AY2027 Admission Guide

Department of Information Physics and Computing

Graduate School of Information Science and Technology,

The University of Tokyo

Master's Program

Doctoral Program

Visit: https://www.i.u-tokyo.ac.jp/edu/course/ipc/admissions_e.shtml

Please refer to the above webpage for contact information.

Note: This guide should be read together with the graduate school's admission guide: "AY2027 Admission Guide: {Master's / Doctoral} Program, Graduate School of Information Science and Technology, The University of Tokyo."

This document is a translation from the official Japanese version. In the case of conflict, the Japanese version shall prevail and be conclusive.

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I. Master's Program

Due to the interdisciplinary nature of the Department of Information Physics and Computing, this department seeks applicants from a wide range of fields, both within and outside The University of Tokyo, with a fundamental understanding and knowledge of informatics, mathematics, physics, electrical or mechanical engineering. Examination subjects have been selected to allow for fair conditions to be met from a variety of departments outside the university. No priority is given to examinees from within the university.

When applying, choose either the Summer or Winter Entrance Examinations. Please note that the application period differs between the Summer and Winter Entrance Examinations. Summer Entrance Examinations consist of document screening, foreign language, written examinations, and oral examination. Winter Entrance Examinations focus only on document screening, foreign language and oral examination, and do not include written examinations. Only a limited number of examinees will be admitted through the Winter Entrance Examinations. For other instructions, please keep checking the department admission website frequently.

i) Summer Entrance Examinations

Written and oral examinations are given to those who pass the document screening, and a comprehensive assessment is used to select applicants for admission.

Select up to nine faculty members to whom you wish to be assigned on the web application system. If you cannot be assigned to any of the faculty members depending on the results of the examination and your preference, you will be rejected. The laboratories in this department conduct research in cooperation with each other, and it is possible for examinees to acquire interdisciplinary knowledge in Information Physics and Computing regardless of which faculty member they are assigned to.

a) Document Screening

   The screening will be conducted based on submitted documents. Please refer to the admission guide of the Graduate School for the notification of acceptance or rejection of the application documents. When applying, the following document (reasons for application) must be submitted.

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Describe reasons for application to the Department of Information Physics and Computing, and explain also why you wish to join the laboratory you selected (a description of your first-choice laboratory is required; descriptions for your second choice and below are optional), with references, if necessary, based on what you have learned and experienced. The document should be written either in Japanese or English.

The font size should be around 11 pt. The document should be on three A4-sized or letter-sized pages. Figures and tables can be included. Please put your name on every sheet. Since the document is used for the screening and evaluation, it should be well-thought-out and of appropriate length and content.

b) Written and Oral Examinations, etc.

For applicants who have passed the document screening, all of the following examinations should be taken. **Those who are absent from one or more of the examinations are considered to have abstained from the entrance examination.**

(1) Foreign language

TOEFL scores will be used. For details, please refer to the "Guidelines for Submission of TOEFL Scores (for AY2027 Entrance Examinations)."

(2) General education subjects

For details, please refer to the Admission Guide of the Graduate School.

(3) Specialized subjects

For examinations on specialized subjects, examinees shall choose one subject among the following: “Information Physics and Computing,” “Mathematical Informatics,” “Computer Science,” and “Information and Communication Engineering.” Please note that dates, times, and locations differ depending on the subject.

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Specialized Subjects	Examination Dates, Times, and Locations	Scope of Questions
Information Physics and Computing	August 24, 2026 (Monday) 10:00 – 12:00 Onsite	Examinees will be required to select and solve two among three problems: “signal processing,” “electronic circuits,” and “control.” The total time for answering the problems is 100 minutes.
Mathematical Informatics	Please refer to the “Admission Guide” for the Department of Mathematical Informatics.	
Computer Science	Please refer to the “Admission Guide” for the Department of Computer Science.	
Information and Communication Engineering	Please refer to the “Admission Guide” for the Department of Information and Communication Engineering.	

The examination for the specialized subject "Information Physics and Computing" will be administered **in person**.

The log-in information for the department admission website will be sent to examinees. Information on precautions and examination locations will be posted on the website, so please check it frequently. For information on the examinations for the Department of “Mathematical Informatics,” “Computer Science,” and “Information and Communication Engineering,” please refer to the Admission Guide for the Department in question.

(4) Oral examination

The oral examination will be conducted between 1:00 p.m. and 6:00 p.m. on August 25 (Tuesday), 2026. Detailed schedules will be posted on the department admission website during the examination period. The oral examination schedule for examinees who take written exam subjects other than “Information Physics and Computing” will be adjusted to avoid overlapping with the examinations of the specialized subjects. During the oral examination, you may be asked questions about the contents of your application documents (including your reasons for application).

ii) Winter Entrance Examinations

An oral examination will be given to those who pass the document screening and whose submitted foreign language test results are recognized as valid through the official evaluation process, in order to select applicants for admission. In principle, the examination will be held

between late January and mid-February 2027, and a limited number of applicants will be accepted. The log-in information for the department admission website will be sent to applicants who have passed the document screening. The details of the schedules and locations of the examination will be posted on the website, so please check it frequently. Select up to nine faculty members to whom you wish to be assigned on the web application system.

a) Document Screening

See Summer Entrance Examinations.

b) Foreign Language

See Summer Entrance Examinations.

c) Oral Examination

An oral examination on mathematics and reasons for application will be conducted. This examination may be conducted over multiple dates. **Applicants who fail to attend all scheduled sessions will be considered to have abstained from the entrance examination.** This oral examination may include questions on (i) the fundamentals of differential and integral calculus, (ii) the fundamentals of linear algebra, (iii) the applicant's intended research area, and (iv) fundamentals of Information Physics and Computing.

II. Doctoral Program

At the time of application, please select either the Summer Entrance Examinations or the Winter Entrance Examinations. Please note that the periods for acceptance of applications differ for the summer and winter examinations.

Persons wishing to be included in the “Special Selection for Professionals” must refer to the “AY 2027 Admission Guide: Doctoral Program [Special Selection for Professionals], Graduate School of Information Science and Technology, The University of Tokyo”. For other detailed instructions, please keep checking the department admission website frequently.

i) Summer Entrance Examinations

a) Prior Interview

Persons wishing to apply to the Doctoral Program should refer to the “AY2027 Admission Guide: Doctoral Program, Graduate School of Information Science and Technology,” and **must contact the faculty advisor of your choice for an in-person or online interview based on your past career, research history, research capabilities, and research plans**.

The interview must be completed between April 24 (Friday) and May 26 (Tuesday), 2026, for Summer Entrance Examinations or between October 9 (Friday) and November 6 (Friday), 2026, for Winter Entrance Examinations. **Enter the date of the interview with the faculty advisor of your choice** in “Field 1 for Department-Specific Information” in the web application system. Applicants will not be allowed to take the examinations if they fail to complete this procedure.

b) Document Screening

All of the following documents must be submitted.

(a) Describe the content and results of past research as well as the perspective and the significance of the research in the field in question with references. The summary should be either in English or Japanese, on no more than four A4-sized or letter-sized pages.

(b) Provide a specific research plan to be conducted after admission to the Doctoral Program and describe how this research will contribute to the field in question. The summary should be either in English or Japanese, on no more than two A4-sized or letter-sized pages.

(c) Provide a list of research achievements on A4-sized or letter-sized pages. Achievements should be categorized into original articles, review articles, oral presentations, and others. If there are no research achievements, write “not applicable.”

Since the above documents (a), (b), and (c) will be used as the basis for the Oral Examinations and subject to scoring, they should be well-thought-out and of appropriate length and content.

c) Foreign Language

TOEFL scores will be used for evaluation of English ability. For details, refer to the "Guidelines for Submission of TOEFL Scores (for AY2027 Entrance Examinations)." Applicants who have completed or are expected to complete a Master’s Program at The University of Tokyo Graduate School will not be required to submit TOEFL scores.

d) Oral Examinations

Oral Examinations I and II will be given to those who pass the document screening and whose submitted foreign language test results are recognized as valid through the official evaluation process, and applicants will be selected for admission based on the results. Applicants who have completed, or are expected to complete a Master’s Program at The University of Tokyo or persons who have been qualified for exemption through the official evaluation of the submitted documents will be exempt from Oral Examination I. Examinees who are rejected

in Oral Examination I cannot take Oral Examination II. The results of Oral Examination I will be posted with the schedules of Oral Examination II on the department admission website.

Examination Dates and Locations	Examination Times	Examination Subjects	Notes:
August 24 (Monday) Online	Detailed schedules will be posted on the department admission website at 17:00 on August 14.	Oral Examination I	Examinees will be required to answer questions related to the fundamentals of Information Physics and Computing and to the applicant's research field.
August 26 (Wednesday) or August 27 (Thursday) Online	Detailed schedules will be posted on the department admission website at 17:00 on August 25.	Oral Examination II	Examinees will be required to answer questions on the results of their past research and research plan submitted beforehand.

The log-in information for the department admission website will be sent to examinees.

ii) Winter Entrance Examinations

As a general rule, the examination will be conducted between late January and mid-February, 2027. Acceptance will be limited to a few examinees. Examination methods will be in accordance with those used for Summer Entrance Examinations. The log-in information for the department admission website will be sent to applicants who have passed the document screening. Detailed schedules and locations will be posted on the website after applications have been received.

a) Prior Interview

See Summer Entrance Examinations.

b) Document Screening

See Summer Entrance Examinations.

c) Foreign Language

See Summer Entrance Examinations.

d) Oral Examinations

See Summer Entrance Examinations.

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Department-specific Conditions on Submitted Documents

For other conditions on submitted documents common to all the departments, check the Admission Guide of the Graduate School.

	Summer Entrance Examination		Winter Entrance Examination	
	Documents to be Submitted	Who to Submit	Documents to be Submitted	Who to Submit
Master's Program	Reason for Application (three A4-sized or letter-sized pages, either in English or Japanese)	All Applicants	Reason for Application (three A4-sized or letter-sized pages, either in English or Japanese)	All Applicants
Doctoral Program	(a) Content and results of past research (no more than four A4-sized or letter-sized pages, either in English or Japanese) (b) Research Plan for Doctoral Program (no more than two A4-sized or letter-sized pages, either in English or Japanese) (c) List of research achievements (A4-sized or letter-sized page. If not applicable, please mention.)	All Applicants	(a) Content and results of past research (no more than four A4-sized or letter-sized pages, either in English or Japanese) (b) Research Plan for Doctoral Program (no more than two A4-sized or letter-sized pages, either in English or Japanese) (c) List of research achievements (A4-sized or letter-sized page. If not applicable, please mention.)	All Applicants
Doctoral Program <Special Selection for Professionals>	(a) Content and results of past research (no more than four A4-sized or letter-sized pages, either in English or Japanese) (b) Research Plan for Doctoral Program (no more than two A4-sized or letter-sized pages, either in English or Japanese) (c) List of research achievements (A4-sized or letter-sized page. If not applicable, please mention.)	All Applicants	(a) Content and results of past research (no more than four A4-sized or letter-sized pages, either in English or Japanese) (b) Research Plan for Doctoral Program (no more than two A4-sized or letter-sized pages, either in English or Japanese) (c) List of research achievements (A4-sized or letter-sized page. If not applicable, please mention.)	All Applicants

Department-specific Conditions on TOEFL Scores

	Summer Entrance Examinations	Winter Entrance Examination
Master's program	All applicants must submit.	All applicants must submit.
Doctoral Program	All applicants must submit, except those who have completed (or are expected to complete) Master's program at the University of Tokyo.	All applicants must submit, except those who have completed (or are expected to complete) Master's program at the University of Tokyo.
Doctoral Program <Special Selection for Professionals>	All applicants must submit, except those who have completed Master's program at the University of Tokyo.	All applicants must submit, except those who have completed Master's program at the University of Tokyo.

Faculty members and laboratories

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<table>
<tr><td colspan="2">Sound Media Informatics Lab. (Saruwatari and Saito Lab.)
http://www.sp.ipc.i.u-tokyo.ac.jp/</td></tr>
<tr><td>Professor
Hiroshi
Saruwatari[1)]

Senior
Assistant
Professor
Yuki
Saito</td><td>This laboratory mainly innovates in new signal processing and information processing systems, focusing our attention on understanding, processing, and controlling sound media (speech, music, etc.). For example, theories on new statistical modeling and machine-learning-based algorithms are of interest for solving optimization problems under acoustical generative models and physical constraints. Through our research, we extend human hearing systems, create new human-machine interface systems, and bring our innovative contribution to music creation.

(1) Auditory Communication Augmentation via Unsupervised Learning
We realize versatile unsupervised source separation combining statistical estimation theories and low-rank modeling. Also, we address a new combination of deep learning and spatial acoustics, which can be applied to semi-supervised source separation. Thanks to these methods, new human-machine interfaces, auditory communication augmentation systems, and user-oriented music information systems can be developed.

(2) Augmented Speech Communication Based on Machine Learning
We investigate signal processing and machine learning theories for speech synthesis and conversion for human-human and human-machine communication. We interpret speech from the perspectives of physics and informatics and deal with accurate modeling of speech signals and speech information. We also develop speech-based virtual reality systems by using human-in-the-loop speech modeling that integrate humans into machine learning.

(3) Sound Media Processing and Its Application to Virtual Reality
We construct a theory of acoustic scene analysis based on multi-channel signal processing and deep learning. Specifically, we study environmental sound recognition/synthesis for various acoustic data not limited to human speech. We also conduct research toward the realization of sound media monitoring and acoustic virtual reality systems on the basis of these methods.</td></tr>
</table>

1) Department of Creative Informatics

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Biomechanical system Lab. (Kawashima and Miyazaki Lab.) http://www.bmc.ipc.i.u-tokyo.ac.jp/index_e.html	
Professor Kenji Kawashima Senior Assistant Professor Tetsuro Miyazaki	We are dedicated to studying living organisms' advanced measurement and control systems through a comprehensive approach to developing innovative medical robots and human-machine interfaces. Our research focuses on leveraging the properties of soft, compressible, fluid-driven systems, such as their flexibility and nonlinear dynamics, to design intelligent systems. (1) Control of Medical Robots: Through research on AI-based state estimation, encrypted control, collaborative control, and autonomous control in pneumatically driven surgical robots and wearable robotic suits, we aim to improve work efficiency and safety through partial automation. (2) State Estimation and Control of Assistive Suit using Physical Reservoir Computing: We propose a physical reservoir computing that utilizes the nonlinear and distributed dynamics of soft actuators such as pneumatic artificial rubber muscles, and a method for controlling a wearable robotic suit by estimating body movements in real time from actuator information without attaching sensors. (3) Soft actuator using gas-liquid phase change: We prototype a soft actuator containing a liquid that vaporizes at a low boiling point, aiming to achieve non-contact gripping and movement using external heat irradiation. We design actuators using simulations and evaluate their operation through experiments. (4) Research on glasses-free 3D visual displays utilizing optical illusions: We are researching a 3D display that allows viewing of large screens without glasses, by utilizing distributed screens and the completion of gaps through human optical illusions. We conduct research on optical design simulations and image composition algorithms toward complete glasses-free viewing.

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<table>
<tr><td colspan="2">Physical Informatics & Inverse Problem Lab. (Nara and Miyazako Lab.)
http://www.inv.ipc.i.u-tokyo.ac.jp/</td></tr>
<tr><td>Professor
Takaaki
Nara

Senior
Assistant
Professor
Hiroki
Miyazako</td><td>Inverse problems are ubiquitous in science and engineering. In these problems, unknown quantities are inversely estimated from indirect measurements through mathematical reconstruction. Our laboratory develops fundamental theories, measurement methods, and applied systems for diverse inverse problems.

(1) Direct reconstruction and measurement methods for inverse problems: We derive the algorithms for inverse source/coefficient/governing-equation problems that directly express the unknown quantities in terms of data using mathematical physics such as complex analysis, potential theories, tensor analysis, and reproducing kernel theories. We also develop sensors that directly measure the Fourier transform of the physical quantities for inverse problems.

(2) Medical imaging and nondestructive testing: We develop mathematical methods for medical imaging, such as neural current estimation based on magnetoencephalography, epileptic focus identification, and magnetic-resonance-based imaging of electrical, mechanical, and thermal properties inside the body. We also develop algorithms and sensors for nondestructive inspection of infrastructure.

(3) Disaster prevention: We develop a system to localize victims buried in rubble, landslides, and avalanches. In this system, a rescuer generates the sound and/or magnetic fields, and then victims' smartphones measure them, compute their locations, and transmit them to the rescuer.

(4) Predictive design of biorobots based on biological cells and molecules: Biorobots built from biological cells and molecules have many possible applications in regenerative medicine, drug discovery, biosensing, and so on. To systematically design such biorobots without many experiments, we develop predictive design method for the biorobots based on mathematical and physical models of cells and molecules. In particular, by using theories of nematic liquid crystals and complex analysis, we build a design method for controlling the shape and deformation of cellular sheets and molecular robots and verify the proposed method by experiments.</td></tr>
</table>

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Real-World Informatics Lab. (Shinoda and Makino Lab.) https://hapislab.org/?lang=en	
Professor Hiroyuki Shinoda[2)] Associate Professor Yasutoshi Makino[2)]	We realize a real-world informative environment that goes beyond conventional barriers by introducing new physical phenomena and physical structures into the system. In particular, we propose technologies from hardware to applied systems for sensing humans, environments, and their interactions, and for supporting humans through haptic and other human senses. Research topics include basic and universal discoveries based on novel ideas and the process of solving social problems and using them in practical technologies. (1) Haptic Interface: A system that supports human life and behavior by stimulating the sense of touch simultaneously with audiovisual information. Clarify the relationship between the tactile sensation and the mind and emotions that support the base of human intelligence, and apply it to real systems. (2) 2D Communication: Information and electricity transmission through a thin sheet using electromagnetic waves to realize wireless power supply and high-speed signal transmission without interfering with conventional wireless LAN. (3) Use of human behavior: Based on the features of human behavior, we predict near-future motion and estimate haptic characteristics of the object in touch. This technology can be used for preventing falls and for sports. (4) Other topics such as physical informatic devices, human-machine interfaces, non-contact measurement of haptic information, artificial robot skin, wearable computing, remote interactions for understanding animal behavior, etc.

2) Department of Complexity Science and Engineering, Graduate School of Frontier Sciences

This document is a translation from the official Japanese version.

Systems Control Lab. (Ishii and Sasahara Lab.) http://www.scl.ipc.i.u-tokyo.ac.jp/index_en.html	
Professor Hideaki Ishii Senior Assistant Professor Hampei Sasahara	In the area of systems control, progress in communication and computation technologies have enabled the design of large-scale systems achieving complex control objectives by connecting various systems and devices that effectively exchange data over heterogeneous networks. The study of such networked control systems and cyber-physical systems requires the two areas of systems control and informatics to meet in new forms. Our group works on a range of problems related to networked systems from their fundamental characterizations to more application-oriented design methodologies. The specific research topics are described as follows: (1) Control over Networks: Networked control systems connect a number of sensors and actuators over shared channels. We aim at developing analysis and design methods for the control of such systems by taking account of properties in communication. Our goal is to expose limitations on control performance under communication constraints on data rates. We further consider enhancing robustness against model uncertainties in the systems to be controlled and the networks. (2) Distributed Cooperative Control of Multi-agent Systems: We study distributed cooperative control of systems consisting of autonomous agents such as multi-mobile robots and sensor networks. There, numerous agents exchange information and make their own decisions locally. Our research centers around fundamental theories and their extensions to resilient approaches in the presence of faults and adversaries as well as inter-disciplinary problems for brain neuronal synchronization, epidemiological networks, opinion dynamics in social networks, and so on. (3) Cyber-physical Security of Control Systems: Cyber-attacks manipulating sensor/control signals can result in irregular responses in the physical systems, which can be extremely dangerous. From the viewpoints of both control and informatics, we analyze the effects of cyber-attacks such as communication disruptions and false data injections and develop security measures for robust control, fault detection, and privacy protection. Security of the critical infrastructure of power systems is also of our interest. (4) Control Methods Utilizing Data-Driven Machine Learning: Due to complexities in the systems to be controlled, mathematical models can be difficult to obtain at times. For example, it may be hard to model robots working in complex environments such that controllers can be designed in a reasonable manner. We study comprehensive methods based on machine learning techniques for finding controllers from data, where control theory provides certain guarantees on reliability and so on.

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Neural Information Lab. (Amano, Nakai and Nakayama Lab.) https://www.brain.ipc.i.u-tokyo.ac.jp/	
Professor Kaoru Amano Associate Professor Tomoya Nakai	We investigate the neural mechanisms underlying human perception and cognition using non-invasive neuroimaging techniques such as magnetoencephalography (MEG), electroencephalography (EEG), functional magnetic resonance imaging (fMRI). Furthermore, we develop methods for non-invasive manipulation of brain information to elucidate the neural process that causally contributes to behaviors. In recent years, we have been focusing on the functional roles of neural oscillations in information integration, the mechanisms of the individual differences in brain activity and perception/cognition, and fusion of machine learning techniques and neuroscience. (1) Development and application of brain information control technology: We are developing techniques for non-invasive manipulation of brain information based on transcranial electrical/magnetic stimulation and neurofeedback. Using these techniques, we investigate the changes in perception, cognition, and behavior associated with the changes in brain information. (2) Neural oscillations as a clock for visual processing: Neural oscillations such as alpha (8-13 Hz) and theta (4-8 Hz) oscillations are thought to work as a clock for information processing in the brain. We investigate this clock function by combining functional brain imaging such as EEG and MEG with non-invasive manipulative techniques. (3) Mechanism of brain state dynamics: Human behavior invariably accompanies fluctuations, one cause of which lies in the fluctuations of brain states. This research aims to elucidate the neural mechanisms behind these fluctuations by exploring the relationship between fluctuations in brain states measured by fMRI, MEG/EEG, and outcomes in brain network connectivity and cognitive task performance. Additionally, it investigates changes resulting from learning and how humans control their brain states, shedding light on the underlying neural mechanisms. (4) Elucidating the human neural processing using computational models: Recent advances in computational models have enabled the quantitative evaluation of complex and diverse cognitive functions, such as perception, learning, memory, and reasoning. By predicting brain activity and decoding neural information through these models, we aim to elucidate the mechanisms of information processing in the human brain.

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Information Photonics Lab. (Horisaki and Röhm Lab.) http://www.infotonics.ipc.i.u-tokyo.ac.jp/index_e.html	
Professor Ryoichi Horisaki	"Photonics × Computing": We aim to develop novel optical and computing systems by integrating optics/photonics and information science. Specifically, we strive to create innovative system architectures from the viewpoint of systems information science, leveraging the inherent advantages of light—such as high speed, parallelism, and low loss—as a medium for information transmission and processing. As detailed below, our research progresses along two primary directions: "Computing for Photonics" and "Photonics for Computing." Through these initiatives, we also endeavor to foster individuals proficient in both natural sciences and information science, who will significantly contribute to society in the future. (1) Computational Imaging – Computing for Photonics: Conventional imaging technologies are often designed with optical and signal processing systems treated independently, leaving significant room for innovation in end-to-end system design. We integrate optics and information science by harmonizing optical measurement and control with signal processing, including the rapidly advancing field of machine learning, to explore new imaging technologies that go beyond simple image acquisition. Such technologies are strongly expected to serve as foundational platforms across diverse fields, including life sciences, astronomy, and next-generation visual interfaces. Guided by a minimalist yet sophisticated design philosophy rooted in the fundamentals of optics and information science, our approach focuses on advancing information visualization, improving performance, and simplifying optical hardware. Specific objectives include the development of innovative microscopes, imaging through scattering media, and three-dimensional displays. (2) Photonic AI – Photonics for Computing: With the growing demand for information communication and computation, conventional computing based solely on electronic processors faces fundamental limitations due to finite computational resources. Therefore, computing paradigms and accelerators that exploit the inherent properties of natural and physical systems are indispensable for next-generation computing platforms designed to achieve reduced power consumption and higher processing speed. Motivated by this background, we develop photonic AI systems implemented through physical phenomena centered on light. In particular, we explore reservoir computing and deep learning frameworks that integrate control theory, leveraging not only the high speed and parallelism of light but also its complex dynamics.

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Computing System Lab. (Nakamura and Takase Lab.) https://hal.ipc.i.u-tokyo.ac.jp/en/	
Professor Hiroshi Nakamura[3)] Associate Professor Hideki Takase	Our goal is to establish a design methodology for high-quality computing in which advanced interactions between the physical world and the cyber world are realized. Here, high-quality includes performance, responsiveness, power consumption, reliability, and security. These qualities are in a trade-off relationship, and the system needs to be optimized according to its characteristics and requirements. We are researching the comprehensive system-level design methodology to optimize the entire system, including edge devices, such as sensors and robots, servers, and networks by coordinating device, circuit technology, architecture, and software. (1) Cyber-physical systems: Cyber-physical systems connect everything in the physical world to the Internet, process enormous amounts of obtained data in the information or cyber world, and work on the physical world. We are conducting research on optimization of computing to improve performance, responsiveness, power efficiency, reliability, and security by making full use of characteristics of the target processing task. (2) Highly Efficient Accelerated Computing: To achieve significant computing capability increases, we are researching acceleration technologies at low cost and low power by specializing in targeted domains. Specific domains include machine learning, probabilistic graphical model, and homomorphic encryption, and so on. We are also working on quantum computing based on new computing principles. (3) Resource Permeating Comprehensive Computing Technology: We are conducting research on wide-area distributed processing platforms based on the functional paradigm. We are also working on a lightweight runtime environment for embedded devices based on ROS (Robot Operating System), communication middleware technology with high autonomy and real-time performance, and optimization of robot system design and development using cloud-native technology and virtual environment. (4) Distributed Machine Learning Technologies from a System Architecture Perspective: We are conducting research on federated learning and split learning technologies that adapt to fluctuations in resource and geographic information of wide-area distributed systems. We are also working on robot arm control technologies using multi-sensor fusion and adaptive sampling techniques aimed at realizing AI tactile perception framework.

3) Not accepting students for 2027.

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<table>
<tr><td colspan="2">Information Somatics Lab. (Inami and Monnai Lab.)
https://www.star.rcast.u-tokyo.ac.jp</td></tr>
<tr><td>Professor
Masahiko
Inami

Associate
Professor
Yasuaki
Monnai</td><td>We are exploring "Information Somatics," which investigates the body’s mechanisms as a physical information system based on physiological, cognitive, and physical findings. It aims to enhance the innate human sensory functions, motor functions, emotional functions, and intellectual processing abilities through measurement, communication, and control technology.

(1) Extended Body: Research on technologies that extend human input/output by integrating biometric information such as gaze, facial expressions, and heart rate, with sensory and perceptual measurement technologies such as motion prediction and intention, and intervention technologies like robot control or electrical muscle stimulation. This involves engineering research and development aimed at enhancing human capabilities and acquiring new bodily perceptions by appropriately sensing the user's intent and feeding back information about the task object to the user's body.

(2) Extended Communication: The human body and mind are inseparably related, and subjective experiences such as perception and emotions are constituted through the mediation of one's own and others' bodies. In a system that includes both self and others, this research aims to transform subjective experiences by controlling the flow of physical and cognitive information using Virtual Reality (VR), augmented reality, wearable technology, wireless technology, robotic technology, and telexistence. The goal is to socially implement support for communication among users with different attributes and preferences, aiming for the realization of super-aged societies and smart cities where diverse people thrive.

(3) Wireless Interaction: In measurement and communication, electromagnetic waves are used in the air (outside the body), while ultrasound is used in water (inside the body), resulting in a separation between the two physical layers. To bridge this gap, we are developing novel wireless technologies. Specifically, we are working on non-contact ultrasound generation inside the body via terahertz wave irradiation and beam-tracking technology enabling terabit-class communication with moving individuals and devices. These advancements aim to revolutionize biological measurement and human-computer interaction. Furthermore, we are expanding these technologies for non-destructive testing applications, ranging from modern industrial products to historical artifacts dating back a thousand years.</td></tr>
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<table>
<tr><td colspan="2">Information Communication System Architecture Laboratory
https://www.sekiya-lab.info/</td></tr>
<tr><td>Professor
Yuji
Sekiya[4)]</td><td>In this laboratory, we research communication infrastructure technology and its architecture using software and virtualization, and methods for detection and countermeasures against cybersecurity threats using machine learning.

This laboratory collaborates with the Information Technology Center and the Center for Information Security Education and Research, aiming to develop system architectures and cybersecurity countermeasures based on real-world system operations.

(1) In modern IT and communication systems, core technologies such as virtualization and software-based control have been widely adopted. As IT systems have become critical social infrastructure, high availability and real-time responsiveness are required. Consequently, systems are transitioning from traditional hardware-centric designs to those leveraging software technologies. In response to this trend, our laboratory focuses on research into fundamental software technologies that underpin IT systems, as well as system architectures that effectively utilize these technologies.

(2) Cybersecurity is a big problem for ICT systems. Attackers steal confidential information and hijack systems through organized and sophisticated attacks. In this laboratory, we research methods to detect cyber threats using machine learning technologies with various types of datasets from communication infrastructure to social trends. This research improves the safety of ICT systems that support society’s infrastructures.

(3) We aim to realize “Security DX” (Digital Transformation in Security), which emphasizes user-friendly security measures. Current security approaches tend to be technology-driven, often placing the burden of ensuring safety on users themselves. In contrast, our research promotes user-centric security approaches that enhance safety and security from the user’s perspective, rather than relying on burdensome and enforcement-oriented measures.</td></tr>
</table>

4) Security Informatics Education and Research Center

This document is a translation from the official Japanese version.

Systems Pharmacology (Prof. Ueda) http://sys-pharm.m.u-tokyo.ac.jp/	
Professor Hiroki Ueda[5)]	**Our goal: Understanding and controlling sleep and consciousness through the integration of medicine and information science** Whole-brain & whole-cell analysis Our laboratory established the CUBIC technology platform, which can make brain samples look transparent, enables visualization and analysis of all cells in the brain, and achieved a whole-brain atlas at single-cell resolution. In addition, we developed analytical and visualization methods for large-scale imaging data. Through the understanding of neural activity dynamics at the whole-brain level, we aim to elucidate the mechanisms underlying sleep–wake rhythms. **Keywords**: Cloud computing, Brain function analysis, Image analysis Human Sleep Analysis Using the Accurate Sleep Measurement Technology We developed ACCEL, an algorithm that applies machine learning to wrist acceleration data to estimate human sleep–wake states in a simple yet highly accurate manner. Through large-scale data analysis, we aim to reveal the biological basis of human sleep phenotypes and their relationships with health and disease. **Keywords**: Machine learning, Time series analysis, Biological data Establishing Clinical Medicine that Begins with Humans With the advent of high-precision phenotyping technologies, genome-wide association studies (GWAS) can now be conducted for diverse sleep phenotypes. Genotype–phenotype correlations identified in human populations will be causally tested in animal models, enabling us to investigate and ultimately control the mechanisms governing sleep–wake rhythms. **Keywords**: GWAS, Large-scale data analysis, Real-world intervention study

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