is a novel paradigm in life sciences that takes a multidisciplinary approach and utilizes cutting-edge technologies to understand life phenomena and to solve grand challenges facing humanity. The Department of New Biology aims to cultivate leading scientists who will open a new scientific culture and future civilization. With creative and analytical convergence thinking, we strive to lead an emergent research paradigm, explore uncharted territories, and solve fundamental problems, ultimately contributing to the sustainability of humanity.

Vision

- ✓ To lead a new paradigm in future biological sciences
- ✓ To pioneer unexplored areas of biology and address fundamental scientific challenges
- ✓ To contribute to sustainable humanity through education and research in New Biology

Goals

- ✓ To become a global leader in life sciences by advancing into the top 30 departments worldwide
- ✓ To identify and address grand challenges through collaborative research within the core New Biology clusters
- ✓ To nurture the next generation of life scientists with strong analytical thinking, independent research capabilities, and interdisciplinary skills

Core Research Clusters



Specialized Program Features

- ✓ Integrated Master's and Ph.D. Program(5-Year Track)
 - Year 1: Education in core technologies, interdisciplinary knowledge, and experimental skills essential for convergence research; acquisition of foundational knowledge and selection of academic advisor
 - Years 2–5: Execution of interdisciplinary thesis research; academic advisor system supports degree completion within five years
- ✓ Creative Curriculum
 - Creative Education: Cultivation of talent capable of creating new problems, methodologies, and outcomes
 - Holistic Education: Development of programs focused on scientific creativity, logic, science communication, and the history of science and technology
- ✓ Global Collaborative Research Programs
 - Joint research initiatives with world-leading institutions, including: Max Planck Institute, Harvard University, UC San Diego, Duke University, National Cancer Institute(USA), National Cancer Center(Japan), University of Copenhagen, A*STAR(Singapore), European Liquid Biopsy Society(ELBS), Salk Institute, Nanyang Technological University(Singapore), University of Michigan, Rutgers University, and more

Food Security & Eco-Plants (FEP) Cluster

- ✓ Goal: To understand developmental principles of living organisms and contribute to food security and climate change adaptation
- ✓ Faculty: Jun Myeong Kwak, Min Sik Kim*, Hye Ryun Woo, Sang Im Lee, Song Yi Lee*, Jong Chan Lee*(*Professors involved in multiple clusters)
- ✓ Outlines
 - Growth of human population and climate change threaten the sustainability of nature and humanity, thereby creating new challenges
 - It is necessary to secure sustainable agriculture by clarifying the principle of development and/or adaptation of living organisms(animals and plants) to climate change
 - FEP cluster focuses on investigating metabolism and function of organisms in response of climate change and for food security in collaboration with the DAC cluster in the department
- ✓ Specialized Programs
 - FEP1: Studies of plants on the principles spatiotemporal development and adaptation to environmental changes and evolutionary strategy
 - FEP2: Studies on metabolism and function linked to vitality and aging
 - FEP3: AI-based studies on plant growth and functional enhancement

Disease & Aging Control (DAC) Cluster

- ✓ Goal: Research on disease control and vitality-driven aging for human longevity and well-being
- ✓ Faculty: JaeHyung Koo, Young Hoon Kee, Min Seok Kim*, Min Sik Kim*, Yoo Ri Kim*, Jin Hae Kim, Tae Wan Kim, Chang Hoon Nam, Kyung Moo Yea*, Byung Hoon Lee, Song Yi Lee*, Young Sam Lee, Jae Min Lee, Jong Chan Lee*, Chang Hun Lee, Young Tae Jeong, Chan Chung, Il Kyu Choi(*Professors involved in multiple clusters)
- ✓ Outlines
 - Early disease diagnosis, customized precision medicine, and new drug development are key areas for securing global competitiveness and creating new bio-industry in the future life sciences field
 - The need for researches of vitality and healthy aging has increased as social, economic, and health care costs increase due to rapid growth of aged population
 - DAC cluster contributes to human permanence through the development of technologies for disease and aging control
- ✓ Specialized Programs
 - DAC1: Studies on pathology, early and precise diagnosis of disease, precise control and prevention
 - DAC2: Studies on the development of new drugs linked to new convergence technologies
 - DAC3: Studies on cell aging, reverse aging, aging disease mechanism, and aging control technologies
 - DAC4: Studies on reorganization of biomolecular structures induced by aging and disease

Multi-Omics, AI & Biotechnology (MAB) Cluster

- ✓ Goal: Development of core technologies through the convergence of Multi-Omics, artificial intelligence, and biotechnology
- ✓ Faculty: Min Seok Kim*, Min Sik Kim*, Yoori Kim*, Kyung Moo Yea*, Song Yi Lee*, Jong Chan Lee*(*Professors involved in multiple clusters)
- ✓ Outlines
 - Multi-Omics, AI, biotechnologies are at the core of the biohealth industry innovation strategy in the era of 4th industrial revolution
 - Developing emerging technologies as core foundational tools to establish the foundation for an innovative and distinguished New Biology research program
- ✓ Specialized programs
 - MAB1: Studies on building multi-omics data production platform
 - MAB2: Studies on new artificial intelligencec onvergence technologies for multiomics bio big data analysis
 - MAB3: Development of core technologies for life science and biomedical engineering

- ✓ Interdis ciplinary education and research based on a matrix structure, fostering the development of new problems and methods in collaboration with other departments at DGIST
- ✓ Collaboration in research projects with various DGIST institutes such as the Nano-Energy, IoT Robotics Convergence Research Group, and the Well-Aging Research Center
Examples: Nerve Aging and Regeneration Research(DGIST Flagship), Space Farm, Quantitative Measurement and Control of Human Body Activities Including Aging, New Habitat

Career Paths

Post-doctoral Research

- Graduates have pursued postdoctoral research at globally renowned institutions, including:
- ✓ UC Berkeley, CNRS, Harvard University, UC San Diego(UCSD), University of Pennsylvania(Upenn), Stanford University
 - ✓ Max Planck Institute, Salk Institute, Scripps Research, Yale University, National Institutes of Health(NIH), Johns Hopkins University
 - ✓ University of Cambridge, ETH Zurich, Technical University of Munich, Memorial Sloan Kettering Cancer Center, and more

Industry Employment

- ✓ Biotechnology Companies: Samsung, LG, and other major biotechnology firms
- ✓ Bioinformatics Companies: Theragen, Macrogen, DNA Link, BERTIS, and more
- ✓ Pharmaceutical Companies: Green Cross(GC), Chong Kun Dang, and other domestic pharmaceutical firms
- ✓ Bio-venture Startups: Opportunities in industrial proteins, bio-based materials, bioenergy, and entrepreneurship in emerging biotech sectors

Government-Funded Research Institutes

- Graduates also work as researchers in prominent Korean national institutes, including:
- ✓ Korea Research Institute of Bioscience and Biotechnology(KRIBB)
 - ✓ Korea Basic Science Institute(KBSI)
 - ✓ Korea Disease Control and Prevention Agency(KDCA), National Cancer Center, Rural Development Administration(RDA), among others

Academic Careers

- Many alumni have been appointed as professors or lecturers at prestigious universities, including:
- ✓ Seoul National University, Yonsei University, Ajou University, Sahmyook University, Wonkwang University(Korea)
 - ✓ Hanoi Medical University(Vietnam) and others

The interview process

- ✓ Interview(10 min): Qualification evaluation of personality, leadership and communication skills including English, creativity, and knowledge required for study of convergence biology
- ✓ Oral Presentation: Each applicant will be asked to give a 30 min presentation, which includes a 10 min Q&A. Presentation topic will be announced a few days before the presentation
- ✓ Online interview can be arranged for students residing outside Korea, upon early request
- * Applicants should arrive 30 min before the interview
- * Detailed guidelines will be provided prior to the interview

Major research facilities

Bio-imaging Core Facility

- ✓ State-of-the-art fluorescence microscope and confocal microscope
- ✓ Super-resolution optical microscope(STED, PALM)
- ✓ Nano-bio imaging(TOF-MEIS, SR-CARS, SPRIE-TIRF, bio-SIMS/MALDI/PADI)
- ✓ Single-molecule fluorescence measurement platforms



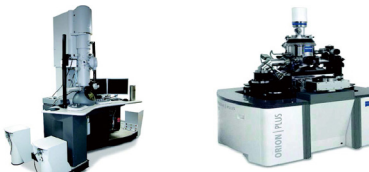
Laboratory Animal Resource Center

- ✓ Pathogen-free growth environment
- ✓ Isolated experimental areas



Central Equipment Center

- ✓ Access to cutting-edge bioanalytical equipment, including cryo-electron microscopes and super-resolution microscopes



What topics are studied in the Department of New Biology?

What kind of interesting researches are going on in New Biology?

The Department of New Biology aims to integrate biology with various other disciplines(physics, chemistry, engineering, computer science, etc.) to establish an innovative research paradigm and pioneer unexplored fields. Through this, we strive to address critical challenges in health, food, and the environment that humanity faces today. To achieve this goal, the following research and education programs are in place:

- Food Security&Eco-Plants: Investigating the principles of living organisms' adaptation and development in response to climate change to contribute to food security
- Disease&Aging Control: Researching disease control and vitality aging for improved human health and longevity
- Multi-omics&AI Bioinformatics: Developing core foundational technologies through the integration of multi-omics, AI, and biotechnology

Does the Department of New Biology offer a unique educational and research environment?

The Department of New Biology offers a specialized educational and research environment aimed at nurturing future-oriented, next-generation scientists with the potential to become global leaders. Students are expected to complete their degrees within an average of 5.5 years(Integrated Master's and Ph.D. program). The department enhances graduate students' multidisciplinary research experience through collaborative research among faculty members and partnerships with leading international research groups. Additionally, graduate students are

encouraged to participate in international academic conferences, which help foster academic growth, global awareness, and competitiveness through scholarly exchanges and motivation.

Who are the right students for New Biology?

The Department of New Biology seeks creative and talented students who are capable of not only solving given problems and developing knowledge and technologies, but also identifying new challenges. The department aims to nurture well-rounded scientists through a holistic curriculum that includes diverse topics such as scientific creativity, ethics and philosophy, scientific communication, the history of scientific discoveries, business administration, and more.

Who can apply for New Biology?

Undergraduate students from any disciplines with an interest in convergence biological science are welcome to apply to the New Biology department at DGIST. Students majoring in New Biology are expected to enjoy confronting challenges and creative thinking, which are characteristics required for student-led learning and research.

How is the research environment in New Biology?

Instead of the typical laboratory-based environment, the New Biology department integrates education and research in a matrix structure, and maximizes research and learning capacity for largescale projects. Students will be offered diverse opportunities to participate in major research groups during their course of study and expected to produce world-class results.

- Translational Responsive Medical Center

Development and commercialization of precise biomedical technology for diagnosis and treatment of intractable diseases. Vitalization of start-up in fields of personalized targeted therapeutic drugs and diagnosis. Synergy maximization with Daegu Gyeongbuk hightech medical complex and contribution to companies in local community.

- Disease mimic biochip, disease model animals
- Precision biomedical stimulation, Precise cell separation, Precision tissue engineering
- Antibody therapeutics and Cancer immunotherapy

Are there extracurricular activities in the department?

Various extracurricular activities help the development of students in the department of New Biology by stimulating open discussions and knowledge exchange.

- New Biology Research in Progress(NBRiP) semina: Research exchange meeting led by graduate students and researchers in the department
- Inter-lab social activities including the Year-end lab festival and research photo exhibition
- DGIST Post-Graduate Research Abroad Awards: a program for graduate students in the department which supports international lab visits and research exchange

How can we learn about the department of New Biology in more detail?

You can apply for the following programs to learn more about the department

- Summer and winter internship program
- DGIST graduate school open lab
- New Biology Boot Camp

I'd like to know more about the labs at the Department of Physics and Chemistry.

Prof. June M. Kwak

Lab of Cellular Precision and Plant Development

- Accidental and programmed cell fate changes of Residium cells and Secession cells in the Arabidopsis abscission zone
- Transcriptional factors an d transporters regulating fruit growth
- Single-cell transcriptomics and spatial transcriptomics
- Cell type-specific and cell state-specific genetics
- Stomatal development and environmental cues

Prof. JaeHyung Koo

G protein-coupled receptors(GPCRs)/Brain tumor/Alzheimer's diseases/ Microbiome

Brain-Immune Axis Laboratory(BRIMAX)

- Brain and Systemic Inflammation Research
- Investigates the role of novel orphan GPCRs in tissue-resident macrophages during inflammatory responses
- Studies how novel orphan GPCRs expression in immune cells regulates systemic inflammation, focusing on their potential as therapeutic targets
- Explores interactions between microglial novel orphan GPCRs and microbiome-derived metabolites, uncovering novel mechanisms in neuroinflammation and systemic immune responses
- Brain-Immune Cross-Activity in Cancer
- Analyzes the expression of novel orphan GPCRs in tumor cells and tissues to identify potential biomarkers and therapeutic targets
- Examines brain-immune interactions that influence tumor progression and immune evasion
- Utilizes transcriptomic and proteomic approaches to link novel orphan GPCRs expression with cancer patient outcomes, contributing to precision oncology strategies
- Brain-Immune Interaction in Dementia
- Investigates the connection between neuroimmune signaling and the progression of dementia-related diseases
- Identifies GPCR-mediated mechanisms in microglia-astrocyte-neuron cooperation, aiming to develop therapeutic interventions for neurodegenerative diseases

Prof. Young Hoon Kee

Laboratory of Genomic Stability and Cancer

- Understanding mechanisms that contribute to genomic instability in cancer development
- Understanding how intra-cellular signaling contributes to cancer development
- Understanding how cancers develop drug resistance to anti-cancer therapeutics
- Understanding the role of protein-protein interactions genome protection
- Using CRISPR-Cas9 to modify genome

Prof. Minseok S. Kim

Micro-and nanotechnology/Biomimetics/Liquid biopsy/Companion diagnostics/ Electroceuticals/Cancer immunotherapy

Bioinspired Diagnostic–regenerative technology (BioDr.) Lab

- Liquid biopsy/Companion diagnostics
- Development of next-generation liquid biopsy technologies to enable non-invasive diagnostics using blood or other body fluids instead of invasively collecting tissue samples
- Real-time identification of patients status with liquid samples
- Cancer immunotherapy
- Research on immune cell isolation and cell engineering techniques for anticancer drug development
- Micro-Nano engineering/Biomimetics
- Development of organ-on-a-chip technologies that mimic tissues, microenvironment and disease conditions
- Design of bioengineering-based automated and high-throughput platforms
- Development of cell culture and analysis systems using the microfluidic technology
- Electroceuticals
- Development of stimulation-based therapeutics for intractable diseases

Prof. Min Sik Kim

QBIO and Precision Medicine

- Mass spectrometry: Development of novel methods to detect biomolecules
- Proteomics: Systems Biology at the single-cell level and tissues/organs
- Precision Medicine: Development of precision diagnostics and therapies using Multi-Omics
- Biomarkers: Biomarker discovery for precision medicine

Prof. Yoo Ri Kim

Molecular Epigenetics Laboratory

- Chromatin organization and dynamics
- Protein chemistry
- DNA biosensors&Microfluidics

Prof. Jin Hae Kim

Protein Structure/Protein Aging/Protein Misfolding&Aggregation Protein Structure Aging Lab

- Structural and functional characterization of aged proteins
- Structural characterization of native&aged proteins at atomic resolution
- Aging&disease-induced deformation mechanisms of proteins
- Molecular mechanisms of protein misfolding and aggregation
- Development of novel therapeutic strategy based on protein structures
- Aging&disease-induced alteration mechanisms of protein-protein interactions
- Characterization of protein-protein interactions before&after aging/disease
- Development of therapeutic molecules based on altered interactions of proteins

Prof. Tae Wan Kim
Stem Cell Engineering/Therapy Lab

- Development of methods to derive diverse brain cell types from human pluripotent stem cells
- Modeling, understanding, reversing neurodegenerative disease in a dish using human pluripotent stem cells
- Development of new system to develop stem cell-based therapeutics for neurodegenerative disease

Prof. Chang Hoon Nam
Aging and Immunity Lab(AIM Lab)

- Ageing immune system restructuring
- Inflammaging and metabolism
- Ageing-cell homeostasis
- Age-related association of autophagy and oxidative stress
- Study of shared mechanisms of neurodegenerative processes and ageing
- Paige engineering
- Development of functional biomaterials through paige surface display

Prof. Kyung Moo Yea
Bio-therapeutics Design Lab

- Development of Antibody Drugs
- Devebpmnt ofAntibody Selection Tech
- Antibody enneering
- Cellular Communication

Prof. Hye Ryun Woo
Plant senescence/Plant growth/Stress response/DNA damage/Regulatory mechanism
Laboratory of Plant Molecular Communication

- Molecular genetic regulatory mechanisms of leaf senescence
- DNA damage repair-mediated plant senescence
- Ferroptosis and leaf senescence
- Proliferation and senescence of plant meristem cells
- Regulatory mechanisms of multi-stress responses in plants
- Fine-tuners of photosynthesis and photoprotection
- Small peptide-mediated stress response

Prof. Byung Hoon Lee
Protein Biochemistry/Cell Biology/Drug Screening&Development
Protein Homeostasis and Drug Discovery Lab

- Protein Degradation Mechanism
- Ubiquitin-proteasome system(UPS)
- Deubiquitinating enzyme(DUB)
- Autophagy
- Targeted Protein Degradation(TPD)%Novel Therapeutics
- Development of ‘induced proteolysis’ technology
- PROTAC, DUB inhibitors
- Protein Homeostasis Maintenance&Overcoming Protein Diseases
- Drug Screening&Development Based on Degradation Biology

Prof. Sang Im Lee
Laboratory of Integrative Animal Ecology

- Elucidation of the impact of climate change and urbanization on the breeding ecology of wild birds based on long-term monitoring data
- Evaluation of negative impact of urbanization by analysing ecological changes observed in wild birds who can serve as ecological “sentinels”
- Conducting citizen science and providing opportunities for ecology education through collaborative monitoring with local citizens
- Integrative investigation on the adaptations of birds and insects
- Adopting multidisciplinary approaches on material properties, structural characteristics and biological function
- Elucidating the diversity of adaptation focusing on the key innovations resulting in adaptive radiation in birds and insects
- Contributing to broaden the knowledge on the diversity of animal adaptations by searching for and investigating new model species

Prof. Song Yi Lee
Chemical biology&Protein Engineering Laboratory

- Elucidating cellular networks through enzymatic chemical reaction(proximity labeling)
- Engineering novel functional proteins for biotechnology tool development

Prof. Young Sam Lee
Cellular and Molecular Biology/Protein Biochemistry
Senescence-Associated Mechanism(S.A.M.) Lab

- Delve into the molecular mechanisms responsible for cellular senescence, with a specific emphasis on molecular communication and trafficking within subcellular organelles
- Identify small molecules and genetic factors capable of inducing physiological restoration in senescent cells. Additionally, elucidate the mechanisms through which these selected factors reverse senescence.
- Investigate the relationship between the structure and function of biomacromolecules in the progression of senescence

Prof. Jae Min Lee
Laboratory of Aging, Metabolism and Physiology

- Metabolism, diabetes and obesity
- Endocrinology, hormonal regulation of metabolism
- Cellular stress and signal transduction responses

Prof. Jong Chan Lee
Single-molecule Biophysics and Advanced Bioimaging Laboratory

- Cellular Liquid-Liquid Phase Separation(LLPS)
- LLPS of Biomolecules such as Protein, RNA, etc
- Investigation of the Role of LLPS in Living Systems
- Single-molecule Biophysics
- Single RNA Imaging in Living Cells
- Optogenetic Regulation of Single Cell and RNA
- CRISPR-based Technologies
- Single DNA and RNA manipulation
- Novel Technologies Applying CRISPR Principles
- Super-Resolution Bioimaging
- Development of Super-resolution Microscopes
- Super-resolved Imaging and Analysis of Living System

Prof. Chang Hun Lee
Biointerface Structure and Skin Lab

- Skin Physiology
- Skin Diseases
- Protein Biochemistry
- Structure-based Drug Design

Prof. Young Tae Jeong
Stem cell biology/Organoids/Cancer biology/Tumor immunology
Stem Cell Biology and Cancer Precision Medicine Laboratory

- Identification of tissue stem cells and their regulatory mechanisms and development of regenerative medicine
- Development of organoids and bioartificial organs
- Cancer stem cells, Cancer targeted therapy, and Cancer molecular prevention
- Tumor immunology

Prof. Chan Chung
Cancer Study/Epigenetics/Metabolomics/Therapeutic Development
Cancer Epigenetics Laboratory

- We study epigenetic changes in cancer through DNA, RNA, and histones, as well as their effects on signaling pathways
- Tumors utilize metabolic processes distinct from normal cells to support rapid cell proliferation, and our laboratory aims to elucidate the metabolic pathways that tumor cells depend on
- We investigate how cancer-derived metabolites influence epigenetic factors and how these metabolites create a favorable environment for cancers
- We explore the interplay between metabolism and epigenetics in the tumor micro-environment and develop cancer treatment strategies targeting these interactions

Prof. Il Kyu Choi
Lab of T-cell Biology&Immunotherapy

- Tumor immunology&immunotherapy
- Cytotoxic CD4+ T cell
- Epstein-Barr virus as the human virobiota

Faculty

**Young Hoon Kee** Professor

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Degree: University of Texas at Austin, Ph.D.
Research interests: Genomic instability, DNA replication stress | DNA damage and repair | Tumor Suppressive mechanisms
Career&Major achievements: Postdoc fellow, Dana-Farber Cancer Institute/Harvard Medical School | Tenured Associate Professor, University of South Florida. | Academic Editor, PLOS One journal

**June M. Kwak** Professor

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Degree: Ph.D.(POSTECH)
Research interests: Molecular cell biology | Cell type-specific genetics | Plant development | Cell fate change control | Cell signaling
Career&Major achievements: Professor, University of Maryland, College Park | Editor-in-Chief(J.Plant Biology) | Cargill Korean Academy of Science and Technology Life Science Award(2022) | Scientist of the Month(2019) | 100 Excellent achievements in National Science and Technology(2019) | HFSP Postdoctoral Fellowship(1998-2000)

**JaeHyung Koo** Professor&Associate Vice President of Research affair&University-Industrial Cooperation

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Degree: Yonsei University, Ph.D.
Research interests: Infection/Inflammation | Brain-Immune Crosstalk in Cancer | Brain-Metabolic Control | Unraveling Brain-Microbiota-Gut Interactions | Exploring/Therapeutically Exploiting | Brain-Immune Interaction in Dementia
Career&Major achievements: Assistant Professor, University of Maryland School of Medicine | Associate Professor, Brain&Cognitive Sciences, DGIIST | Visiting Professor, Johns Hopkins Medicine | Associate Vice-President for Research Affairs, DGIIST | DGIIST Best Research Award('17) | 1st DGIIST Way Award('16) | General Secretary for KSBNS('17) | Editor for BMB Reports

**Min Seok Kim** Associate Professor

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Degree: KAIST, Ph.D.
Research interests: Nanobiotechnology | Nanomedicine | Aging recovery technology | Companion diagnostics | Liquid biopsy | Cancer immunotherapy | Electroceuticals | Biomimetic system | BioMEMS
Career&Major achievements: Director, DGIIST Translational Responsive Medicine Center | Assistant Professor, Konyang University | Senior researcher, Samsung Advanced Institute of Technology | Director of The Korean BioChip Society(KBCS) | Gold prize winner('10, Samsung Human Tech Paper Competition) | New Academic Research Award('22, KBCS)

**Min Sik Kim** Professor

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W. <https://sites.google.com/view/bio-mass-spec/>
Degree: Johns Hopkins University School of Medicine, Ph.D.
Research interests: Mass Spectrometry | Proteomics | Proteogenomics | Precision Medicine | Biomarker
Career&Major achievements: Postdoctoral fellow, Istitute of Genetic Medicine, JHUSOM('13-'16) | Albert Lehninger Award('14) | Assistant Professor, Kyung Hee University('16-'18) | Young Analytical Chemist Award from Korean Chemical Society('20) | DGIIST Research Award('21) | Ministerial Citation, Ministry of Science and ICT('24)

**Yoo Ri Kim** Assistant Professor

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W. <https://www.yk-laboratory.org/>
Degree: University of Texas at Austin, Ph.D.
Research interests: Genome organization | Singlemolecule/ cell imaging and protein dynamics | microfluidics
Career&Major achievements: Postdoctoral fellow, UT Southwestern Medical Center('19-'21) | HHMI international research fellow('15-'18)

**Jin Hae Kim** Associate Professor

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W. <https://sites.google.com/view/jinhaekim>
Degree: University of Wisconsin-Madison, Ph.D.
Research interests: Aging-induced structural changes of proteins | Protein misfolding&aggregation | Protein structure and dynamics
Career&Major achievements: BKI Young Scientist Award('21) from Korean Magnetic Resonance Society | Senior Researcher, Samsung Advanced Institute of Technology | Humboldt Research Fellow, Germany('14)

**Tae Wan Kim** Assistant Professor

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Degree: Seoul National University, Ph.D.
Research interests: Human Pluripotent Stem Cell, Direct Differentiation, Cell Replacement Therapy, Epigenetics, Neuron Development and Degeneration, Neurodegenerative Disease
Career&Major achievements: Research Follow/Associate/ Senior Research Scientist in Memorial Sloan-Kettering Cancer Center

**Chang Hoon Nam** Associate Professor

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Degree: Institut Curie(UTC), Ph.D.
Research interests: Senescent immune remodeling | Inflamm-aging | Ageing-cell homeostasis | Phage engineering
Career&Major achievements: MRC-LMB(Postdoc) | KIST-Europe(Group leader) | DGIIST School of Undergraduate Studies(Associate Prof.) | Lady Tata Memorial Trust International awards for research in leukaemia('04)

**Kyung Moo Yea** Professor

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Degree: POSTECH, Ph.D.
Research interests: Development of Antibody Drugs | Devebpment of Antibody Selection Tech | Antibody enneering | Cellular Communication
Career&Major achievements: The Scripps Research Institute(Lo Jolla), Assistant Professor | Shanghai Tech University, Research Associate Professor | Establishment of new method for the agonist antibody selection | Development of surface engineering technology for Extracellular vesicles

**Hye Ryun Woo** Professor

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Degree: POSTECH, Ph.D.
Research interests: Plant senescence&stress response | Plant DNA damage response | Epigenetics
Career&Major achievements: Assistant Professor, Chungnam National University | DGIIST Excellent Teacher Award('21) | The Blue Ribbon Lecture Award('10) | Associate Editor of Journal of Plant Biology('25-)

**Byung Hoon Lee** Associate Professor

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Degree: University of Texas Southwestern Medical Center at Dallas, Ph.D.
Research interests: Ubiquitin-proteasome system | Protein homeostasis | Targeted protein degradation | Small-molecule chemical screening and drug discovery in human disease
Career&Major achievements: Postdoctoral Scientist, Harvard Medical School&MIT | Scientific consultant, Proteostasis Therapeutics Inc('11) | Alfred Gilman Award

**Sang Im Lee** Associate Professor

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Degree: Seoul National University, Ph.D.
Research interests: Animal Ecology | Evolutionary Ecology | Ornithology
Career&Major achievements: Research Associate Professor, SNU Institute of Advanced Machinery&Design | Researcher, Ewha Womans University EcoScience Research Institute | Currently belong to the Editorial Boards of Frontiers in Ecology and Evolution and of European Journal of Ecology

**Song Yi Lee** Assistant Professor

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Degree: UNIST, Ph.D.
Research interests: Chemical Biology | Protein Engineering | Cellular networks | Functional protein design
Career&Major achievements: Postdoctoral Researcher, Stanford University

**Young Sam Lee** Associate Professor

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<https://scholar.google.com/citations?user=Yh-hvEkAAAAJ>
Degree: University of Texas at Austin, Ph.D.
Research interests: Restoration of cellular senescence | Structural and functional relationship of age-related proteins | DNA replication and repair
Career&Major achievements: Senior research staff, Samsung Advanced Institute of Technology

**Jae Min Lee** Associate Professor

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Degree: University of Michigan, Ph.D.
Research interests: Metabolism, diabetes and obesity | Endocrinology, hormonal regulation of metabolism | Cellular stress and signal transduction responses
Career&Major achievements: Research fellow, Harvard Medical School and Boston Children's Hospita

**Jong Chan Lee** Associate Professor

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Degree: POSTECH, Ph.D.
Research interests: Single molecule Biophysics | Advanced Bioimaging | Cellular Liquid-Liquid Phase Separation
Career&Major achievements: Postdoctoral Researcher, Johns Hopkins University/School of Medicine

**Chang Hun Lee** Associate Professor

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Degree: Johns Hopkins University, School of Medicine, Ph.D.
Research interests: Skin Physiology | Skin Diseases | Protein Biochemistry | Structure-based Drug Design
Career&Major achievements: Professor in the School of Undergraduate Studies | Post-Doc(Bloomberg School of Public Health, JHU) | DGIIST Education Award('19) | Visiting Scientist(University of Texas, Health Science Center at Houston)('23)

**Young Tae Jeong** Associate Professor

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Degree: Johns Hopkins University, Ph.D., Seoul National University, M.D.
Research interests: Stem cell biology | Organoid | Cancer biology | Precision medicine
Career&Major achievements: Instructor, Stanford University | ECFMG(US Medical License) certified



Chan Chung Assistant Professor

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Degree: University of Michigan, Ph.D.

Research interests: Epigenetic changes in carcinogenesis

| Metabolic regulation and genetic alteration in cancer |

Interplay between Metabolism and Epigenetics | Targeting

epigenetic modification for cancer therapies.

Career&Major achievements: Research Investigator, University of Michigan, Medical school



Il Kyu Choi Assistant Professor

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Degree: Yonsei University, Ph.D.

Research interests: Tumor immunology&immunotherapy

| Cytotoxic CD4+ T cell | Epstein-Barr virus as the human

virobiota

Career&Major achievements: Instructor, Dana-Farber Cancer

Institute&Harvard Medical School('20-'21) | Claudia Adams

Barr Award('20)



Interview

Q — What made you choose DGIST?

I first know of DGIST as a research-orientated institution with a strong emphasis on creativity and interdisciplinary collaborations. I was impressed by the well-equipped facility, alongside a multitude of innovative research themes that DGIST offered. Moreover, for an international student such as myself, studying abroad is not merely for acquiring knowledge but also to immerse oneself in cultural exchange. I discovered that DGIST's International Affairs team would organize excursions to explore the heritages alongside other engaging activities for students to adapt to Korean customs or simply to unwind after work.

To top it all off, DGIST's generous financial benefits, which scholarships and stipends would be endowed to enrolled students, allow individuals to be engrossed in academic excellence without the monetary concerns.

Q — What are the strong points of DGIST and the department of New Biology?

DGIST presents an environment that is exceptionally conducive to scientific research. The campus harbors cutting-edge technologies and sophisticated systems which serve an array of purposes. For instance, the Laboratory Animal Resource Center provides invaluable management for research organisms, whereas the Supercomputing and Big Data Center supports interdisciplinary studies that offer multifaceted insights into overcoming pressing biological challenges.

Moreover, New Biology students can work with fellow researchers from diverse departments such as Robotic Engineering or Brain and Cognitive sciences to elevate their research output's caliber, as shown by the prolific publications in distinguished journals annually. The seminars and lectures, delivered in English by renowned professors, ensure that international students can seamlessly follow along and stay abreast of the latest developments in the field. The Post-Graduate Research Abroad Awards also enable students to broaden their horizons and experience top-tier education at universities worldwide. With the opportunities that DGIST

Experience happiness and a sense of accomplishment when the results are presented as papers after difficult research.



Shirley Nguyen
Ngoc Chau Thy

Nationality | Vietnam
Lab | QBIO and Precision
Medicine lab

affords, individuals can unlock new avenues for their future endeavors.

Q — Explain your research field and purpose at DGIST.

In general, we employ state-of-the-art mass spectrometry to comprehend the alteration of proteomic and metabolomic profiles of ample diseases, including but not limited to cancers, neurodevelopmental disorders, and cardiovascular disease. Our objective is to translate the scientific knowledge into clinical utility. We are at the forefront of discovering the putative lung cancer biomarkers from patients' bronchoalveolar lavage fluid, and detecting the neoantigens for immunotherapy in gastric cancer and calcific aortic valve disease. Coming from a biomedical background, I am intrigued by the core regulation of pathogenesis, the protein interaction networks, and how they can be disrupted to halt disease progression. My own research focuses on peripheral neuropathy, aiming to unravel its molecular mechanisms for developing therapeutic regimes.

By implementing the advanced multi-omics approach, we have justified the effectiveness of several drugs that can prevent the exacerbation of nerve damage and potentially reverse it. This will be of significance to diabetes patients and the aging cohort who have to endure chronic pains and debilitating conditions stemming from nerve degeneration.

Another aspect I invest most of my time in is characterizing the "toggle switch" of proteins, termed post-translational modification (PTM). A small perturbation in these switches might drastically lead to chaotic signals within and between cells. I have optimized the mass spectrometer-compatible methods to depict the holistic overview of the phosphorylation status of thousands of proteins and infer their contributions to cancer development. In the impending future, I aspire to transcend the understanding of other PTMs, such as nitrosylation, acetylation, and ubiquitination, to grasp the intricacy of their harmonized cross-talks.

Q — What was the best moment in your DGIST life?

It was a humbling experience for me to witness the discussion between experts in the medical and proteomic fields at an international conference regarding the application of artificial intelligence to biomarker discovery. I was indeed astounded by the study they devised, the opposing perspectives they raised, and their ability to efficiently process complex information to tackle potential shortcomings on the spot. All of which I would have missed if it were not for the financial support from DGIST that encouraged me to attend the event. In terms of life experience, I have lived a few delightful moments with my local friends.

We assimilated the Korean tradition of viewing the sunrise on New Year's Eve by embarking on a 3-hour hike to the summit of the Biseul mountain, which is in the close vicinity of DGIST. Cliché, but I always think of it as an analogy of the postgrad journey—there will be a time that you are burnt out and question the meaning of it all. Yet, you can rest, adjust the gears, and return to the trail. The moment you are mesmerized by the dawn atop the mountain while catching your breath and saying to your companions, "we made it", all the perseverance will be worthwhile.

Q — What are you planning to do after graduation?

My experiences participating in multiple projects at DGIST have substantially cultivated my scientific mindset and myriad transferable skills that will ultimately pave my path toward success in academia and industry settings. My unwavering passion for combatting diseases is constantly kindled throughout the rigorous Ph.D. program. I consider it a great honor to have been inspired and mentored by numerous elites in the field. Therefore, I am compelled to pay it forward and bring out the best in the next generation through teaching and sharing the sheer wonder of scientific discovery with them. As such, I have planned to pursue an academic track, commencing with a postdoctoral position.

Q — Please advise our applicants.

Selecting a research focus that aligns with one's interests is crucial for postgraduate students. To this end, a short internship is advantageous for prospective applicants to explore personal inclinations, get the gist of the research routine, and acquaint themselves with critical thinking in a research-intensive milieu. Furthermore, adequate biological knowledge is a prerequisite for admission interviews and academic assignments. The notion that one should be curious to thrive is also particularly accurate in the New Biology research discipline. Building a habit of perusing scholarly articles is a good way to stay updated with the latest scientific advancements and expand one's intellectual horizons.

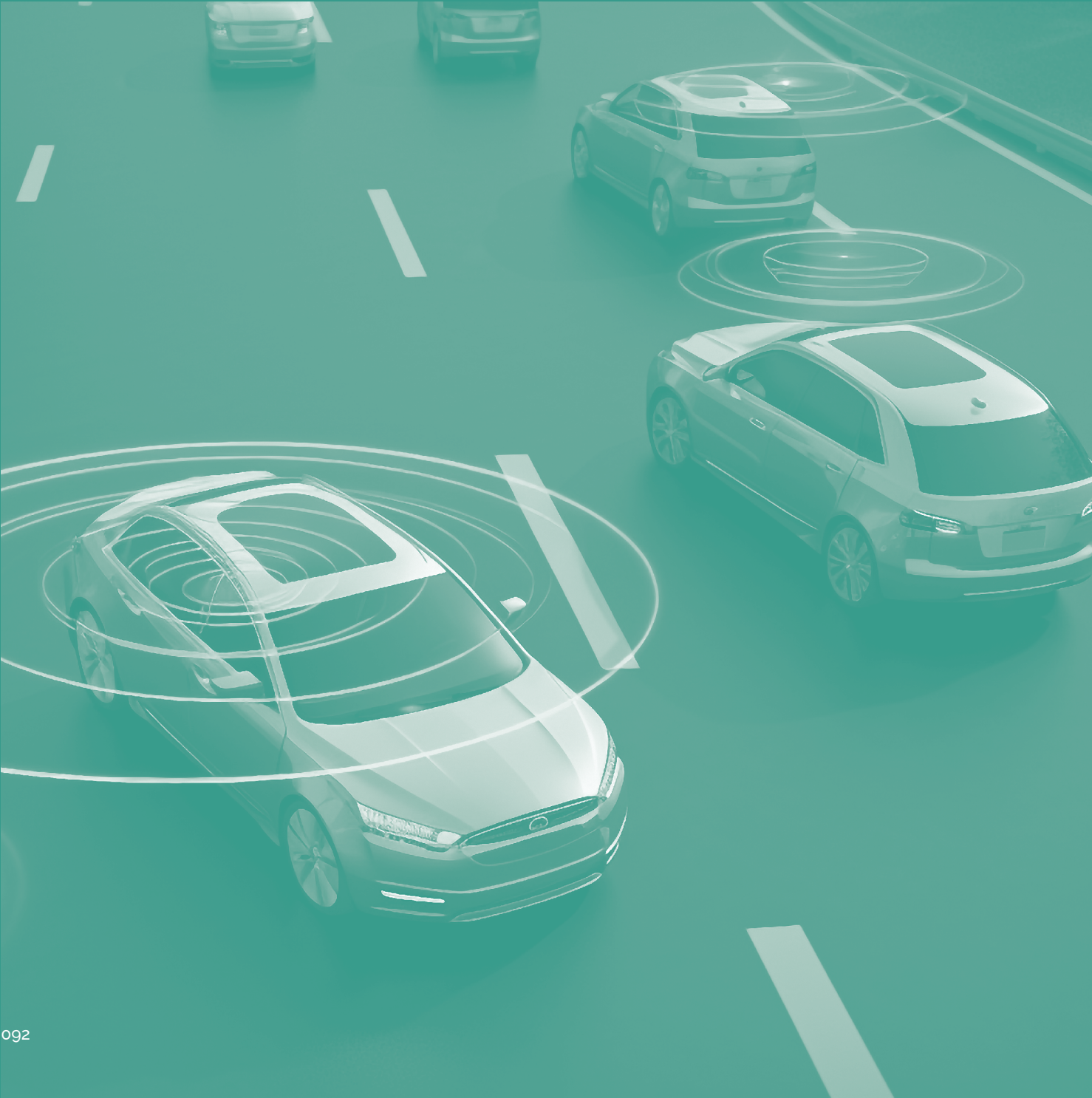
VII. 1. Interdisciplinary Engineering of Interdisciplinary Studies

Interdisciplinary Engineering Major in Interdisciplinary Studies is designed for studies and research on intelligent mobilities and emerging devices, the key elements for the fourth industrial revolution, through interdisciplinary and multidisciplinary education. The main goal is to foster science and technology professionals with creative problem-solving skills through education and research at Convergence Research Institute in collaboration with other departments at DGIST Graduate School.

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Introduction to the department

Interdisciplinary Engineering combines various fields of study and technologies that can respond to the rapidly changing industrial and social structure to seek creative convergence of science and technology for the future. We provide interdisciplinary education. Through the curriculum, we aim to nurture talents who have comprehensive design thinking capability and convergence research capacity on the fields drawing attention in the era of the fourth industrial revolution such as future autonomous mobilities, high-tech materials, components, and devices.

Vision

- ✓ To cultivate problem building and solving skills in the emerging technology fields
- ✓ To foster competences in creative, innovative science and technology for the future industries
- ✓ To nurture creative leaders in convergence science and technology

Research and Education Focus

- ✓ Cultivation of international leaders for the convergence energy devices through closely interconnected interdisciplinary system of DGIST
- ✓ International exchange(including double-degree program) and team projects with global top Institutes
- ✓ Solution searching education and research experiences to technical challenges

Key Research Fields

- ✓ Intelligent Mobilities
 - Autonomous Driving
 - Technology/Human Mobility
 - Interaction/High-Performance
 - Radar Signal Measurement Technology
- ✓ Emerging Materials and Components
 - Energy Conversion Materials&Technology
 - Functional Material for Carbon-neutral Technology
 - Sensors&Packaging Technology
- ✓ Advanced Biotechnology
 - Practical Technology for Translational Medicine(Therapeutics, Diagnostics)
 - Convergence Technology for Quality of Life(Medical Device&Services)

Specialized Research Fields

- ✓ Interdisciplinary Engineering has pioneering curriculums that cover creative and interdisciplinary areas of research in convergence technology for intelligent mobilities and emerging devices, and in biotechnology
- ✓ Education system focused on core research fields by participating in R&D projects

Career paths

- ✓ DGIST Convergence Research Institute
- ✓ National Research Institutes such as CRI of DGIST, ETRI(Electronics and Telecommunications Research Institute), ADD(Agency for Defense Development), KITECH(Korea Institute of Industrial Technology), etc.
- ✓ Research institutes of conglomerate, foreign companies, or promising middle-market enterprises such as Samsung Electronics, LG Electronics, and Hyundai Motor Group, SKT, Hyundai Heavy Industries, etc.
- ✓ Entering domestic and international graduate school doctoral programs and academic circles

The interview process

- ✓ Individual interviews to evaluate the essential background and professional knowledge
- ✓ Oral presentation on self-introduction, experience or achievement of research, study or research plans, plans after graduation, etc. in both Korean and English
- ✓ The online interview can be arranged for students residing outside Korea, upon early request

What topics are studied in
Interdisciplinary Engineering Major in Interdisciplinary Studies?

- Students learn about the world's leading convergence science and technologies and develop the emerging technologies, mainly focused on intelligent mobilities, intelligent robots, advanced materials and devices and biotechnology, the key technologies of the fourth industrial revolution.
- Like other departments at DGIST, students have opportunities to experience interdisciplinary and multidisciplinary research, and convergence R&BD(Research and Business Development), which cannot be provided in a traditional single major.
- Students will acquire advanced convergence knowledge and technologies by participating in government or industrial research projects conducted at DGIST Convergence Research Institute(CRI) as well as taking range of related courses offered at other departments.

What lecture courses and research projects are offered?

- Students acquire basic interdisciplinary knowledge by taking common courses offered at Convergence Science and other departments.
- After taking the basic common courses, students will take advanced interdisciplinary courses specialized in autonomous mobilities and emerging devices.

- Students perform Project-Based-Research(PBR), the program where students participate in a variety of interdisciplinary research projects in CRI.
- Students are focused more on carrying out research projects to acquire practical knowledge than on learning basic principles, which distinguishes IE from other departments. The main advisor can be chosen from the adjunct faculties of CRI. If needed, co-advisors can be selected from the faculties at IE or other departments, to conduct in-depth multidisciplinary research projects successfully.

Are there any specific undergraduate majors or mandatory courses required to apply for admissions into the graduate programs of IE?

- As the title of 'Convergence Science' itself implies, we welcome ambitious students who have the basic knowledge required for the Convergence Science programs with an academic background in the fields of science and engineering, not limited to computer, electric, electronic, mechanical, materials, or device engineering.

What are the expected fields for students to work in after graduation?

- After graduation, students would be able to work in most industries and academia related to the fourth industrial revolution,

- including the areas of IT, automobile, robotics, energy, device, and materials engineering.
- What makes this program better is that DGIST has cooperative networks of international and domestic research institutions where students can get further opportunities to work.

What is the difference in benefits between Interdisciplinary Studies and other departments?

- Students of the Interdisciplinary Studies department will receive the DGIST scholarship and should pay the tuition. However, they will receive a decent amount of stipend that is enough to cover the tuition fee. Since the full stipend comes from the external funding sources, participation in the related research projects is obligatory. Besides, Convergence Science students are not eligible to be a Technical Research Personnel(Convergence Science students are not exempt from military service).

Please introduce divisions of DGIST
Convergence Research Institute(CRI).

Division of Mobility Technology

Division of Future Automotive Technology leads the development of convergence technology to create innovative value for the automotive industry. It aims to open a new era of automotive research that will address environmental issues by securing convergence technology of automotive with AI, Smart Sensor, and lot for unmanned and accident-free smart cars.

- Core Sensor and Element Technology for Smart Cars
- Practical Technology for Autonomous Driving

Division of Electronics and Information System

Division of Electronics and Information System conducts researches focusing on the following fields:

- High precision positioning/cognition technology and system based on multiple types of sensors to enhance the core cognitive performance of human support system in the future
- Bio-based Big Data analysis and diagnosis-treatment system based on AI(Artificial Intelligence)
- Display technology&Conformal electronics
- Open innovation research based on data science, system dynamics, and qualitative research-based business model
- Multi-Sensor-based Cognitive Technology and System
- Diagnosis-treatment system based on Big Data
- Display&Conformal electronics

Division of Intelligent Robot

Division of Intelligent Robot pursues excellence in research by securing the leading robotics technology. It plays a crucial role in making the domestic robotics industry competitive in the global market through the steady commercialization of its technology. The ultimate goal is to lead technology commercialization to build a welfare society where humans and robots coexist.

- Collaborative Robotics
- Human Cognitive and Physical Augmentation
- Complex Information Processing Platform based on Life-log

Division of Energy&Environmental Technolog

Division of Energy Technology focuses on next-generation thin-film solar cells, efficient hydrogen energy technology, and smart textile technology for energy conversion and storage, which is versatile, eco-friendly, and highly reliable. It aims to promote key research areas and commercialize its research performance.

- Eco-friendly and High-Performance Solar Energy
- Materials and Devices of Hydrogen Energy
- Energy Harvesting and Storage Technology for Wearable Electronics

Division of Nanotechnology

Division of Nanotechnology focuses on new functional materials using nanotechnology and structure control technology. It includes synthesis and application technology of inorganic and organic composite materials.

- High-Performance Thermoelectric Energy Conversion
- Next-generation Extreme Low-power Semiconductor Materials/Devices
- Self-luminescent Nanomaterials and Colloidal Semiconductor Nanocrystals(Quantum Dots)

Division of Biomedical Technology

Division of Biotechnology aims to improve human life quality through the combination of applied life science and biomaterial technology development. It conducts research on disease-related mechanisms and therapeutic targets, development of the molecular diagnostic index, which is a key technology to realize personalized precision medical care, and development of molecular and non-molecular diagnostic indicators, including drug-susceptibility.

- Establishment of the Biological and Computational Model for Controlling and Revealing the Mechanism of Incurable Diseases
- Application and Practical Use of Precision Medicine
- Functional Biomaterials and Bioplastics

Intelligent Mobility



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Research interests: VILS | ADAS | Future mobility policies
Career&Major achievements: Chairman of the Automated Vehicle Accident Investigation Committee | Distinguished Advisor Professor(KMUTNB) | KASA President | Korean Vehicle Safety Defects&Recalls Committee Member | Editor-in-Chief KSEE | Adjunct Professor, University of Louisville



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Degree: Kyungpook National University Ph.D
Research interests: Multimodal sensor signal processing(Deep learning, Vital sign, Radar/Lidar)
Career&Major achievements: IEEE Senior Member | Pennsylvania state university Visiting professor | Institute of Embedded Engineering of Korea Director | Minister of Science, ICT and Future Planning Award(2024)



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Degree: KAIST Ph.D
Research interests: Robotics | Haptics | Brain-Machine Interface | Artificial Intelligence
Career&Major achievements: Researcher, Robotics&Mechatronics Institute, German Aerospace Center | Professor, Dept. of Robotics, Kwangwoon Univ. | Adjunct Professor, Purdue Polytechnic Institute, Purdue Univ. | Adjunct Professor, Dept. of Biomedical Science&Engineering, GIST | IEEE Senior Member | President, Brain Engineering Society of Korea | Vice President | Koream Society of Rehabilitation Robot



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Degree: Sung Kyun Kwan University Ph.D
Research interests: Radar Sensor | Signal Processing | AI(Machine/Deep Learning) | Sensor Fusion
Career&Major achievements: Samsung Electronics Principal Researcher | Georgia Institute of Technology visiting scholar | IEEE senior member | Director of DGIST radar lab | IEMEK Vice President



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Degree: KAIST. Ph.D
Research interests: Machine Vision | Intelligent Robot | Optomechatronics | Optical Metrology
Career&Major achievements: Koh Young Technology Inc. Sensor Team Leader | International Journal of Optomechatronics, Editorial Board Member



Byeong Dae Choi Adjunct Professor/Principal Researcher of Division of AI, Big Data and Block Chain
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Degree: Tokyo Institute of Technology Ph.D
Research interests: Electronic devices | Display
Career&Major achievements: LG-Phillips LCD(LG Display) | RIST, Senior Researcher

Future Materials



Dae Hwan Kim Adjunct Professor/Principal Researcher of Division of Energy&Environmental Technology
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Degree: Ph.D.(Chemical Engineering), POSTECH
Research interests: Thin film solar cells | CIGS/CZTS solar cells | ALD for high-k dielectrics
Career&Major achievements: Highest efficiency of CZTS solar cells, DGIST | Inventor of DRAM-MESH Process, Samsung Electronics



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Degree: Japan Advanced Institute of Science and Technology. Ph.D
Research interests: Thermoelectric technology | Energy conversion device | Permanent magnet
Career&Major achievements: Senior Researcher/ Research Professor, Gyeongsang National University | Scholarship Researcher, Japan Advanced Institute of Science and Technology



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Research interests: Photocatalysis | Advanced Oxidation Process | H2 Production | Nanomaterials for Photoenergy Conversion
Career&Major achievements: CALTECH Visiting Scholar



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Degree: Ph.D.(Chemical Engineering), Postech
Research interests: Nanochemistry | Thin films and bulk structures for energy conversion materials | Thermoelectric materials | Electrode materials for LIBs
Career&Major achievements: Principal researcher, DGIST | Visiting professor, University of Arizona, USA



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Research interests: Thin Film Solar Cells | Compound Semiconductor Materials&Processes | Interfacial Engineering of Energy Devices
Career&Major achievements: Principal Engineer, Samsung Electronics | Courtesy Faculty, Oregon State University



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Degree: University of Tokyo Ph.D
Research interests: Nanoelectronic device | Nanomaterials | Spintronics | Quantum hybrid system
Career&Major achievements: Postdoc, University of Basel(Switzerland) | Postdoc, Princeton University (US) | Postdoc, KRISS(Korea)



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Degree: Maryland Univ. Ph.D
Research interests: Nano-magnetic materials&devices | Thermal interface material | Display materials
Career&Major achievements: Research Scientist, NIST/ UMD Nano-Center | Post-doc, Argonne Lab

Biotechnology



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Degree: UC-Irvine Ph.D
Research interests: Label-free nonlinear bioimaging | SHG/SFG microscopy | Ultrafast carrier dynamics | Quantum physics of low dimension materials
Career&Major achievements: Research associate National institute of standards and technology&KRICT



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Research interests: Body-on-a Chip | 3D Micro-organs | Microfluidic chips | BioMEMS
Career&Major achievements: Post-doc ETH Zurich, Switzerland



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Research interests: Motor control | Computational neurophysiology | Neuromodulation
Career&Major achievements: Research Associate Northwestern University | Researcher Agency for Defense Development

Interview

Q — What does the new beginning of DGIST Interdisciplinary Engineering mean?

With the rapid development in information and communication, disruptive innovation of technology is becoming more common, while the conventional concepts and technologies have been reinterpreted and converged throughout the whole history of the Industrial Revolution. The life cycle of technology is getting shorter as the creation and replacement of the emerging technologies take place in the short term. Moreover, knowledge acquired in school is likely to become obsolete. Our degree program is pursuing project-based research through systematic thinking about complex realities and interdisciplinary convergence in the curriculums rather than merely acquiring knowledge. Students are expected to acquire creative competences to respond to future needs based on practical issues, and we hope that students will not set their own limits and maximize their intellectual curiosity through in various principles.

Q — What do you expect from the students of DGIST Interdisciplinary Engineering?

Through the project-based research, students are expected to clarify concepts of basic science and engineering learned in classes and to establish a foundation communicating with adjacent disciplines effectively. Students are encouraged to build critical and creative thinking skills to respond quickly to rapid changes in the technological revolution of the 21st century. Please pay attention to the history and the development of civilization by studying history, humanities, and so forth. I hope students cultivate qualities to be a creative, socially respectful, and influential leader with whom colleagues feel happy to work.

**Don't decide
on your limits,
but grow your
intellectual
curiosity..**



Gyeong Ho Choi

Professor of Interdisciplinary
Engineering Major

Q — Through Interdisciplinary Engineering, what kind of scientist should students be?

I hope students gain balanced thinking skills by cultivating extensive academic competency both in their specialized and adjacent fields so that they can respond to rapid changes in technologies and complex practical issues. It would be the best if you were a scientist capable of creating new concepts and or finding important issues for the future through endless intellectual curiosity. Keep in mind that being a pioneer or a follower depends on your performance to collect and utilize knowledge around you. We hope to become a scientist who interprets the knowledge spread around us from a consilient perspective and solves the problems facing our society so that everyone can enjoy scientific civilization.

Q — What advice would you give to students who are considering their career?

If you are considering graduate school, you are the ones who obviously benefited from our society. You are all obligated to contribute to society after graduation. As you are responsible for raising the next generation, your choice is undoubtedly important. Take your time to think about what you genuinely like to do. Imagine how it would be helpful for society and then choose the most significant thing you can make it possible. Sometimes the outcome may be delayed. However, trust on yourself and keep on it. The effort won't betray you.

VII. 2. Artificial Intelligence of Interdisciplinary Studies

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The AI department aims to produce advanced AI experts who can perform world-class AI development and research in practice by convergence of multidisciplinary studies based on the best AI faculty and infrastructure. It provides a differentiated curriculum that converges AI with smart city, manufacturing/innovation, bio/medical fields, which is attracting attention in the era of the 4th industrial revolution, and operates a convergence research program that meets the needs of domestic and local industries.

Introduction to the department	The AI major aims to produce advanced AI experts who can perform world-class AI development and research in practice by convergence of various disciplines based on the best AI faculty and infrastructure. We provide a differentiated curriculum that converges smart city, manufacturing/innovation, bio/medical and artificial intelligence, which is attracting attention in the era of the 4th industrial revolution, and operates a convergence research program that meets the needs of domestic and local industries.
Vision	✓ To discover AI problems through close industry-university collaboration projects ✓ To provide creative and innovative AI education curriculum ✓ Cultivating practical advanced AI convergence innovation talent
Key areas of research	Research and Education Focus ✓ Provide AI-specialized curriculum ✓ Securing convergence education program tied with key AI research fields ✓ Provide personalized project courses for student's career ✓ Convergence industry-university joint education track provided: AI-Startup, AI Industry-University Linkage, AI Industry-University Cooperation
Key Research Fields	✓ ML Theory - Explainable AI/Efficient AI/AI Optimization - Human-AI Interaction/Learning Data Optimization ✓ Vision&Imaging - Visual Recognition and Video Processing/Real-time - Deep Learning Network Weakly supervised Learning/Video Inverse Problem/Medical Image Analysis ✓ AI Robotics Robot Automation/Surgery Robot Vision System/Unstructured Data Analysis/Edge Computing/Personalized Service ✓ AI System - AI Accelerator Design/Real-time Training and Inference/Cyber Physical System/AI Security - ML-based Data Recovery/Brain Interface ✓ Applications - Bio/Medical/Manufacture/Industry/Smartcity
Career paths	Career Opportunities after Graduation ✓ DGIST Convergence Research Institute ✓ National Research Institutes such as CRI of DGIST, ETRI(Electronics and Telecommunications Research Institute), ADD(Agency for Defense Development), KITECH(Korea Institute of Industrial Technology), etc. ✓ Research institutes of conglomerate, foreign companies, or promising middle-market enterprises such as Samsung Electronics, LG Electronics, and Hyundai Motor Group, SKT, Hyundai Heavy Industries, etc. ✓ Entering domestic and international graduate school doctoral programs and academic circles
The interview process	Interview Contents ✓ Individual interviews to evaluate the essential background and professional knowledge ✓ Oral presentation on self-introduction, experience or achievement of research, study or research plans, plans after graduation, etc, in both Korean and English ✓ The online interview can be arranged for students residing outside Korea, upon early request

I'd like to know more about the labs at the Department of Artificial Intelligence.

Prof. Young Sik Kim

Applied Cryptography/AI Security/Privacy Enhancing Technologies/Smart Car Security

- Applied Cryptography
- Post-Quantum Cryptography(Lattice/Code-based) Design and Cryptanalysis
- Efficient Implementation of Post-Quantum Cryptography(SW/HW/PIM)
- Side-Channel Attack and Countermeasures
- Quantum Cryptography
- AI Security
- High-speed Implementation of Fully Homomorphic Encryption and Libraries
- Efficient Computation of Fully Homomorphic Encryption
- FHE-based AI(CNN/Transformer) Inference and Training
- FHE-MPC hybrid AI Security
- Privacy Enhancing Technologies
- Secure multi-party Computation and Secret Sharing
- Zero-knowledge proof
- Smart Car Security
- Vehicular Intrusion Detection/Tolerance Technology
- Security of Next Generation Vehicular Networks

Prof. Ga In Kim

Communication Circuits/Hardware Accelerator/FPGA

- Wireline/wireless communication circuits
- Low-power ultra-high-speed wireline transceivers for chip-to-chip interfaces
- High-performance 6G digital baseband modem
- Design of new modulation scheme for wireline transceivers
- Crosstalk cancellation for ultra-high-bandwidth chip-to-chip dense interconnects
- High-performance ADC design for wireline and wireless communications
- Multi-chip Hardware accelerators
- System architecture and circuit design for scalable multi-chip AI accelerators
- Design framework and compiler design for multi-chip AI accelerators
- Programmable System-on-Chip(SoC), FPGA
- Design automation of embedded FPGA for programmable SoC
- Beyond 5G/6G baseband modem design
- Real-time lost signal reconstruction algorithm and its design for wireless communications
- Programmable accelerator for homomorphic encryption

Prof. Gi Seop Kim

Autonomy and Perceptual Robotics Lab(APRL)

- Research on Sensor Fusion and SLAM(Simultaneous Localization and Mapping) for Mobile Robots
- Development of robust SLAM and autonomous driving algorithms capable of operating in large-scale outdoor environments, complex indoor spaces, and extreme conditions

Prof. Ye Seong Kim

Next-Generation Embedded Systems/HDComputing for Cognitive learning/Machine Learning

- Next-Generation Embedded Systems
- Efficient machine learning and applications for the Internet of Things(IoT) systems
- Self-learning embedded systems using reinforcement learning
- Hyperdimensional(HD) Computing
- Machine learning algorithms based on brain-inspired HD(HighDimensional) computing
- Hardware acceleration using parallel computing platforms
- Low-power, high-efficiency intelligence systems based on cognitive science
- Machine Learning
- Deep learning acceleration using emerging computing technologies(e.g., processing in-memory, approximate computing)
- Performance/power prediction of learning algorithms on heterogeneous platforms
- HW/SW Co-design of Secure&Fault-Tolerant Computer Systems

Prof. In Kyu Moon

Intelligent Imaging&Vision Systems Lab

- Biomedical Imaging Systems
- AI-based Multimodal Holographic Imaging Systems Design
- AI Models Design in Biomedical Image Analysis&Processing
- AI-based Automated Phenotypic Analysis of Live Cells
- Image Security&Cyber Security
- Privacy Preserving Image Data Analysis&Captioning
- Optical Cryptosystems Desin&Image Integrity Verification
- Generative AI Security&AI-based Cryptanalysis

Prof. Kyung Seo Park

Interactive Robot Lab

- Next-Generation Human-Robot Interaction
- Development of whole-body multi-modal robot skin
- Hyper-sensory integrated humanoid robot
- Autonomous Robot System based on Multi-modal Perception
- Environment perception based on audio-visual and tactile data
- Artificial intelligence to infer physical and social contexts

Prof. Kyung Joon Park

Cyber-Physical Systems/Industrial Robots/Physical AI/Smart Manufacturing

- Physical AI
- Integration of Physical AI and industrial robots with industrial and military constraints
- Physical AI that enables multi-robot collaboration in wireless network environments
- Training and validating the reliability of Physical AI using digital twin platforms
- Robot Software
- Algorithms for mapping, localization, and path planning of Autonomous Mobile Robots(AMRs) in dynamic environments
- Software-based performance optimization of robotic systems to overcome the limitations of low-cost hardware
- AI-focused robot software architectures ensuring both stability and sustainability
- Robot Network
- Robot Operating System(ROS 2) utilized for Physical AI implementation
- Industry-oriented robot network optimization grounded in theoretical analyses of ROS 2
- Enhancing ROS 2 data distribution services for multi-robot and swarm drone systems
- Smart Manufacturing
- Real-time optimization and autonomous production lines utilizing autonomous robots and AI
- Predictive maintenance and process automation achieved through digital twin technologies
- Next-generation manufacturing solutions meeting safety, reliability, and sustainability

Prof. Dae Hee Park

Intelligent Systems and Learning(ISL) Lab

- Developing AI-based intelligent systems with human-level cognitive and decision-making capabilities
- Research in machine learning and computer vision techniques includes:
- Perception and prediction of surrounding environments
 - Understanding environments using vision sensor data
 - Anticipating future risks through predictive technologies
 - Action planning
 - Developing decision-making methods based on imitation/reinforcement learning
 - Applying these methods to intelligent systems such as autonomous driving and robotics
 - Multimodal learning
 - Integrating visual, language, and motion information
 - Researching applications using foundation models(LLM/VLM/VLA)

Prof. Sang Hyun Park

Medical Image and Signal Processing Lab

- Medical Imaging and Signal Analysis
- Medical image classification, segmentation, enhancement, and registration
- Biosignal analysis and recognition
- Artificial Intelligence and Computer Vision
- Weakly and semi-supervised learning
- Computer vision and anomaly detection

Prof. Dae Won Seo

Machine learning/statistical inference/information theory

- Machine learning theory
- Theoretical analysis of machine learning and deep learning systems
- Social learning theory
- Decision-making process over networks using statistical inference and information theory

Prof. Jin Hyun So

Distributed AI/Federated Learning/On-device AI

- Federated Learning
- Federated learning for parameter efficient fine-tuning of foundation models
- Federated learning framework for multiple AI agents
- Federated continual learning
- On-device AI
- AI Model Compression/pruning
- Efficient ML for on-device learning
- Multi-modal AI
- Hallucination detection and correction framework for vision-language model
- Multi-modal representation learning for BI-directional olfactory system

Prof. Min Young Song

Wireless Integrated Circuits and Systems | Analog/RF/Mixed-Signal Integrated Circuits

- Design of Low-Power/High Energy-Efficient RF Integrated Circuits(ICs)
- Ultra-Low-Power RFIC design for Short-Range Radios(Bluetooth, WiFi, UWB)
- Energy-Efficient Wireless Transceiver IC Design
- IC Based High Integrated Wireless System Design for Internet-of-Things(IoT) and Biomedical Applications
- Research on Next-Generation Low-Power Wireless
- Communication System
- High Integration and System Miniaturization for Wireless Systems
- Radio Miniaturization for Tiny Sensor Nodes and Bio-Implanted Sensors
- Optimization of Communication Links in Various Environments
- Antenna-IC Co-Design
- Highly Efficient Wireless Power Transfer
- Analog/RF/Mixed-Signal Core Circuit Design
- Design of Oscillators, Clock Generators and Frequency Synthesizers
- Design of Low-Noise Amplifier(LNA), Mixers, Power Amplifier(PA), Filters

Prof. Cheol Song

Intelligent Bio-Opto-Mechatronics Lab

- AI based Robot and Biomedical System
- Camera Vision based Robot Motion Study
- Bio-Signal/Imaging based Optical-Medical System
- Precision Robot , Commercial Robot, Human-Robot Interaction

Prof. Se Hoon Oh

Motion Control Lab

- Robot Control
- Development and control of manipulators and quadruped robots
- Dynamic model analysis and multi-degree-of-freedom control using these models
- Vehicle Mechanism Control
- Development and control of new suspension systems, steering systems, and braking systems
- Control strategies to enhance vehicle safety, improve ride comfort, and achieve a fun-to-drive experience
- Precision Control
- Vibration suppression control for industrial robots
- Precision position control for semiconductor equipment and machining tools
- Data-driven controller design

Prof. Jae Sok Yu

Advanced Ultrasound Research Lab

- Functional Imaging and Therapeutic Technologies for Brain Disorders and Cerebral Blood Flow
- High-sensitivity cerebral blood flow imaging techniques
- Skull-penetrating ultrasound technologies
- Sonogenetics-based brain stimulation therapy
- Next-generation Ultrasound Imaging Systems
- AI-based image reconstruction and diagnostic technologies
- 3D imaging system development
- Si-Photonics-based ultrasound sensors
- GPU-based parallel computing technology development
- Robot-assisted imaging platform development

Prof. Dong Won Yun

Biorobotics and Mechatronics Lab

- Bio-Inspired Robotics
- Developing innovative robots inspired by observing and mimicking nature
- Researching novel robots that emulate the structure and motion of animals
- Soft Robotics
- Investigating soft robotics technology utilizing flexible materials and structures
- Developing various soft robots such as robotic hands and robotic legs
- Sensors and Actuators Research
- Conducting research on sensors and actuators, the core components of robotics
- Developing sensors and actuators leveraging electromagnetic principles
- Utilizing polymer and additive manufacturing technologies for sensor and actuator development
- Robotics Applications Research
- Exploring application technologies by integrating robotic components and existing robotics technologies
- Studying robotics applications across diverse fields, including industrial, medical, and military sectors

Prof. Jong Hyeok Yoon

Intelligent Integrated Circuits and Systems Lab

- Circuits for artificial intelligence(AI) systems
- Neuromorphic circuits and systems for automotive navigation
- Energy-efficient computing circuits for edge intelligence and tinyML
- Processing-in-memory(PIM) circuits and systems
- Resistive RAM(RRAM)-based compute-in-memory(CIM) circuits and systems
- Mixed-signal circuits for MAC accelerators
- High-speed wireline transceiver designs
- Multi-standard clock and data recovery architectures for backward compatibility
- Transceivers to support forthcoming Ethernet standards

Prof. Yong Soon Eun

Cyber-Physical Systems and Feedback Control

- We carry out research on modeling of dynamic systems, advancing control theory and the applications to cyber-physical systems(CPS)
- Resilient CPS design methods
- Controls for systems with nonlinear actuators and sensors
- Geometric Control of UAVs
- Networked Control Systems
- City metro precision stop control

Prof. Sung Hoon Im

Computer Vision and Machine Learning

- 3D Computer Vision and Scene understanding
- 3D reconstruction: Mutli-view stereo, SLAM, Sensor fusion etc.
- Scene understanding: Segmentation, Optical flow, Motion estimation etc.
- Image&Video Generation&Editing
- Diffusion-based Generation&Editing
- AutoRgressive-based Generation&Editing
- Vision-Language Model
- Video-text Alignment
- Text-driven Image/Video Reasoning
- Vision-Language-Action Model
- Machine learning for computer vision
- Unsupervised/Weakly-supervised learning
- Transfer learning
- Multi-task learning

Prof. Yong Seob Lim

Autonomous Systems and Control Lab

- Artificial Intelligent(AI) algorithms of perception and control techniques for autonomous systems in the presence of complex and abnormal condition environments
- AI based perception and control algorithms for self-driving and autonomous mobile robotic systems
- Deep learning based path planning and tracking control algorithm for autonomous systems
- Intelligent Mechatronic systems and control

Prof. Kyung In Jang

Bio-Integrated Electronics Lab

- Neural engineering
- Neural signal recording and treatments
- Wearable sensor
- Skin-and cloth-integrated biosensor

Prof. Jin Ho Chang

Medical Acoustic Fusion Imaging and Therapy

- Wearable&Flexible device
- New signal and image processing algorithms to improve the efficiency of disease diagnosis
- High intensity focused ultrasound(HIFU) for cancer treatment
- Molecular imaging using photo acoustic effect
- Combined ultra sound and light techniques for imaging and therapy
- Improving the performance of optical imaging and treatment using ultrasound energy
- Deep learning algorithms for improvement of medical image quality
- New signal and image processing algorithms to improve the efficiency of disease diagnosis
- Ultrasound sensors
- New ultrasound sensors for ultrasound therapy, photoacoustic imaging, cell imaging, etc.

Prof. Hoon Sung Chwa

Real-Time Systems/Cyber-Physical Systems

- Advancing multi-core scheduling for real-time embedded systems
- Heterogeneous multi-core scheduling for smartphones
- Parallelism-oriented real-time multi-core scheduling for embedded systems
- Optimal real-time multi-core scheduling techniques
- Supporting real-time AI services for safety-critical systems
- Real-time scheduling platform design for multi-DNN real-tme inference in embedded systems
- Developing new computing resource management for cyber-physical systems
- Physical-state-aware dynamic cyber resource management for mixedcriticality systems
- Control-schedule co-design and new task model for cyber-physical systems
- Developing new thermal management for automotive systems
- Context-aware thermal management for automotive vision systems
- Thermal-aware adaptive resource management for real-time automotive systems

Prof. Jae Ho Choi

Intelligent Radio Sensing

- AI+Radio
- Radio-centric AI framework
- Radar signal processing
- Next-generation wireless sensing systems
- Human perception with wireless signals
- Health monitoring with wireless signals
- Defense/Remote sensing
- Radar imaging(SAR/ISAR)
- Detection/Classification for threatening targets
- Multi-sensor fusion
- Multi-sensor(e.g., vision, lidar, radar, and IMU) signal processing and fusion

Prof. Ji Woong Choi

Communication System and Signal Processing/Machine Learning Research on communication theory and signal processing/machine learning technologies for advanced communication systems and biomedical system

- Future mobility system and communications
- Next-generation vehicle/robot/UAM(in-vehicle network/V2X) communications and security
- Physical layer security technologies including RF scanner, jamming/anti-jamming
- Core technologies for 5G/6G system
- Biomedical system based on brain-machine/computer interface(BMI/BCI)
- Sensing/stimulation control system design for treatment of neurological disorders
- Functional brain connectivity based biomarker detection&diagnosis/screening algorithm
- Artificial five senses based on bio-mimic artificial sensors and signal processing/AI technologies

Prof. Min Ho Hwang

Surgical Robotics and Robotic Manipulation Lab(SurGLab)

- Precise Object Manipualtion using Robot Hands/Arms
- Automating precision tasks such as surgical suturing, knot-tying, part assembly
- AI-based teleoperation/shared-control
- Continuum Robotics
- Miniaturized/flexible joint mechanism
- Hysteresis compensation algorithm
- Learning-based robot control
- Visual-servoing Control
- Force-servoing Control
- Imitation learning/Reinforcement learning for robots

Prof. Jae Youn Hwang

Advanced Multimodal Biomedical Imaging System/Analysis and Mobile Healthcare Systems

- Multimodal biomedical imaging and Mobile Health-care Systems
- Mobile health-care systems and image/bio-signal processing
- Smart phone-based imaging system and image analysis for early detection of various diseases
- Wearable sensor systems and signal processing for mobile healthcare
- Advanced Multimodal imaging system and image analysis for detection of various diseases
- High-frequency ultrasound imaging system and signal processing
- Biomedical optical imaging system and image analysis

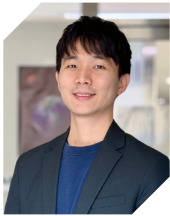
Faculty



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Degree: Ph.D., Seoul University
Research interests: Post-Quantum Cryptography | Fully Homomorphic Encryption | Applied Cryptography | AI Security | Privacy Enhancing Technology | Smart Car Security
Career&Major achievements: Chair of The Interdisciplinary Studies of Artificial Intelligence and Super-computing AI Education-Research Center | Professor, Chosun University | Senior Engineer, Samsung System LSI Division | Leader of Future Technology, National Academy of Engineering of Korea | The recipient of Prime Minister's Commendation(2024)



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Research interests: Wired/Wireless Communication Circuit | Hardware Accelerator | Reconfigurable Semiconductor Circuit
Career&Major achievements: Postdoctoral Researcher, KAIST | Senior Researcher, Samsung Research | IEEE CASS Pre-doctoral scholarship Award(2018)



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Degree: Ph.D., KAIST
Research interests: Mobile Robotics | SLAM(Simultaneous Localization and Mapping) | Sensor Fusion | Autonomous Driving
Career&Major achievements: Research Scientist, Naver Labs(2021-2024)



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Research interests: Next-Generation Embedded Systems | Hyperdimensional(HD) Computing | Machine Learning
Career&Major achievements: Samsung Research America | Intel, USA



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Research interests: Image Processing&Optical Imaging | Deep Learning | AI-based Cryptography/Cryptanalysis
Career&Major achievements: Adjunct Faculty, Univ. of Connecticut | Professor&Director, Chosun University | Exchange Professor Program Award, LG Yonam Culture Foundation | Director of Global Research Lab(GRL) Program, National Research Foundation of Korea | Nomination for Distinguished Alumni Award, Univ. of Connecticut | Director of BK21Four Program | Ministry of Science and ICT Award



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Degree: Ph.D., KAIST
Research interests: Robotics | Physical Human-Robot Interaction | Tactile perception system
Career&Major achievements: Postdoc, University of Illinois Urbana-Champaign(2022-2023) | Visiting Researcher, Max Planck Institute for Intelligent System(2018)



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Degree: Ph.D., Seoul National University, Rep. of Korea
Research interests: Cyber-Physical Systems | Industrial Robots | Physical AI | Smart Manufacturing
Career&Major achievements: Senior Engineer, Samsung Electronics | Postdoctoral Research Associate, UIUC | Associate Editor, IEEE Trans on Industrial CPS | Top 100 Outstanding Achievements in National R&D(2023)



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Degree: Ph.D., KAIST
Research interests: Decision-Making AI | Multimodal Learning | Computer Vision | Autonomous Systems
Career&Major achievements: Ph.D. Research Intern, Qualcomm Autonomous Driving Research, USA(2024) | Ph.D. Research Intern, NAVER LABS(2021) | Qualcomm Innovation Fellowship(2024)



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Research interests: Medical image analysis | Computer vision | Machine learning
Career&Major achievements: SRI International at Menlo Park, Postdoctoral fellow(2016-2017), University of North Carolina at Chapel Hill, Postdoctoral fellow(2014-2016)



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Degree: Ph.D., University of Illinois Urbana-Champaign, USA
Research interests: Artificial Intelligence | Social networks | Information theory
Career&Major achievements: Postdoctoral Researcher, USC | Postdoctoral Researcher, UW-Madison



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Degree: Ph.D., University of Southern California, USA
Research interests: Distributed AI | Federated Learning | On-device AI
Career&Major achievements: Staff Research Engineer, Samsung Cellular&Multimedia Lab, USA(2022-2024) | Ph.D. Research Intern, Microsoft Research, USA(2021) | Engineer, Samsung Model Development Team, South Korea(2013-2017) | Best Paper Award, 2020 NeurIPS Workshop



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Degree: Ph.D., Korea University
Research interests: Low-Power Wireless Integrated Circuits and System for IoT and Biomedicines(Communication and Radar) | Low-Power, High-Performance Analog/RF Core Circuit Design
Career&Major achievements: IEEE Senior Member | Researcher, imec, Europe(Tech. lead of low-power RFIC design) | Senior Engineer, Samsung System LSI Division | 2022 IEEE Brain and Solid-State Circuits Joint-Society Best Paper Award Honorable Mention



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Degree: Ph.D., KAIST
Research interests: Metaverse human-robot interaction | Intelligent mechatronics system | Intelligent biomedical system
Career&Major achievements: KAIST Postdoctoral Researcher | Johns Hopkins University Postdoctoral Researcher | KROS Young robot scientist award(2016) | KROS Best paper award(2021)



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Degree: Ph.D., University of Tokyo
Research interests: Motion control | High precision control and application | Electric vehicle control | Novel Actuator and control | Learning and control of manipulator | Quadruped robot and control
Career&Major achievements: Project Assistant Professor, University of Tokyo | Visiting Scholar, University of Texas at Austin | Senior Engineer, Samsung Heavy Industries | Guest Professor at Osaka University | German Aerospace Center(DLR) Guest Scientist | Best Paper award(IEEE TIE)



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Degree: Ph.D., University of Pittsburgh
Research interests: Biomedical multimodal ultrasound and photoacoustic molecular imaging system and technologies | Ultrasound and photoacoustic based therapeutics | Translational research towards a clinical utility
Career&Major achievements: Postdoctoral Fellow, Georgia Institute of Technology&Emory University | Predoctoral Fellow, University of Pittsburgh Medical Center&University of Pittsburgh | Cover for August issue of IEEE Transactions of UFFC(2017) | The Alavi-Mandell Award, Society of Nuclear Medicine and Molecular Imaging(2018)



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Degree: Ph.D., KAIST
Research interests: Biomimetic Robot | Soft Robotics | Robot elementary technology: Sensors and actuators | Study on the medical application | Study on the industrial application
Career&Major achievements: Researcher, Agency for Defence Development(ADD) | Senior researcher, Korea Institute of Machinery and Materials(KIMM) | Post-doc, UC Berkeley | KSME conference Paper Award(2007) | KSME conference Poster Award(2010) | KSPSE conference Paper Award(2015) | KIMM Achievement Award(2008, 2015) | KIMM Academic Award(2015) | Excellence research award, DGIST(2021) | Ministerial Commendation, MOTIE(2024)



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Research interests: Edge intelligence | Processing-in-memory(PIM) architecture | Clock and data recovery | Mixed-signal circuit design
Career&Major achievements: Postdoctoral fellow, Georgia Institute of Technology



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Research interests: Control theory for cyber-physical systems | Resilient cyber-physical systems | Control systems with nonlinear sensors and actuators | Cyclic control | Performance improvability of control systems | Variable structure control
Career&Major achievements: Senior Research Scientist, Xerox Research Center Webster, Xerox Corporation | Co-author of the book <Quasilinear control>(2011) | Xerox Innovation Group Excellence in Research and Technology Award(2011) | 2nd Asian Control Conference Young Author Award(1997)



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Research interests: Recommendation Systems | Social Network Analysis | Machine Learning | Smart Factory
Career&Major achievements: Postdoctoral Researcher, Computer Science Dept., Carnegie Mellon Univ. | Senior Data Scientist(Researcher), Bigdata Analytics Team, Hyundai Heavy Industries



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Research interests: Computer Vision | Machine Learning | Intelligent System
Career&Major achievements: Vising Scholar, Carnegie Mellon University, USA | Microsoft Research Asia Fellow(2018) | Samsung HumanTec Paper Award(2016, 2022, 2024) | Qualcomm Innovation Award(2016) | The Electronic News ICT Paper Competition Grand Prize(2024), Excellence Prize(2023) | AFCV best robot vision paper(2023) | IEIE Outstanding New Researcher Award(2024)



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Degree: Ph.D., University of Michigan-Ann Arbor
Research interests: AI based autonomous driving and mobile robotic systems and control | Intelligent Mechatronic systems and control
Career&Major achievements: Principle research engineer, Samsung/HanwhaTechwin | Research engineer, Hyundai Motor Company | UGRP Best Research Project Award, DGIST | Robert M. Caddell Memorial Award for Research, University of Michigan



Kyung In Jang Associate Professor
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Degree: Yonsei University
Research interests: Skin-mountable and body implantable health care system | Embedded system for wireless power transmission, communication, and bio-signal processing
Smart cloth with artificial intelligence
Career&Major achievements: University of Illinois at Urbana-Champaign Postdoctoral Researcher(2011-2016) | Frontispiece for October issue of Advanced Functional Materials(2016) | Cover for June issue of Advanced Functional Materials(2015) | Feature image for the September issue of Nature Communications(2014)



Jin Ho Chang Professor
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Research interests: Medical Ultrasound Imaging&Therapy
Photoacoustic Imaging Ultrasound Sensors Biomedical Signal&Image Processing
Career&Major achievements: Postdoctoral Research Associate, NIH UTRC Center, USC | Associate Editor of IEEE TUFFC | IEEE IUS TPC | Board Member, Korea Engineering Deans Council | Board Member, the Institute for Promotion of Engineering and Science of Korea | Board Member, Daegu National Science Museum | Review Board, National Strategic R&D Programs, National Research Foundation of Korea | Medical Device Review Committee, the Ministry of Food and Drug Safety, Korea | Board Member, the Korea Society of Medical&Biological Engineering | Board Member, the Korean Society for Therapeutic Ultrasound | Board Member, the Acoustic Society of Korea | 2024 Award, Minister of Science and ICT of Korea | 2023 Best Paper, The Korean Society for Therapeutic Ultrasound | 2018 Best Paper, The Korean Society of Medical&Biological Engineering



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Research interests: Real-Time AI Services | Real-Time Systems | Cyber-Physical Systems | Mobile Systems
Career&Major achievements: Research Fellow, University of Michigan, USA | Best Paper Award, IEEE RTSS 2012 | Best Paper Award, IEEE CPSNA 2014



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Degree: Ph.D., POSTECH, Rep. of Korea
Research interests: AI+Radio | Radar Signal Processing | Wireless Sensing System | Sensor Fusion
Career&Major achievements: Postdoctoral Researcher, Stanford University, USA(2023-2024) | Postdoctoral Researcher, Next-Gen. Defense Technology Research Center, POSTECH(2023)



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Degree: Ph.D., Seoul National University, Rep. of Korea
Research interests: Communication theory | Signal processing techniques for wired and wireless communication systems | Bio-medical signal processing for brain machine/computer interface | Bio-mimic artificial 5-senses
Career&Major achievements: Staff Engineer, Marvell Semiconductor, CA, USA | Postdoctoral Researcher, Stanford University | IEEE Senior Member | Silver Award, Samsung Human-Tech Paper Competition(2005)



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Research interests: Robot Grasping and Manipulation | Robot/ AI-Assisted Surgery | Next Generation of Surgical Robot System | Robot Learning and Control
Career&Major achievements: Postdoctoral Fellow, University of California, Berkeley(2019-2021) | Top 10 Mechanical Engineering Technology of Korea(2019) | Overall winner and Best Application Award at International Surgical Robot Challenge(2018) | Best Paper Award at ACCAS(2018) | Best Paper Award at ISCAS(2015) | Finalist for the Best Paper Award at ACCAS(2013)



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Research interests: Intelligent Multimodal Biomedical Imaging System | Mobile Edge AI Healthcare System | High-frequency Ultrasound/Optical Imaging System | AI for Ultrasound and Optical Image Analysis | AI for Remote Sensing
Career&Major achievements: Outside Director, Dabeoo(2023-2024) | Research Associate, NIH Resource Center for Medical Ultrasonic Transducer(2012-2014) | Postdoctral Researcher, Cedars-Sinai Medical Center(2009-2011) | KOSOMBE Convergence Director | IEEE IUS TPC | SPIE BIOS TPC

Interview

An environment is provided to focus on convergence research and research with experts in various fields.



Hyuk Joon Kwon

Department and Program | AI Major in Interdisciplinary Studies, M.S., Working Lab | Computation Efficient Learning Lab.(Prof. Yeseong Kim)

Q — What made you choose DGIST?

During the undergraduate course of DGIST, we researched UGRP with a topic related to computer engineering. While conducting the study, I aimed to enter graduate school with an interest in computer science and related fields. In particular, I wanted to study more about the subject of alternative computing for AI. So, I participated in the internship program in DGIST graduate labs and learned about the research process and graduate school or graduate life. When I heard the news of the opening of the artificial intelligence major at the time of graduation, I entered the artificial intelligence major master's program, which I later transferred to the integrated M.S.-Ph.D. program.

Q — What are the strong points of DGIST and the department of AI Major in Interdisciplinary Studies?

I think DGIST's biggest advantage is its excellent research facilities, faculty, and research support. The pleasant research environment and supporting system allows me to focus more on research, which is the best aspect as compared to other graduate schools.

Q — What was your most rewarding moment in the graduate school?

I organized the topics I studied during the undergraduate and graduate programs and published a paper in a top-tier international academic conference. I also had a chance to attend the conference happening in San Francisco. I think it was a good experience to meet other researchers in related fields and expand my knowledge. This experience was a good motivation for my research and made me decide to keep doing research with great vision.

Q — Explain you research field and purpose at DGIST.

I am studying alternative computing for more efficient artificial intelligence. Recently, the size of models and data used in machine learning are increasing significantly, and the computing resource is not capable anymore to run AI on the current computing systems. We are studying both theoretical approaches and system designs to improve the efficiency of AI for various systems, from servers to edges.

Q — What are you planning to do after graduation?

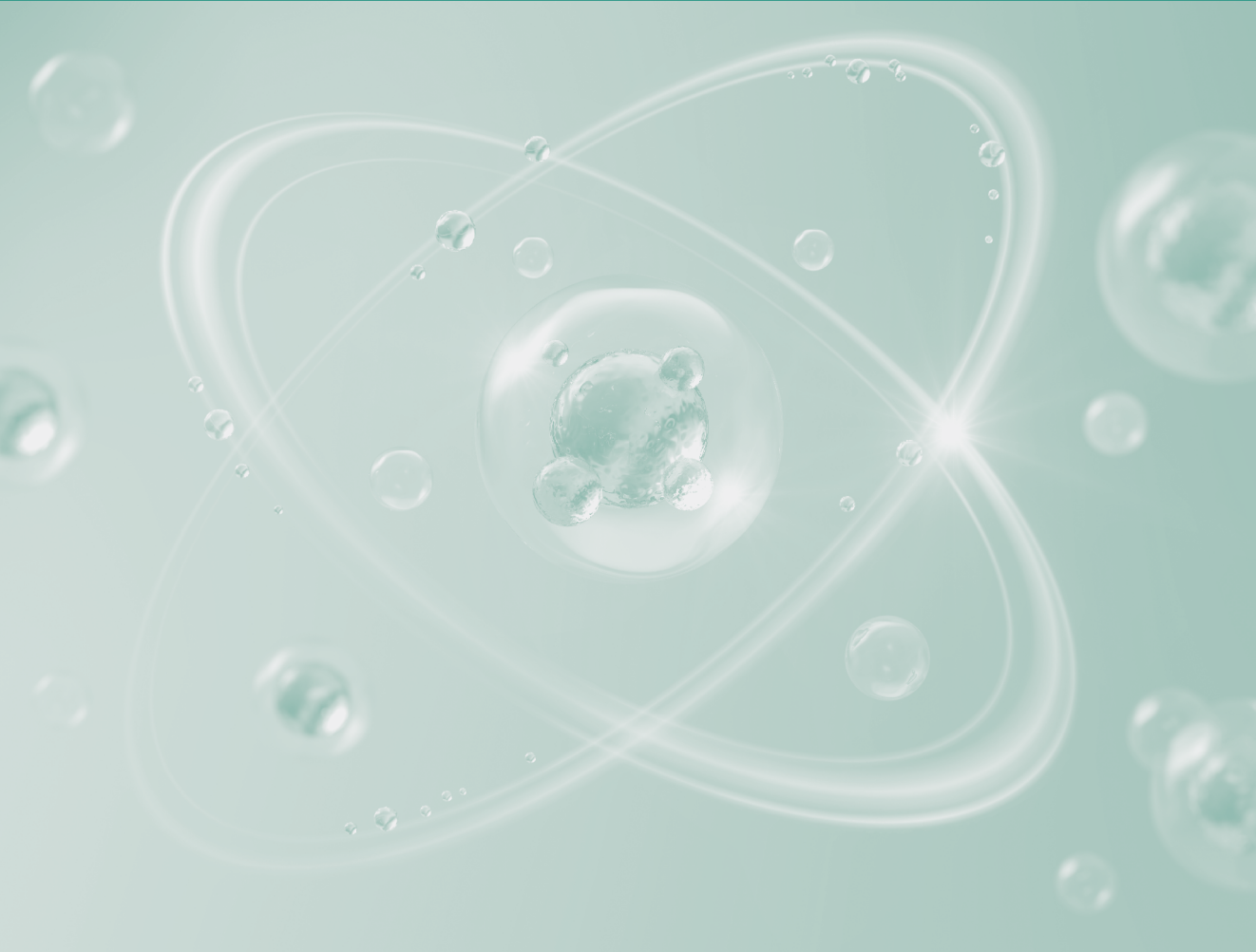
Since I am currently enrolled in the integrated M.S.-Ph.D. program, I plan to pursue long-term research. After graduation, I hope to work as a researcher in a research institute or industry where I can continue impactful AI research.

Q — Please advise our applicants.

Before going to graduate school, you should experience and decide about graduate life through undergraduate research or intern programs. In the process, it is important to make sure that research fits your aptitude and interest. Also, if you are interested in entering graduate school but are not sure about the research field or topic, I think it is important to participate in open labs or related events to obtain as much information as possible.

IX. 3. Biomedical Science&Engineering Major of Interdisciplinary Studies

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The Biomedical Science&Engineering(BMSE) Program in the Department of Interdisciplinary Studies is dedicated to addressing intractable human diseases, particularly those associated with aging, through interdisciplinary research integrating brain engineering, neuroscience, biotechnology, artificial intelligence, robotics, and rehabilitation engineering. Our program aims to cultivate global physician-scientists, biomedical scientists, and engineers who will drive future innovations in healthcare by identifying novel mechanisms underlying various intractable diseases and developing cutting-edge diagnostic and therapeutic technologies.

The BMSE program includes top-level professors specializing in life sciences, brain sciences, artificial intelligence, medical imaging, robotics, and rehabilitation engineering across IT, BT, and NT sectors to nurture interdisciplinary talent. The program offers a range of academic tracks, including M.S., Ph.D., Integrated M.S./Ph.D., and physician-scientist programs. Committed to excellence, the BMSE program conducts world-class research, drives innovation in R&D, promotes industry-academia collaboration, and strengthens global competitiveness.

Vision	The vision of the Biomedical Science and Engineering program is to cultivate global physician-scientists, biomedical scientists and engineers who will lead future medical innovations to treat intractable human diseases.
Specialization of Our Program	✓ Multidisciplinary Curriculum: Integrates cutting-edge knowledge in medicine, neuroscience, brain engineering, life sciences, and biomedical engineering to develop new technologies for the treatment of intractable human diseases ✓ MD-Ph.D. and M.S./Ph.D. Programs: Offeres in collaboration with leading global medical schools and institutes ✓ Innovative Therapeutics and Diagnostics: Focuses on developing new therapeutic technologies by elucidating novel mechanisms in life sciences, while also innovating diagnostic and therapeutic medical devices through interdisciplinary research ✓ Translational Research: Accelerates the commercialization of research outcomes through close collaboration with hospitals and industries
Key Research Areas	✓ Mechanism and Therapeutic Research for Treatment of Intractable Human Diseases - Regenerative medicine using stem cells, organoids, spheroids, etc. - Precision medicine for cancer diagnosis/treatment - New drug design for intractable human diseases - New technology for Super-resolution microscopy, single-molecule observation, and protein phase separation - AI technology for biomarker discovery - Mechanism study for treating brain diseases through brain stimulation ✓ Brain engineering: - Implantable electronic circuits - Non-invasive/minimally invaisive technique for brain stimulation and sensing technology - Signal sensing and processing/stimulation technology for implantable brain devices - High-resolution soft brain interfaces ✓ Intelligent medical imaging systems and analysis: - Ultrasound and optical imaging systems - AI technology for medical image and signal analysis - Edge AI for medical instrumentation - Multimodal imaging and analysis technology for biomedical applications ✓ Medical robotics and therapeutic support systems: - Biomedical devices such as wearable and implantable sensors and stimulators - Robotics and exoskeleton technology for human rehabilitation - Surgical robots, navigation systems, and medical virtual/augmented reality systems - AI-based diagnostic and therapeutic technologies
Career Development	✓ Graduate students can pursue careers as researchers or faculty members at research institutes or universities, both domestically and internationally ✓ Graduate students in biomedical sciences can join global pharmaceutical companies, including Janssen, AstraZeneca, SK Biopharm, SK Bioscience, Samsung Biologics, and others ✓ Graduate students specializing in biomedical engineering can work for leading corporations such as Samsung Electronics, LG Electronics, Siemens, GE, Samsung Medison, and others ✓ MD-Ph.D. graduates from our physician-scientist program can become clinical researchers or professors at hospitals, both domestically and internationally ✓ Graduate students can also pursue careers in government agencies such as the Ministry of Health and Welfare, the Korea Food&Drug Administration(KFDA), or policy research institutes

Graduate programs:

- ✓ Physician-Scientist Program
 - Integrated M.S./Ph.D. Program: Open to individuals with a Bachelor's degree or those expecting to obtain one, along with a license in Medicine, Dental Medicine, or Korean Medicine
 - Ph.D. Program: Open to individuals with a Master's degree or those expecting to obtain one, along with a license in Medicine, Dental Medicine, or Korean Medicine
- ✓ Biomedical Science and Engineering Program
 - M.S. or Integrated M.S./Ph.D. Program: Open to Bachelor's degree holders or those expecting to obtain one
 - Ph.D. Program: Open to Master's degree holders or those expecting to obtain one



Admission process for Prospective Graduate Students:

- ✓ Applicants for the government-funded scholarship, DGIST President's Scholarship, and general scholarship for the Master's Program, Integrated M.S./Ph.D. Program, and Ph.D. Program must meet the same eligibility criteria
- Final candidates invited for on-site or online interviews are selected by the admission committee based on evaluations of their application materials
- The on-site or online interview is customized to the applicant's major, such as medicine, engineering, or science
- Prospective graduate students are expected to demonstrate potential as researchers, global competence, commitment to further education, and strong academic achievements



I'd like to know more about the labs at the Department of Biomedical Science&Engineering.

Prof. JaeHyung Koo

G protein-coupled receptors(GPCRs)/Brain tumor/Alzheimer's diseases/ Microbiome

Brain-Immune Axis Laboratory(BRIMAX)

- Brain and Systemic Inflammation Research
- Investigates the role of novel orphan GPCRs in tissue-resident macrophages during inflammatory responses
- Studies how novel orphan GPCRs expression in immune cells regulates systemic inflammation, focusing on their potential as therapeutic targets
- Explores interactions between microglial novel orphan GPCRs and microbiome-derived metabolites, uncovering novel mechanisms in neuroinflammation and systemic immune responses
- Brain-Immune Cross-Activity in Cancer
- Analyzes the expression of novel orphan GPCRs in tumor cells and tissues to identify potential biomarkers and therapeutic targets
- Examines brain-immune interactions that influence tumor progression and immune evasion
- Utilizes transcriptomic and proteomic approaches to link novel orphan GPCRs expression with cancer patient outcomes, contributing to precision oncology strategies
- Brain-Immune Interaction in Dementia
- Investigates the connection between neuroimmune signaling and the progression of dementia-related diseases
- Identifies GPCR-mediated mechanisms in microglia-astrocyte-neuron cooperation, aiming to develop therapeutic interventions for neurodegenerative diseases

Prof. Ga In Kim

Communication Circuits/Hardware Accelerator/FPGA

- Wireline/wireless communication circuits
- Low-power ultra-high-speed wireline transceivers for chip-to-chip interfaces
- High-performance 6G digital baseband modem
- Design of new modulation scheme for wireline transceivers
- Crosstalk cancellation for ultra-high-bandwidth chip-to-chip dense interconnects
- High-performance ADC design for wireline and wireless communications
- Multi-chip Hardware accelerators
- System architecture and circuit design for scalable multi-chip AI accelerators
- Design framework and compiler design for multi-chip AI accelerators
- Programmable System-on-Chip(SoC), FPGA
- Design automation of embedded FPGA for programmable SoC
- Beyond 5G/6G baseband modem design
- Real-time lost signal reconstruction algorithm and its design for wireless communications
- Programmable accelerator for homomorphic encryption

Prof. Mean Hwan Kim

Central expertise in our lab lies in the integration of advanced experimental techniques, ranging from molecular and cellular approaches to circuit-level investigations. Our goal is to uncover the principles of neuronal signaling and synaptic connectivity in both human and rodent neocortex at an individual neuron and circuit level. Ultimately, our research aims to enhance our mechanical understanding of the structure-function relationships within human cortical circuits. I believe that these combined translational methods, alongside technological advancements, will significantly impact the fields of not only basic molecular/cellular/circuits neuroscience but also human neurological diseases.

Prof. So Hee Kim

Neural Interfaces and MicroSystems Lab

- Brain interface and neural interface
- Brain interfaces and peripheral nerve interfaces toward BMI/BCI
- Long-term reliable implantable interface technology
- Soft bioelectronics
- High-resolution patterning technology based on soft and flexible materials
- Soft-actuation-based bioelectronic devices, such as neural interfaces and drug delivery devices

Prof. Tae Wan Kim

Stem Cell Engineering/Therapy Lab(SCET Lab)

- Development of protocol to derive special types of brain cells from human pluripotent stem cells
- Human pluripotent stem cell based disease modeling and drug discovery
- Human pluripotent stem cell based cell replacement therapy
- Understanding neuron differentiation and degeneration via Epigenetic regulation

Prof. Hoe Joon Kim

Nano Materials&Devices Lab

- Semiconductor Devices and Microfabrication
- Advanced micro/nano-manufacturing for MEMS/NEMS
- Piezoelectric resonators: sensing, RF, energy, and wireless communication
- Smart Manufacturing
- Additive manufacturing(3D printing) of functional materials
- Mechanical metamaterials for robotics and physical systems
- AI-driven structure design and optimization

Prof. Chang Hoon Nam

Aging and Immunity Lab(AIM Lab)

- Ageing immune system restructuring
- Inflammaging and metabolism
- Ageing-cell homeostasis
- Age-related association of autophagy and oxidative stress
- Study of shared mechanisms of neurodegenerative processes and ageing
- Paige engineering
- Development of functional biomaterials through paige surface display

Prof. Kyung Seo Park

Interactive Robot Lab

- Next-Generation Human-Robot Interaction
- Development of whole-body multi-modal robot skin
- Hyper-sensory integrated humanoid robot
- Autonomous Robot System based on Multi-modal Perception
- Environment perception based on audio-visual and tactile data
- Artificial intelligence to infer physical and social contexts

Prof. Suk Ho Park

Multiscale Biomedical Robotics Lab

- Biomedical Micro/Nano Robots
- Diagnostic and Therapeutic Capsule Robots for Gastrointestinal Tract
- Magnetically Actuated Therapeutic Cell/Drug Delivery Micro/Nano Robots
- Soft Micro Robots(Magnetically Actuated Guidewire and Cilia etc.)
- Biomedical Macro Robots and Devices
- Diagnosis and Therapy Technology for Robot-assisted Minimally Invasive Surgery(RMIS)
- Medical Devices(Position Sensing of Catheter, Haptic Sensing Device, etc.)

Prof. Byung Chang Suh

- My research goal is to understand the molecular mechanism and biophysical properties of ion channel modulation by membrane phospholipids in neuronal excitability and synaptic transmission, and then to examine the functional significance of membrane lipids and proteins in physiological and pathophysiological activities of neurons.
- KCNQ K+Channels and Epilepsy from Molecules to Medication:
To investigate the fundamental functions of membrane phosphoinositides(PIs) in the regulation of KCNQ channels and neuronal excitability in peripheral and central nervous systems. The results will provide new insight into the physiological significance of phospholipids in the regulation of cell excitability
 - Ca2+ -Permeable Channels and Pain Signaling in Nociceptive Neurons:
To understand the effects of receptor-mediated modification of membrane phospholipids on nociceptive channels, such as VGCCs, TRPV1, and ASICs. This knowledge will contribute significantly to understanding the biophysical properties of lipids in pain transmission
 - Lipidomics: Modification and Functions of Phosphoinositides(PIs):
To define the functional actions of PI turnover on signal transduction pathways in living cells, focusing mainly on voltage-gated ion channels. I will utilize several PI-specific modifying approaches including chemically inducible dimerization, voltage-sensitive phosphatases, and optogenetics which permit observation of PI modulation of channel activity without activating any other signaling pathways

Prof. Min Young Song

Wireless Integrated Circuits and Systems I

Analog/RF/Mixed-Signal Integrated Circuits

- Design of Low-Power/High Energy-Efficient RF Integrated Circuits(ICs)
- Ultra-Low-Power RFIC design for Short-Range Radios(Bluetooth, WiFi, UWB)
- Energy-Efficient Wireless Transceiver IC Design
- IC Based High Integrated Wireless System Design for Internet-of-Things(IoT) and Biomedical Applications
- Research on Next-Generation Low-Power Wireless
- Communication System
- High Integration and System Miniaturization for Wireless Systems
- Radio Miniaturization for Tiny Sensor Nodes and Bio-Implanted Sensors
- Optimization of Communication Links in Various Environments
- Antenna-IC Co-Design
- Highly Efficient Wireless Power Transfer
- Analog/RF/Mixed-Signal Core Circuit Design
- Design of Oscillators, Clock Generators and Frequency Synthesizers
- Design of Low-Noise Amplifier(LNA), Mixers, Power Amplifier(PA), Filters

Prof. Cheol Song

Intelligent Bio-Opto-Mechatronics Lab

- AI based Robot and Biomedical System
- Camera Vision based Robot Motion Study
- Bio-Signal/Imaging based Optical-Medical System
- Precision Robot , Commercial Robot, Human-Robot Interaction

Prof. Yong Seok Oh

- My research is mainly focused on the molecular mechanism underlying major depression and its reversal by long-term antidepressant medication. We are pursuing the specific aims as follow.
- Identification of neuronal subtypes and molecules regulating mood/anxiety and their roles in the context of the neuronal circuit and behaviors
 - Neuro-adaptive responses to the prolonged antidepressant treatment, with a focus on cell-type specific transcriptional change
 - Serotonin-dopamine interaction and its relevance to depression and antidepressant actions
 - Exploration about molecular mechanisms underlying the comorbidity of metabolic diseases and the mood disorders

Prof. Jae Sok Yu

Advanced Ultrasound Research Lab

- Functional Imaging and Therapeutic Technologies for Brain Disorders and Cerebral Blood Flow
- High-sensitivity cerebral blood flow imaging techniques
- Skull-penetrating ultrasound technologies
- Sonogenetics-based brain stimulation therapy
- Next-generation Ultrasound Imaging Systems
- AI-based image reconstruction and diagnostic technologies
- 3D imaging system development
- Si-Photonics-based ultrasound sensors
- GPU-based parallel computing technology development
- Robot-assisted imaging platform development

Prof. Dong Won Yun

Biorobotics and Mechatronics Lab

- Bio-Inspired Robotics
- Developing innovative robots inspired by observing and mimicking nature
- Researching novel robots that emulate the structure and motion of animals
- Soft Robotics
- Investigating soft robotics technology utilizing flexible materials and structures
- Developing various soft robots such as robotic hands and robotic legs
- Sensors and Actuators Research
- Conducting research on sensors and actuators, the core components of robotics
- Developing sensors and actuators leveraging electromagnetic principles
- Utilizing polymer and additive manufacturing technologies for sensor and actuator development
- Robotics Applications Research
- Exploring application technologies by integrating robotic components and existing robotics technologies
- Studying robotics applications across diverse fields, including industrial, medical, and military sectors

Prof. Kyoung Tae Lee

Integrated circuit based sensor circuits and systems

- Implantable sensors
- Wireless power transfer and communication algorithm and system
- Mm-scale in vivo dosimeter for cancer radiotherapy
- Implantable in vivo signal monitoring(e.g., electrical, oxygen, protein) system
- Li-ion battery monitoring and managing system
- Optimal charging/discharging scheduling and protocol
- Mm-scale Li-ion battery monitoring and controlling IC
- Li-ion lifetime maximization algorithm
- Low power analog/digital sensor IC design
- Analog front end(e.g., amplifiers and filters)
- Mixed-signal circuit(e.g., ADC/DAC)
- Power management circuit(e.g., AC-DC, DC-DC, and LDO)

Prof. Ki Joon Lee

Quantum and Biomedical Optics

- Noninvasive Deep Tissue Imaging and Spectroscopy
- Diffuse Optical Tomography, Functional Near-Infrared Spectroscopy
- Diffuse Correlation Spectroscopy, Diffuse Speckle Contrast Analysis
- Nonlinear Optics
- Random lasing and coherent backscattering in highly scattering medium
- Stimulated Raman Scattering, Spontaneous Parametric Down-Conversion
- Complexity Analysis of Biosignal
- Use of Sample Entropy for vascular health assessment
- Quantum Optics
- Use of Entanglement in Optical Coherence Tomography
- Fundamental study of Bell-type inequality violation

Prof. Jae Sung Hong

Surgical Robotics&Augmented Reality Laboratory

- Flexible Endoscopic Surgery Robot
- Precise and flexible surgical robot system for reduced patient pain and shortened hospitalization
- Master-slave robot system for radiation-free, remote and emergency medical support
- Medical Imaging and Surgical Navigation based on Virtual/Augmented Reality
- Visualization for internal organs using virtual/augmented reality and digital twin technology
- Image processing and simulation for real-time tracking of organ in deformation
- High-magnification microscope calibration using deep learning and artificial intelligence

Prof. Jae Youn Hwang

Advanced Multimodal Biomedical Imaging System/Analysis and Mobile Healthcare Systems

- Multimodal biomedical imaging and Mobile Health-care Systems
- Mobile health-care systems and image/bio-signal processing
- Smart phone-based imaging system and image analysis for early detection of various diseases
- Wearable sensor systems and signal processing for mobile healthcare
- Advanced Multimodal imaging system and image analysis for detection of various diseases
- High-frequency ultrasound imaging system and signal processing
- Biomedical optical imaging system and image analysis

Faculty

Mechanism and Therapeutic Research for Treatment of Intractable Human Diseases



Denis Noble Distinguished Chair Professor

Degree: Ph.D. in Physiology, University of London
Research interests: Systems Biology | Computational Physiology | Cardiovascular Physiology | Philosophy of Biology
Career&Major achievements: Distinguished Chair Professor of Biomedical Science&Engineering, DGIST
President of the International Union of Physiological Sciences(2009) | Burdon Sanderson Chair of Cardiovascular Physiology, University of Oxford(1984-2004) | Secretary-General, International Union of Physiological Sciences(1993-2001) | Emeritus Fellow of Balliol College, Oxford | Director of Computational Physiology, Co-Director of e-science centre, Oxford



JaeHyung Koo Professor/Associate Vice-President for Research Affairs&University-Industry Cooperation

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Research interests: Infection/Inflammation | Brain-Immune Crosstalk in Cancer | Brain-Metabolic Control | Unraveling Brain-Microbiota-Gut Interactions | Exploring/Therapeutically Exploiting | Brain-Immune Interaction in Dementia
Career&Major achievements: Assistant Professor, University of Maryland School of Medicine | Associate Professor, Brain&Cognitive Sciences, DGIST | Visiting Professor, Johns Hopkins Medicine | Associate Vice-President for Research Affairs, DGIST | DGIST Best Research Award(*17) | 1st DGIST Way Award(*16) | General Secretary for KSBNS(*17) | Editor for BMB Reports



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Research interests: Lipid Omics, Ion Channel Regulation, and Molecular Mechanism of Epilepsy and Pain
Career&Major achievements: Research Assistant Professor, University of Washington-Seattle | Member, Society for Neuroscience | Young Scientist Research Promotion Award(1997) | DGIST Achievement Award(2016) | Citation for Distinguished Service to the Journal of General Physiology(2017) | Published seminal papers Cited over 300 including Science and Neuron



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Research interests: Monoaminergic regulation of the CNS and mood/anxiety disorder
Career&Major achievements: PostDoc. Res., Res. Associate, Adjunct Faculty at the Rockefeller Univ., NY | NARSAD Young Investigator award, Brain&Behavior Res. Foundation, US. | Cell 2013, Nature Rev. Neurosci. 2013, Mol. Psychiatry 2020, Cell Rep. 2024, Frontiers in Bioengin.&Biotech. 2024, eNeuro 2024, Frontiers in Mol. Neurosci. 2024 | Editorial Board Member in Exp.&Mol. Med., Frontiers in Mol. Neurosci., Lab. Animal Res. | Review Board Member in National Research Foundation, Korea



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Research interests: Neurodegenerative Disease&Neuronal Aging
Career&Major achievements: Postdoctoral fellow at UCSF, HHMI | Agrwal award | Published seminal papers Including Nature, PNAS, Nature Communications, and EMBO reports | Member, Society for Neuroscience



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Research interests: Synaptic transmission | Synapse and network connectivity and their functional properties | Neuromodulation of synaptic transmission and network connectivity
Career&Major achievements: Senior Scientist at the Allen Institute for Brain Science | Postdoctoral fellow at Biozentrum, University of Basel | Postdoctoral fellow at Vollum Institute, Oregon Health&Science University | Published seminal research papers including Nature, Science, Neuron, Cell Reports, and eLife



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Research interests: Senescent immune remodeling | Inflamm-aging | Ageing-cell homeostasis | Phage engineering
Career&Major achievements: MRC-LMB(Postdoc) | KIST-Europe(Group leader) | DGIST School of Undergraduate Studies(Associate Prof.) | DGIST Director of Center for Teaching and Learning | Lady Tata Memorial Trust International awards for research in leukaemia(2004)



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Degree: Ph.D., University of Texas at Austin
Research interests: Restoration of cellular senescence | Structural and functional relationship of age-related proteins | DNA replication and repair
Career&Major achievements: Senior Research Staff, Samsung Advanced Institute of Technology



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Career&Major achievements: Research fellow, Harvard Medical School and Boston Children's Hospital



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Career&Major achievements: Professor in the School of Undergraduate Studies, Visiting Scientist(University of Texas, Health Science Center at Houston), Post-Doc(Bloomberg School of Public Health, JHU) | DGIST Education Award('19)



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Degree: Ph.D., Johns Hopkins University, and M.D., Seoul National University
Research interests: Stem Cell Biology | Organoid | Cancer Biology | Precision Medicine
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Research interests: Human Pluripotent Stem Cell, Direct Differentiation, Cell Replacement Therapy, Epigenetics, Neuron Development and Degeneration, Neurodegenerative Disease
Career&Major achievements: Medical Researcher in Seoul National University | Research Follow/Associate/Senior Research Scientist in Memorial Sloan-Kettering Cancer Center | Editorial Board Member in Exp.&Mol. Med., Frontiers in Cell. Dev. Biol.



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Research interests: Epigenetic Changes in Carcinogenesis | Metabolic Regulation and Genetic Alteration in Cancer | Interplay between Metabolism and Epigenetics | Targeting Epigenetic Modification for Cancer Therapies
Career&Major achievements: Research Investigator, University of Michigan, Medical school



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Research interests: Learning&Memory, Computational Psychiatry, Neurocognitive Decision-Making, In Vivo Brain Imaging, Neurophysiology, Systems Neuroscience
Career&Major achievements: Research Fellow at Johns Hopkins University | Postdoctoral Fellow at Max Planck Florida Institute for Neuroscience | Research published in Nature Biotechnology and other journals

Brain engineering



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Research interests: Neural interface | Brain interface | Bio MEMS | Soft MEMS | Zebrafish Electrophysiology
Career&Major achievements: Researcher, Fraunhofer Institute for Biomedical Engineering(2006-2009) | Assistant&Associate Professor, Gwangju Institute of Science and Tg Germany(2001-2005) | Postdoctoral Researcher&Research Assistant Professor, University of Uechnology(2009-2015) | Best Paper Award, National Research Foundation(2013) | Excellence in Neural Engineering Travel Award, IEEE EMBC Neural Engineering Conference(2007)



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Research interests: Communication Theory and Signal Processing Techniques, Bio-medical Communications and Machine Learning for Brain Machine/Computer Interface(BMI/BCI), Brain Implants, Artificial Senses
Career&Major achievements: Staff/Senior Engineer, Marvel Semiconductor, USA | Postdoctoral Researcher, Stanford University | IEEE Senior Member | Science and ICT Minister's Award(2023), DGIST Award for Research and Academic Excellence(2019/2017), Silver Award at Samsung Human-Tech Paper Competition(2005), Deleagte of Korean Society for Brain and Neural Science, Board Member of the Korea Information and Communications Society, the Korean Society of Automotive Engineers, the Mobile Communications Society, Board Members of VSI, Inc. and Hansol Technics, Inc.



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Research interests: Advanced Neuro/muscle Interface for Neuroprosthetics | Implantable Neuroelectronics | Neuromodulation Technology | Next Generation of Neuro-Robotics
Career&Major achievements: Postdoctoral Research Fellow, Singapore Institute for Neurotechnology(2017- 2018) | NUS Best Student Award(2014) | KSEASG Best Paper Award(2015) | Cover for March issue of Nano Energy(2017)



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Degree: Ph.D., KAIST, Rep. of Korea
Research interests: Integrated circuits and microsystems | Analog&mixed-signal circuit design | Brain-computer interface ICs
Career&Major achievements: Scientist, A*STAR, Singapore | IEEE ISSCC TPC | Silver prize(2024, 2023), Participation prize(2022), Samsung HumanTech Paper Award | Prime Minister's Award(2023), Minister's Award(2024), Korea Semiconductor Design Contest | DGIST Outstanding Scholar Award(2019) | Best paper award(2019, 2018), Korea Conference on Semiconductor | Best design award(2018), IEEE/ACM ASP-DAC



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Research interests: Wired/Wireless Communication Circuit | Hardware Accelerator | Reconfigurable Semiconductor Circuit
Career&Major achievements: Postdoctoral Researcher, KAIST | Senior Researcher, Samsung Research | IEEE CASS Pre-doctoral scholarship Award(2018)



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Degree: Ph.D., Korea University
Research interests: Low-Power Wireless Integrated Circuits and System for IoT and Biomedicines(Communication and Radar) | Low-Power, High Performance Analog/RF Core Circuit Design
Career&Major achievements: IEEE Senior Member | Researcher, IMEC, Europe(Tech. lead of low-power RFIC design) | Senior Engineer, Samsung System LSI Division | 2022 IEEE Brain and Solid-State Circuits Joint-Society Best Paper Award Honorable Mention



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Degree: Ph.D., UC Berkeley, USA
Research interests: Biomedical Sensor System Design | Low Power Sensor IC Design | Li-ion Management System Design
Career&Major achievements: Researcher, KAIST IT Convergence Center | Postdoctoral researcher, University of California San Francisco

Intelligent Medical Imaging Systems and Analysis



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Career&Major achievements: Postdoctoral Research Associate, NIH UTRC Center, USC | Associate Editor of IEEE TUFFC | IEEE IUS TPC | Board Member, Korea Engineering Deans Council | Board Member, the Institute for Promotion of Engineering and Science of Korea | Board Member, Daegu National Science Museum | Review Board, National Strategic R&D Programs, National Research Foundation of Korea | Medical Device Review Committee, the Ministry of Food and Drug Safety, Korea | Board Member, the Korea Society of Medical&Biological Engineering | Board Member, the Korean Society for Therapeutic Ultrasound | Board Member, the Acoustic Society of Korea | 2024 Award, Minister of Science and ICT of Korea | 2023 Best Paper, The Korean Society for Therapeutic Ultrasound | 2018 Best Paper, The Korean Society of Medical&Biological Engineering



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Research interests: Biomedical devices | Brain-computer interfaces | Integrated circuits and microsystems
Career&Major achievements: Scientist, Institute of Microelectronics, A*STAR, Singapore | IEEE ISSCC TPC Silver prize(2024, 2023), Participation prize(2022), Samsung HumanTech Paper Award | Prime Minister's Award(2023), Minister's Award(2024), Korea Semiconductor Design Contest | DGIST Outstanding Scholar Award(2019) | Best paper award(2019, 2018), Korea Conference on Semiconductor | Best design award(2018), IEEE/ACM ASP-DAC



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Research interests: Biosignal Processing and Bio Imaging | Diffuse Optical Tomography | Diffuse Correlation Spectroscopy
Career&Major achievements: Postdoc at Univ of Pennsylvania | Assistant Professor in Bioengineering at Nanyang Technological University, Singapore | Best Teaching Award at DGIST(2015)



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Research interests: Biomedical Robot System | Intelligent Optical System | Intelligent Biomedical Imaging/Sensing System
Career&Major achievements: KAIST Postdoctoral Researcher | Johns Hopkins University Postdoctoral Researcher | KROS Young Robot Scientist Award(2016) | KROS Best paper award(2021) | Institue of Control, Robotics and Systems(ICROS) Outstanding Paper Award(2023) | IEEE ICRA Outstanding Healthcare and Medical Robotics Paper Award(2023)



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Research interests: Biomedical Multimodal Ultrasound and Photoacoustic Molecular Imaging System and Technologies | Ultrasound and Photoacoustic Based Therapeutics | Translational Research Towards a Clinical Utility
Career&Major achievements: Postdoctoral Fellow, Georgia Institute of Technology&Emory University | Predoctoral Fellow, University of Pittsburgh Medical Center&University of Pittsburgh | Cover for August issue of IEEE Transactions of UFFC(2017) | The Alavi-Mandell Award, Society of Nuclear Medicine and Molecular Imaging(2018)



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Career&Major achievements: Postdoctoral Researcher, KAIST | BK21 Fellow



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Research interests: Medical Image Processing/ Reconstruction/Analysis | Photon Counting CT | Functional Brain Imaging | Algorithm Development | Deep Learning/ Machine Learning
Career&Major achievements: Researcher, KAIST(2014-2015) | Research Fellow, Johns Hopkins University(2015-2016) | Research Associate, Johns Hopkins University(2016-2018)

Medical Robots and Therapeutic Support Systems



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Career&Major achievements: Postdoctoral Researcher in the University of Tokyo, Japan



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Career&Major achievements: Postdoctoral Researcher in University of Cambridge(UK) and Oak Ridge National Laboratory(US)



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Career&Major achievements: Prime Minister's Commendation(2020), Co-chairman's award by Presidential Council on Intellectual Property of Korea(2019), Prize of The State of Geneva at the 47th International Exhibition of Inventions of Geneva, Switzerland(2019), Best Preclinical Manuscript Award, SCRN, France(2019) | Post Doctoral Researcher, University of California, Davis, Nov. 2007-Feb. 2009 | Senior Researcher, Korea Institute of Machinery&Materials, Feb. 2009-Sep. 2010



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Research interests: Medical Imaging | Surgical Robot | VR and AR Visualization
Career&Major achievements: Vice-president of KSMR | Cochair of IEEE RAS TC Surgical Robotics | International network director of ASCAS | JSPS researcher of The University of Tokyo | Associate Professor of Kyushu University | Best paper awards of CARS 2011, ACCAS 2007, JSCAS 2007, etc.



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Career&Major achievements: Carneige Mellon University Postdoctoral Researcher(2015-2016)



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Research interests: Biomimetic Robot | Soft Robotics | Robot elementary technology: Sensors and actuators | Study on the medical application | Study on the industrial application
Career&Major achievements: Researcher, Agency for Defence Development(ADD) | Senior researcher, Korea Institute of Machinery and Materials(KIMM) | Post-doc, UC Berkeley | KSME conference Paper Award(2007) | KSME conference Poster Award(2010) | KSPSE conference Paper Award(2015) | KIMM Academic Award(2015) | DGIST Excellence research award(2021)



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Career&Major achievements: ETH Postdoctoral Fellow(2018-2020) | Seal of Excellence of Marie-Curie Actions(2018) | Several cover papers featured in many international prominent journals



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Career&Major achievements: University of Illinois at Urbana-Champaign Postdoctoral Researcher(2011- 2016) | Frontispiece for October issue of Advanced Functional Materials(2016) | Cover for June issue of Advanced Functional Materials(2015) | Feature image for the September issue of Nature Communications(2014)



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Research interests: Robotics | Physical Human-robot Interaction | Tactile perception system
Career&Major achievements: Postdoc, University of Illinois Urbana-Champaign(2022-2023) | Visiting Researcher, Max Planck Institute for Intelligent System(2018)

Interview

Q — What is the background and vision behind the establishment of the Biomedical Science and Engineering Program at DGIST's Interdisciplinary School?

The vision of the Department of Biomedical Science and Engineering is to nurture global physician-scientists who lead innovative medical research to overcome intractable human diseases through Biomedical science and engineering. In a research and educational environment that fosters interdisciplinary convergence, students are encouraged to explore the mechanisms of complex diseases using cutting-edge knowledge and to develop new diagnostic and therapeutic strategies through IT, BT, and NT technologies. DGIST promotes collaboration among experts in various fields—life sciences, neuroscience, neuroengineering, artificial intelligence, medical imaging, and robotics—to support students in acquiring world-class research capabilities in biomedical science and engineering. Through partnerships with numerous medical institutions, we also provide practical experiences, offering students unique opportunities to strengthen both their research and clinical competencies.

Q — What academic background is required for students to apply to the Department of Biomedical Science and Engineering at DGIST?

The Department of Biomedical Science and Engineering at DGIST welcomes students from diverse academic backgrounds. As we emphasize interdisciplinary research across medicine, life sciences, and engineering, applicants with expertise in medicine, biology, neuroscience, bioengineering, electrical engineering, computer science, and related fields are all encouraged to apply. Students passionate about tackling human diseases and neurological disorders—particularly through neuroscience, biomedical engineering,

We are shaping the future of physician-scientists, biomedical scientists, and biomedical engineers to advance healthcare and scientific innovation.



Jae Youn Hwang

Degree | Ph.D., University of Southern California, USA

artificial intelligence, and robotics—will find this major especially enriching. It also offers an ideal environment for those on the MD-Ph.D. track, supporting the development of both clinical and research competencies.

Moreover, DGIST's extensive global research network provides unique opportunities for academic and professional growth. This program is open not only to medical doctors but also to scientists and engineers who aspire to contribute to biomedical innovation.

Q — What are the career prospects for graduates of the Department of Biomedical Science and Engineering at DGIST?

Graduates of our Biomedical Science and Engineering Program have access to a wide range of career paths. After graduation, they may become researchers or faculty members at universities and research institutes. They also contribute to drug development and precision medicine at global pharmaceutical and biotech companies such as Janssen, AstraZeneca, SK Biopharmaceuticals, and Samsung Biologics. Graduates may work at major corporations such as Samsung Electronics, LG Electronics, Siemens, GE, and Samsung Medison, developing advanced technologies in medical imaging, robotics, rehabilitation devices, and AI-based diagnostics. Those who complete the MD-Ph.D. track can pursue careers as clinical faculty at hospitals or medical schools, engaging in both patient care and translational research. Additionally, opportunities exist in public institutions such as the Ministry of Health and Welfare and the Ministry of Food and Drug Safety, where graduates can contribute to health policy and regulatory affairs. With a strong foundation in interdisciplinary training, our graduates are equipped with global research capabilities and practical expertise to pursue diverse and impactful careers.

Q — What's the unique features of the department of Biomedical Science and engineering in DGIST from medical graduate schools in other universities?

We train medical engineers and life scientists with strong backgrounds in AI, neuroscience, brain engineering, and robotics engineering. A key strength of the program is its focus on empirical and clinically oriented research through collaboration with domestic and international medical schools and global universities. DGIST partners with leading medical schools and hospitals in Korea, as well as renowned overseas universities and research institutes such as the University of Oxford, Johns Hopkins, Stanford, USC, Harvard, and Yale. These collaborations allow students not only to gain academic knowledge in an advanced interdisciplinary research environment but also to engage in the development of diagnostic and therapeutic technologies that are directly applicable to real-world medical settings. Through this global network, students acquire research experience in actual clinical environments and participate in hands-on research aimed at developing innovative medical solutions. Based on these collaborations, DGIST supports future medical scientists in building practical problem-solving skills across both clinical and research domains, providing the optimal environment for them to grow into global leaders in medical science.



VII. 4. Quantum Information Science of Interdisciplinary Studies

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The Quantum Information Science major in the Department of interdisciplinary studies aims to address the challenges of the second quantum revolution by advancing research and education in next-generation quantum computing, quantum communication, and related quantum information science technologies. Next-generation quantum technologies explores various physical systems, including photons, atoms, superconductors, semiconductor quantum dots, and solid-state quantum devices, to generate, control, and measure qubits, as well as to study quantum entanglement, quantum gates, and quantum circuit design.

Accordingly, the major provides a well-structured environment for both research and education by collaborating with faculty members from various academic backgrounds such as the Department of Physics and Chemistry, the Department of Electrical Engineering and Computer Science, the Department of Robotics and Mechatronics Engineering, and the Department of New biology et al, and utilizing DGIST's state-of-the-art research infrastructure. Furthermore, we aim to establish itself a leading hub for quantum information science research and education by actively strengthening industrial and global collaborations.

- Vision
- ✓ Lead the Second Quantum Revolution: Establish a research and education hub at the forefront of the Second Quantum Revolution
 - ✓ Cultivate Innovative Talent: Nurture creative, interdisciplinary talent with a strong foundation in fundamental knowledge

- Key areas of research
- ✓ Quantum algorithm and software development
 - ✓ Research on quantum computing based on photonic integrated circuits
 - ✓ Research on fabrication of quantum interference circuits using topological quantum gates
 - ✓ Development of topological superconductors and two-dimensional heterojunction devices for error-free quantum circuits
 - ✓ Fabrication and measurement of spin qubit devices
 - ✓ Research on ultrafast control of quantum qubits using lasers
 - ✓ Quantum sensing using ultrafast spectroscopy
 - ✓ Research on super-resolution bioimaging using quantum entanglement
 - ✓ Research on exciton-polariton-based quantum information devices
 - ✓ Design and safety analysis of quantum-resistant cryptography
 - ✓ Study of the time-dependent evolution of quantum information

- Career paths
- ✓ Professors and researchers at major domestic and international universities and research institutes
 - ✓ Conduct research at government-funded quantum technology research institutes(KIST, ETRI, KAERI, KISTI, ADD, NSR, etc.) and private research institutes
 - ✓ Employment at global quantum technology companies(Google, IBM, Microsoft, intel, D-wave etc.), and domestic semiconductor and IT companies(Samsung Electronics, SK Hynix, LG Electronics, etc.)
 - ✓ Founding startups based on quantum computing, quantum sensing, and quantum cryptography
 - ✓ Planning and researching quantum technology policies at government agencies or policy research institutes

- The interview process
- ✓ Selection of final successful candidates through stage 1 document review and stage 2 interview assessment
 - ✓ Interviews consist of presenting one's own research or reviews of others' research papers, followed by related questions and answers
 - ✓ Evaluation of potential for growth as a researcher, academic achievement, willingness to pursue higher education, and global competency

What topics are studied in the Department of Physics and Chemistry?

The quantum information science major conducts research in various fields such as quantum computing, quantum sensing, quantum communication, and quantum materials. In particular, we are developing quantum algorithms and software, studying quantum dynamics, fabricating quantum interference circuits using topological quantum gates, developing topological superconductors and two-dimensional heterojunction systems for error-free quantum circuit realization, and researching quantum computing based on photonic integrated circuits. Also we are fabricating and measuring spin qubit devices, ultrafast control of quantum qubits using lasers, developing quantum sensing technologies using ultrafast spectroscopy, researching ultra-high-resolution bio-imaging using quantum entanglement, and researching exciton-polariton-based quantum information devices. Furthermore, we are designing and analyzing quantum-resistant cryptography and studying the time evolution of quantum information to develop safe and efficient quantum communication technologies. Quantum materials explores new materials for quantum computing and quantum sensing, and is laying the foundation for the second quantum revolution through the realization and understanding of quantum states. In these superposed and entangled research topics, students will experience the process of moving research activities from thesis to the lab to the industrial field. They will also have the opportunity to collaborate and compete with other research groups at home and abroad, and grow as world-class researchers.



I'd like to know more about the labs at the Department of Physics and Chemistry.

Prof. Kee Seong Park

Quantum Materials

Novel Quantum Materials Lab

- Single Crystal Synthesis
 - Flux method, chemical vapor transport, etc.
 - Exploration of new quantum materials
 - topological materials/magnetic materials/superconductors
- Physical properties of Materials
 - Measurement of electrical, magnetic and thermal properties
 - Elastic and inelastic scattering using X-ray and neutrons

Prof. So Yeun Kim

Strongly Correlated Quantum Materials/Ultrafast-Infrared Spectroscopy

Correlated Matter Spectroscopy Lab

- Emergent phases in strongly correlated materials
 - Phase transition mechanism
 - Quasiparticle investigation
- Non-equilibrium and Equilibrium Optical Spectroscopy
 - Low-energy(infrared, terahertz) electrodynamics
 - Time-resolved polarimetry/scattering measurement

Prof. Aa Ram Kim

Computational Quantum Many-Body Physics

Quantum Many-Body Theory Group

- Developing computational algorithms for strongly-correlated systems
 - Diagrammatic Monte Carlo method
 - Dynamical mean-field Theory
- Emergent phenomena of strongly correlated systems
 - Model study of experimentally measurable response functions
 - Symmetry-breaking including superconductivity magnetism, and so on

Prof. Young Sik Kim

Applied Cryptography/AI Security/Privacy Enhancing Technologies/
Smart Car Security

- Applied Cryptography
 - Post-Quantum Cryptography(Lattice/Code-based) Design and Cryptanalysis
 - Efficient Implementation of Post-Quantum Cryptography(SW/HW/PIM)
 - Side-Channel Attack and Countermeasures
- Quantum Cryptography
- AI Security
 - High-speed Implementation of Fully Homomorphic Encryption and Libraries
 - Efficient Computation of Fully Homomorphic Encryption
 - FHE-based AI(CNN/Transformer) Inference and Training
 - FHE-MPC hybrid AI Security
- Privacy Enhancing Technologies
 - Secure multi-party Computation and Secret Sharing
 - Zero-knowledge proof
- Smart Car Security
 - Vehicular Intrusion Detection/Tolerance Technology
 - Security of Next Generation Vehicular Networks

Prof. Young Wook Kim

Quantum Hall Effect/Topological Quantum Computing/Quantum Circuit
Topological Quantum Device

- Quantum Hall Effect
 - Dissipation less quantized current in two dimensional materials
- Topological Quantum Computing/Quantum Circuit
 - Build quantum circuit including topological quantum gate based on anyon
- Spin Qubits
 - Spin qubits based on double quantum dots in 2D materials

Prof. Jung Pil Seo

Quantum Physics/Topological Matters/Future Semiconductors

Nanospm Lab

- Quantum Physics
 - Scanning Tunneling Microscopy
 - Quantum Microscopy
- Topological Matters/Semiconductors
 - Dirac Materials
 - Superconducting Heterostructures
 - 2D Semiconductors

Prof. Ki Joon Lee

Quantum and Biomedical Optics

- Noninvasive Deep Tissue Imaging and Spectroscopy
 - Diffuse Optical Tomography, Functional Near-Infrared Spectroscopy
 - Diffuse Correlation Spectroscopy, Diffuse Speckle Contrast Analysis
- Nonlinear Optics
 - Random lasing and coherent backscattering in highly scattering medium
 - Stimulated Raman Scattering, Spontaneous Parametric Down-Conversion
- Complexity Analysis of Biosignal
 - Use of Sample Entropy for vascular health assessment
- Quantum Optics
 - Use of Entanglement in Optical Coherence Tomography
 - Fundamental study of Bell-type inequality violation

Prof. Jae Dong Lee

Condensed Matter Physics Theory/Ultrafast Dynamics

Quantum Dynamics and Information Lab

- Ultrafast qunatum dynamics
 - Quantum dynamics in ultrafast world
 - Nonequilibrium phenomena
- Quantum information dynamics
 - Extracting quantum information from spectroscopy simulation
 - Development of quantum information

Prof. Jong Chan Lee

Single-molecule Biophysics and Advanced Bioimaging Laboratory

- Cellular Liquid-liquid phase separation(LLPS)
- Phase separation of biomolecules such as protein, RNA, etc.
- Investigation of the role of LLPS in biological systems
- Finding the regulators for LLPS and their mechanisms
- Single-molecule observation and investigation
- Single RNA imaging in living cells
- Optogenetic regulation of single cell and single RNA
- Unveiling the role of single-RNA regulation in development
- Super-resolution Quantum/Bioimaging
- Development of STED super-resolution optical microscope
- Quantum super-resolution microscopy
- Application of super-resolution bioimaging in cells and tissues

Prof. Chang Hee Cho

Quantum Photonics/Light-Matter Interaction/Semiconductor Optics

Semiconductor Quantum Photonics Lab

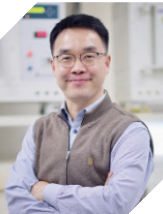
- Semiconductor Optics
- Physics of Excitons and Polaritons
- 2D/Perovskite Semiconductors
- Quantum Information Devices
- Polaritonic Devices for Quantum Information Processing

Prof. Sang Yoon Han

Intelligent Nanophotonics Laboratory

- Optical Computer
- Research on ultra-high-speed AI accelerators that perform computations using light by employing photonic integrated circuits instead of electronic circuits
- Quantum Computer
- Research on large-scale optical quantum computers by combining photonic integrated circuits with nanomechanical systems
- Light-based Autonomous Driving Sensors
- Research on highly sensitive, ultra-compact LiDAR and inertial sensors using photonic integrated circuits
- AR/VR Display
- Research on ultra-compact, ultra-lightweight, and ultra-low-power AR/VR displays based on photonic integrated circuits
- Optical Ultrasound Imaging Systems
- Development of devices that acquire ultrasound images with ultra-high sensitivity using light through photonic integrated circuits

Faculty



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Career&Major achievements: Postdoctoral researcher at Brookhaven National laboratory | Research Associate at the University of Virginia | Assistant Professor in Undergraduate studies of DGIST



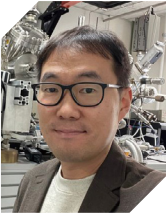
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Research interests: 2D Materials | Quantum Device | Quantum Transport
Career&Major achievements: Postdoctoral Researcher in Max Planck Institute for Solid State Research | Alexander von Humboldt Fellow



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Research interests: Superconducting Materials | Topological Phase Transition | Low-dimensional Materials
Career&Major achievements: Postdoctoral Research Associate in Princeton University



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Research interests: Strongly Correlated Systems | Computational Many-Body Algorithm
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Degree: Ph.D., Seoul National University, Rep. of Korea
Research interests: Post-Quantum Cryptography | Fully Homomorphic Encryption | Applied Cryptography | AI Security | Privacy Enhancing Technology | Smart Car Security
Career&Major achievements: Chair of The Interdisciplinary Studies of Artificial Intelligence and Super-Computing AI Education-Research Center | Professor, Chosun University | Senior Engineer, Samsung System LSI Division | Leader of Future Technology, National Academy of Engineering of Korea | The recipient of Prime Minister's Commendation(2024)



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Research interests: Theory of solid state physics | Ultrafast dynamics | Nonequilibrium phenomena | First-principles calculation
Career&Major achievements: JAIST Associate Professor | NIMS-ICYS Fellow | CALTECH Researcher | Researcher at Tokyo University | MPI-FKF Researcher



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Research interests: Single molecule Biophysics | Advanced Bioimaging | Cellular Liquid-Liquid Phase Separation
Career&Major achievements: Postdoctoral Researcher, Johns Hopkins University/School of Medicine



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Research interests: Photonic integrated circuits | Quantum computing | Photonic AI accelerators | Autonomous sensors(LIDAR, gyroscope)
Career&Major achievements: Postdoctoral researcher, KAIST(2016-2020) | Bronze medal, Collegiate Inventors Competition at USPTO, 2015(Featured on Daily Californian) | Finalist, Coming Outstanding Student Paper Competition, 2014 | Recipient of Korea Foundation for Advanced Studies(KFAS) Scholarship(2010-2015)



Interview

Do you want to dive into the 2nd Quantum Revolution? This is the place. Join us!



Kee Seong Park

Department of Physics and Chemistry Education |
Ph.D University of Texas at Austin Laboratory |
Novel Quantum Materials Laboratory

Q — What is the background and vision for the establishment of the Quantum Information Science major in the Interdisciplinary Studies Department at DGIST?

The Quantum Information Science major was established in response to the Second Quantum Revolution, with the mission of leading future research and education in quantum technologies. Quantum computing, quantum sensing, quantum communication, and quantum materials represent transformative paradigms that go beyond the limits of conventional information technologies. These emerging quantum technologies are expected to play a pivotal role across a wide range of industries in the near future. In line with this global movement, the Quantum Information Science major at DGIST integrates diverse disciplines—including Physics and Chemistry, Electrical Engineering and Computer Science, Robotics and Mechatronics Engineering, and New Biology—to pioneer next-generation quantum technologies and establish a robust environment for practical research and education. As the international race in quantum innovation accelerates, it is imperative for Korea to cultivate top-tier talent and foundational research capabilities. Through strong academia-industry-government collaboration and international partnerships, the program aims to conduct world-class research and foster creative, interdisciplinary leaders who can advance and apply quantum technologies across emerging fields.

Q — What background do students need to have in order to apply for the Quantum Information Science major at DGIST?

The DGIST Quantum Information Science major is an interdisciplinary field encompassing a wide range of quantum-related research, including quantum computing, quantum sensing, quantum communication, and quantum materials. Students from diverse academic backgrounds—such as physics, electrical engineering, computer science, mathematics, materials science, chemistry, and bioengineering—are encouraged to apply. Most importantly, the major welcomes individuals from any field who have a strong interest in quantum science, along with a passion for research and a spirit of innovation and challenge.

Q — What career paths are available after graduating from the Quantum Information Science major at DGIST?

Graduates of the DGIST Quantum Information Science major can pursue a wide range of career paths. They may become professors or researchers at leading universities and research institutes both in Korea and abroad, and have opportunities to work at government-funded and private research centers specializing in quantum technologies, such as KIST, ETRI, KAERI, KISTI, ADD, and NSR. In addition, graduates may pursue careers at global quantum technology leaders such as Google, IBM, Microsoft, Intel, and D-Wave, as well as top domestic companies including Samsung Electronics, SK hynix, and LG Electronics. They are also well-equipped to launch innovative startups in quantum computing, sensing, or cryptography, and contribute to national quantum policy and strategy development through roles in government agencies and think tanks.



- E 1 Main Administration Building
- E 2 Department of Physics and Chemistry
- E 3 Department of Electrical Engineering and Computer Science
- E 4 Department of Brain Sciences
Department of New Biology
- E 5 Department of Robotics and Mechatronics Engineering
- E 6 Department of Energy Science and Engineering
- E 7 Interdisciplinary Studies Department
- E 8 Central Library
- E 14 Green House
- E 15 Outdoor Concert Hall
- E 16 Student Clubs Building
- R 1 Research Administration Building
- R 2 Nano-Bio Technology Research Building
- R 3 Energy Research Building
- R 4 Robotics System and IT Convergence Research Building
- R 5 Center for Next-Generation Convergence Research
- R 6 Institute of Next-Generation Semiconductor Convergence Technology
- R 7 University-Industry Cooperation Center
- S 1 Sports Complex
- H 201-207 Student Dormitory
- H 501 Global Residence



CAMPUS

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