This document is a translation from the official Japanese version.

2020Admission Guide
University of Tokyo Graduate School of Information Science and Technology Department of Creative Informatics

Contact [Department Administration Office]

7-3-1 Hongo, Bunkyo-ku, Tokyo 113-8656
University of Tokyo Graduate School of Engineering / Information Science
Office of Academic Affairs Division
Department Team (Department of Creative Informatics)
TEL: 03-5841-6889

Internet Guide to Entrance Examinations:
https://www.i.u-tokyo.ac.jp/index_e.shtmlUnder "QUICK LINKS" on the homepage [https://www.i.u-tokyo.ac.jp/index_e.shtml], click on "How to apply"

Note 1: In addition to this pamphlet, be sure to check items for examinees in the Guidelines for Applicants for the Graduate School of Information Science and Technology (three versions exist: Master's program, Doctoral program, and Doctoral program [Special selection for working students], as well as the Graduate School of Information Science and Technology Guidelines for Submission of TOEFL Test Scores. When submitting entrance application documents, use the original forms distributed along with other paper documents; do not use a printed version of the Web page.

Note 2: The Department of Creative Informatics conducts Summer entrance examinations and Winter entrance examinations for both the Master's and Doctoral programs. Schedules, examination subjects, and examination methods differ for Summer and Winter entrance examinations.

1. Message for applicants

The Department of Creative Informatics is the newest Department within the comparatively new Graduate School of Information Science and Technology. It was founded in 2005. The Department of Creative Informatics currently incorporates aspects of five fields: Computer Science, Mathematical Informatics, Information Physics and Computing, Information and Communication Engineering, and Mechano-Informatics. The educational philosophy is “To refine practical creativity for realizing outstanding ideas, through creative practices over interdisciplinary fields. To achieve this goal, the Department will combine projects and advanced personnel training, and will promote collaborations among industry, government, and academia aimed at human resource cultivation. We hope that students completing this Department's program will play a leading role in the field of information technology.

2. Master's program

2.1 Examination schedules and examination subjects

i) Summer entrance examination

(1) Regular education subjects

Applicants must select either Mathematics or Programming at the time of application.

Those who are absent from the written exam are considered to have withdrawn from the entrance exam.

Dates, times, and locations (Locations will be posted at the main entrance to the School of Engineering Bldg. No. 6 on the day of the examination)	Examination subjects	Description
Monday, August 19, 2019 10:00 – 12:30 Faculty of Law and Letters Bldg. No.2／School of Engineering; Bldg. No. 2 ・Details on the Examination room will be delivered to every applicant by postal mail with an examination admission card and posted on the bulletin board at the main entrance to Bldg. No. 6 of the School of Engineering at 9:00 a.m. on the day of the Examination.	Mathematics	Students will be required to answer problems that will test basic mathematical abilities required for basic studies of information science and technology. Detailed description is on the admission guide of the graduate school of information science and technology.
Monday, August 19, 2019 10:00 – 12:30 13:30 – (The ending time for the afternoon session varies by the number of the examinees. The schedule of the examination in the specified subjects for other departments is considered.) School of Engineering; Bldg. No. 6 (Refer to postings for details)	Programming	In the morning session, the examinees must bring their own laptop PCs and write programs for specified topics. They may use their preferable programming languages. In the afternoon, the examinees individually take a short oral examination in their programs. The programming examination assesses the students' ability for problem analysis, design, documentation, and presentation.

Notes:

A programming environment must be installed in the laptop PCs used during the programming examination. The examinees may bring one copy of printed book about programming and they may refer to that book during the examination. The examinees may use source programs, libraries, and other resources stored in the PC. Connecting the PC to any network is prohibited during the examination. Confirm that the PC can read from and write to a USB flash drive (type A).

(2) Foreign languages

TOEFL scores will be used to determine the student's English skills. No written English examination will be administered. Refer to the Guidelines for Submission of TOEFL Test Scores, which are provided separately from this guide. Note that in past years, it took a considerable amount of time to submit TOEFL score certificates. If a student is unable to take the TOEFL test for unavoidable reasons, the designated TOEFL-ITP test (August 6, Tuesday, 2019) may be taken as a substitute. For details, refer to the Guidelines for Submission of TOEFL Test Scores.

(3) Specialized subjects

Students shall select one of the following five specialized subjects at the time of application. Students being tested in specialized subjects for other departments should refer to their Entrance Examination Guides for details on locations and subject matters of those examinations.

Those who are absent from the written exam are considered to have withdrawn from the entrance exam.

Subject	Dates, times, and locations	Description
Creative Informatics	Tuesday, August 20, 2019 10:00 – 12:30 School of Engineering Bldg., No. 6	Problems will be selected from fields related to software/algorithms, computer hardware, and information systems, among other fields. Students will be required to answer three questions.
Computer science	Refer to the "Department Entrance Examination Guide" for the Department of Computer Science.	
Mathematical Informatics	Refer to the "Department Entrance Examination Guide" for the Department of Mathematical Informatics.	
Information Physics and Computing	Refer to the "Department Entrance Examination Guide" for the Department of Information Physics and Computing.	
Information and Communication Engineering	Refer to the "Department Entrance Examination Guide" for the Department of Information and Communication Engineering.	

(4) Oral examination

The oral examination is scheduled to be held in the School of Engineering Bldg. No.6 on Wednesday, August 21 2019, starting at 1:30 p.m. (finishing time will depend on the number of examinees). Students will be provided with a rough schedule for the oral examination in advance, but the detailed schedule will be posted on the day of the examination, in front of the room where the oral examination are held, depending on the actual examination progress. In the oral examination, students will be required to answer questions on topics including the content of the written examination, current research themes, and research themes they desire to undertake in graduate school.

ii) Winter entrance examination

(1) Regular education subjects

Unlike the Summer entrance examination, the Winter entrance examination will cover programming only.

Those who are absent from the written exam are considered to have withdrawn from the entrance exam.

Dates, times, and locations (Locations will be posted at the main entrance to the School of Engineering Bldg. No. 6 on the day of the examination)	Examination subjects	Description
Thursday, February 6, 2020 9:30 – 12:00 13:00 – (The ending time for the afternoon session varies by the number of the examinees) School of Engineering, Bldg. No.6 (Refer to postings for details)	Programming	Refer to the description of the Summer entrance examination

Note: Refer to the description of the Summer entrance examination

(2) Foreign languages

TOEFL scores will be used to determine the student's English skills. No written English examination will be administered. Refer to the Guidelines for Submission of TOEFL Test Scores, which are provided separately from this guide. Note that in past years, it took a considerable amount of time to submit TOEFL score certificates. Please note that only TOEFL scores will be accepted for the foreign-language segment of the Winter entrance examination. Students will not be allowed to take the TOEFL-ITP test in lieu of submitting TOEFL scores, so applicants are strongly urged to take the TOEFL test at the earliest possible date.

(3) Specialized subjects

Unlike the Summer entrance examination, students cannot take examination for specialized subjects of other departments.

Those who are absent from the written exam are considered to have withdrawn from the entrance exam.

Dates, times, and locations	Specialized subjects	Description
Wednesday, February 5, 2020 14:00 – 16:30 School of Engineering, Bldg. No.6,	Creative Informatics	Problems will be selected from fields related to software/algorithms, computer hardware, and information systems, among other fields. Students will be required to answer three questions.

(4) Oral examination

Oral examination is scheduled to be held in the School of Engineering Bldg.No.6 on Friday, February 7, 2020. (starting and finishing time will depend on the number of examines). Students will be provided with a rough schedule for the oral examination in advance, but the detailed schedule will be posted on the day of the examination, in front of the room where the oral examination are held, depending on the actual examination conditions. In the oral examination, students will be required to answer questions on topics including the content of the written examination, past research themes, and desired research topics to be undertaken in graduate school.

2.2 Submission of Preference survey form

Applicants must submit the Preference survey form (Summer and Winter entrance examinations for the Master's program) along with other application materials.

3. Doctoral program / Doctoral program [Special selection of working students]

3.1 Examination schedules

i) Summer entrance examination

(1) First round examination

Dates, times, and locations (In the event of changes in examination locations, locations will be posted at the main entrance to the School of Engineering Bldg. No. 6 on the day of the examination)	Examination subjects	Description
Tuesday, August 20, 2019 10:00 – 12:30 School of Engineering; Bldg. No.6,	Specialized subjects	Problems will be selected from fields related to software/algorithms, computer hardware, and information systems, among other fields. Students will be required to answer three questions.
Tuesday, August 20, 2019 From 1:30 p.m. (Finishing time will depend on the number of examinees) School of Engineering; Bldg. No.6, (Students will be provided with a rough schedule for the oral examination in advance, but the detailed schedule will be posted on the day of the examination, depending on the actual examination progress.)	Oral examination	Students will be required to give a presentation on their Master's thesis or equivalent paper (about 15-20 min.; projector can be used), then will be required to answer oral questions on the presentation. Students should also be prepared to answer oral questions about their research plan for the Doctoral program.

Notes:

(a) TOEFL scores will be used to determine the student's English skills. No written English examination will be administered. Refer to the Guidelines for Submission of TOEFL Test Scores, which are provided separately from this guide. Note that in past years, it took a considerable amount of time to submit TOEFL score certificates. If a student is unable to take the TOEFL test for unavoidable reasons, the designated TOEFL-ITP test (Tuesday, August 6, 2019) may be taken as a substitute. For details, refer to the Guidelines for Submission of TOEFL Test Scores.

(b) Persons who have completed or are expected to complete a University of Tokyo Graduate School of Information Science and Technology Master's program will neither be required to submit TOEFL scores nor to take the examination for specialized subjects.

(2) Second round examination

In principle, second round examination will be held from Thursday, January 23 to Friday, January 24, 2020, only for applicants for the Summer entrance examination who are currently registered with the Department of Creative Informatics and who are taking examination for the Master's program.

Examination schedules for other examinees will be in accordance with the Winter entrance examination. Applicants will be notified later regarding details of schedules and locations. In the case of persons wishing to enter the school in September and persons holding a Master's degree at the time of application, the second round examination will be conducted based on the schedule for the oral examination.

ii) Winter entrance examination

First and second round examinations will be conducted during the period from Wednesday, February 5 to Friday 7, February, 2020. Acceptance may be limited to a few students. Examination methods will be the same as those used for Summer entrance examination. Details of schedules and locations will be in accordance with the first and third days of the Master's program Winter entrance examination schedule. Note that only TOEFL scores will be accepted for the foreign-language segment of the Winter entrance examination. Students will not be allowed to take the TOEFL-ITP test in lieu of TOEFL scores, so applicants are strongly urged to take the TOEFL test at the earliest possible date.

3.2 Preference surveys for applicants to the Doctoral program

Persons applying to the Doctoral program should keep in close contact with their preferred faculty advisor before the application period. Applicants must submit the Preference survey form (for the Doctoral program) along with other application materials. Students who have tentatively fulfilled the requirements for the Doctoral program, that is, who have passed the examination informally, will immediately be assigned a tentative faculty advisor.

3.3 Submission documents for the Doctoral program [Special selection for working students]

The format for the "overview of achievements, etc.," is indicated in Chapter 5 in the Documents for submission in the Doctoral program [Special selection for working students] Guidelines for Applicants. Provide a simple explanation of each major achievement during employment, using no more than two A4 size pages.

2020

University of Tokyo Graduate School of Information Science and Technology
Department of Creative Informatics
Information for persons taking the entrance examination
(Master's and Doctoral programs)

1. Examination dates and times

Refer to the "Examination schedules" listed in this guide.

2. Examination locations

University of Tokyo, Hongo Campus (7-3-1 Hongo, Bunkyo-ku, Tokyo)Refer to the Internet Hongo Campus map at http://www.u-tokyo.ac.jp/campusmap/map01_01_e.html

Subway: Marunouchi Line and Oedo Line: Get off at Hongo Sanchome Station
Chiyoda Line: Get off at Nezu Station
Namboku Line: Get off at Todai Mae Station
Mita Line: Get off at Kasuga Station

Bus: Take Toei Bus No. 43 or 51 to "Todai Seimon Mae" (University of Tokyo main gates), or Toei School Bus No. 1 or 7 to "Todai Konai" (University grounds).

Examinees should be in the designated examination room no later than 5 minutes before the start of the examination. If you are late, consult the proctor.

3. What to bring

(1) Examination admission card

(2) Black lead pencil (or black lead mechanical pencil), eraser, pencil sharpener, clock or watch (for consulting time only; devices with other functions are not acceptable).

Note: During the written examination, students are not allowed to use calculators, mobile phones or PHS phones, or other digital devices (including clocks) with calculation functions.

(3) Persons taking the programming examination for the Master's program should bring a laptop PC and no more than one book about programming.

4. Items to keep in mind during examination

(1) Once the exam started, you should not exit the room, even if you finished answering all the questions or decided to give up taking the exam.

(2) As a general rule, you should not exit the room during the exam, even temporarily. Request for a permission when you feel sick or need to use a bathroom.

(3) Examination admission cards must be kept on the desktop throughout the examination period.

(4) During the examination period, and all mobile phones must be turned off. Mobile phones must not be carried on the examinee's person (on neck straps, in pockets, etc.).

(5) Examinees will not be allowed to ask questions about the contents of the examination problems.

(6) Examinees must write their examination admission number and name on all answer sheets, and enter their answers on the designated forms. If there is not enough space, they may write on the back of the answer sheets.

(7) Examinees must not take answer sheets or question booklets out of the examination room.

[Preference Card (Summer entrance examination for Master's program)]

University of Tokyo Graduate School of Information Science and Technology, Department of Creative Informatics

Program	Master's program			
Examinee's name		*Examination admission number		
Graduating university	University:_____ School: _____ Department: _____			
Examinee contact address and phone number during the examination period	Address: TEL: TEL (mobile phone): E-mail:			
Names of preferred advisors	Preference 1		Preference 2	
	Preference 3		Preference 4	
Intention (Check)	I accept enrollment if another advisor offers to serve as my supervisor		I do not accept enrollment if another advisor offers to serve as my supervisor	
Regular education subjects to be tested	Mathematics	Programming	Do you wish to enter the school in September 2019 ?	Yes

Specialized subjects to be tested on the examination (Check)	Creative Informatics	Computer science	Mathematical Informatics	Information Physics and Computing	Information and Communication Engineering
Residence Card	□ Retain Status: student／other(　　)			□ Not Retain	
Preferred field and research ambitions					

- Submit this form along with your application.
- * Leave this box blank
- If you wish to enter the school in September 2019, who have not graduated from university by August 2019,confirm whether the requirements are satisfied with the administration office and circle "Yes" in the appropriate column above.
- Circle one regular education subject and one specialized subject to be tested.

[Preference Card (Winter entrance examination for Master's program)]

University of Tokyo Graduate School of Information Science and Technology, Department of Creative Informatics

<table>
<tr><td>Program</td><td colspan="4">Master's program</td></tr>
<tr><td>Examinee's name</td><td colspan="2"></td><td>*Examination admission number</td><td></td></tr>
<tr><td>Graduating university</td><td colspan="4">University:_____School: _____
Department: _____</td></tr>
<tr><td>Examinee contact address and phone number during the examination period</td><td colspan="4">Address:

TEL:
TEL (mobile phone):
E-mail:</td></tr>
<tr><td rowspan="2">Names of preferred advisors</td><td>Preference 1</td><td></td><td>Preference 2</td><td></td></tr>
<tr><td>Preference 3</td><td></td><td>Preference 4</td><td></td></tr>
<tr><td>Intention (Check)</td><td colspan="2">I accept enrollment if another advisor offers to serve as my supervisor</td><td colspan="2">I do not accept enrollment if another advisor offers to serve as my supervisor</td></tr>
<tr><td>Residence Card</td><td colspan="2">□ Retain
Status: student／other(　　)</td><td colspan="2">□ Not Retain</td></tr>
<tr><td>Preferred field and research ambitions</td><td colspan="4"></td></tr>
</table>

- Submit this form along with your application
- * Leave this box blank.

[Preference Card (Summer/Winter entrance examination for Doctoral program)]

University of Tokyo Graduate School of Information Science and Technology, Department of Creative Informatics

Program	Doctor's program		
Examinee's name		*Examination admission number	
Graduating university or graduate school	University:_____School: _____ Department: _____ Graduate School:_____School: _____ Department: _____		
Examinee contact address and phone number during the Examination period	Address: TEL: TEL (mobile phone): E-mail:		
Names of preferred advisors			
Application period (Circle the appropriate response)	Summer / Winter	Special selection for working students	Working student
Preferred time of entry (Circle the appropriate response)	September 2019 / April 2020		
Residence Card	□ Retain Status: student／other( )	□ Not Retain	
Preferred field and research ambitions			

- Submit this form along with your application.
- * Leave this box blank.
- If you wish to enter the school in September 2019, who have not earn Master's degree by August 2019, confirm whether the requirements are satisfied with the administration office and circle "Yes" in the appropriate column.
- If you are taking examination for "Special selection of working students," circle "Working student" in the "Special selection of working students" column.

University of Tokyo Graduate School of Information Science and Technology, Department of Creative Informatics

Faculty Advisors and Concurrent Faculty Advisors (as of April 2018)

Faculty Advisors

Professor Shigeru Chiba
Programming Languages, Software Infrastructure
Professor Takeo Igarashi
User Interface, Computer Graphics
Professor Akiko Takeda
Mathematical Optimization, Operations Research
Professor Hiroshi Saruwatari
Speech and Acoustic Information Processing, Statistical Signal Processing, Machine Learning
Professor Hiroshi Esaki
Smart Internet, Sensor Network
Professor Masayuki Inaba
Intelligent Robots, Humanoids
Associate Professor Mary Inaba
Networks, Supercomputers, Computational Geometry
Associate Professor Hideki Nakayama
Machine Perception, Natural Language Processing, Machine Learning
Associate Professor Toshiya Hachisuka
Computer Graphics, Computational Statistics
Associate Professor Ryota Shioya
Computer Architecture, System Software, Information Security
Associate Professor Manabu Tsukada
Computer Network, Cyber Physical Systems

Concurrent Faculty Advisors who belong to other departments

Associate Professor Shinpei Kato (Dept. of Computer Science)
Operating Systems, Supercomputing, Autonomous Driving
Professor Kenji Yamanishi (Dept. of Mathematical Informatics)
Information-theoretic Learning Theory, Data Mining, Anomaly Detection
Professor Hiroshi Nakamura(Dept. of Information Physics & Computing)
Computer System, IoT/Cyber-Physical System, Computer Architecture
Professor Shuichi Sakai (Dept. of Information & Communication Engineering)
Computer Systems and Applications
Professor Tatsuya Harada (Dept. of Mechano-Informatics)
Real World Intelligent Systems

Note:
(1)Other advisors who accept students of the Department of Creative Informatics will be registered as concurrent faculty advisors after admission.

Computer Software Group

also known as Prof. Chiba Shigeru's Group

www.csg.ci.i.u-tokyo.ac.jp

About us

Our research interests are in programming languages and system software, i.e. the *core* of computing systems. We are seeking students who love programming as well as programming language design and software engineering. Our aim is to explore "cool" things related to programming.

To Applicants

We welcome students who have passion and strong interests in software development. Good programming skills are desirable but not mandatory. Only basic programming skills are. Past students were able to quickly learn necessary skills if they like programming. Potential applicants can ask a question about such required skills by emails. Visiting our group is also possible by appointment.

Although writing a toy program is easy, developing truly useful and reliable software with a non-trivial size is not a simple task. It is often just too complex to complete and thus we need to carefully write a program to have a *clear* structure and to be easily readable and maintainable.

Developing software for helping such programming is a main part of our research. Most students are developing software as their art work. Coming up with a good idea, developing software based on that idea, and write a paper is our research activity.

We have been studying and developing program libraries, frameworks, and programming tools for a new style of programming. An example is a library for meta-level programming that automates program translation and generation. It allows user programmers to write a simple program and it automatically rewrites it to have more complex functionalities. Another example is a program-ming tool for developing a library with a "fluent" programming interface, so called an embedded domain specific language (DSL). Such a kind of DSL is getting important today.

We have been also developing a new programming language, usually an extended version of existing language that supports a new language construct. A language construct is a various component constituting a language, such as a while statement, an object and a class, a lambda expression, type inference, and so forth. As an academic research group, we are working for inventing a new language construct that will be adopted by widely used major programming languages in future.

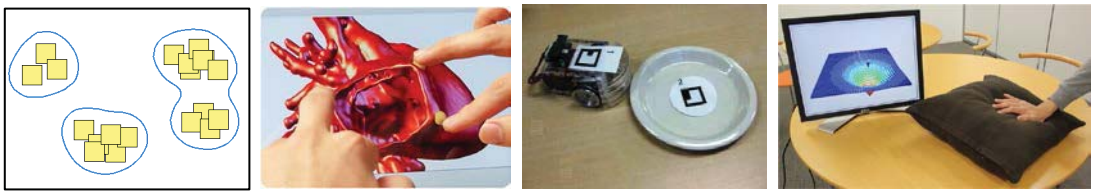
A more fundamental layer of software stack is also our research topic. Our interests cover a compiler, an interpreter, and a language virtual machine. A system service provided by the operating-system layer is also a research topic, such as security, virtualization, distributed and/or parallel computing. We are also studying program analysis from a software engineering viewpoint and a tool for it. Applying machine learning to such analysis is also our recent research topic.

A wide range of research for helping programming practice is covered. A research topic for an individual student is selected through discussion with a supervisor.

指導教員　Takeo Igarashi (proper)　研究分野　User Interface, Graphics

(1) User Interface: We are working on user interfaces for information appliances ranging from personal computers, smartphone, robots, and self-driving automobiles. We not only develop techniques to improve efficiency but also propose new way of interaction or analyzing interactions. Below is some examples.

- User interfaces for machine learning and artificial intelligence. We especially focus on the preparation of training data and interactive learning.
- Interaction techniques for novel appliances such as smartphone, smart watches, AI speakers and smart glasses.
- Interaction techniques for giving directions and controlling real-world systems such as robots and self-driving automobiles.



(2) Graphics: We mainly work on interactive shape modeling. We work on content creation for digital media such as movies and games. We also work on interaction techniques for digital fabrication using 3D printers and laser cutters. We focus on techniques for non-expert users.

- Content creation such as 3D modeling and 2D animation using recent technologies such as sketching and machine learning. We also work on interaction techniques for medical imaging.
- Shape modeling for real world objects such as musical instruments, clothes, and toys leveraging real-time physical simulation.
- Novel techniques for 3D scanning and 3D printing to support personal fabrication.

Each student sets his or her own goal in our group, so we expect students to be self-directed and take responsibility. We can provide opportunity for students to collaborate with research groups in other countries and productions.
http://www-ui.is.s.u-tokyo.ac.jp/

Name	Akiko Takeda	Research Fields	Mathematical Optimization, OR

Operation research (OR) is one of the scientific techniques for constructing a mathematical model and finding its solution by using a computer for real world problems. In particular, we are conducting research focusing on model construction as a mathematical optimization problem and development of algorithms (numerical methods) for solving the problem.

The mathematical optimization problem is a mathematical model to achieve a better objective value under given constraints. Mathematical optimization problems arising from real world problems are usually large in scale and can not be solved without designing efficient algorithms based on the mathematical structure of the problem. We focus on optimization algorithms and software development based on mathematical optimization theory, and are conducting research to apply to problems in fields such as energy systems, financial engineering, machine learning and so on.

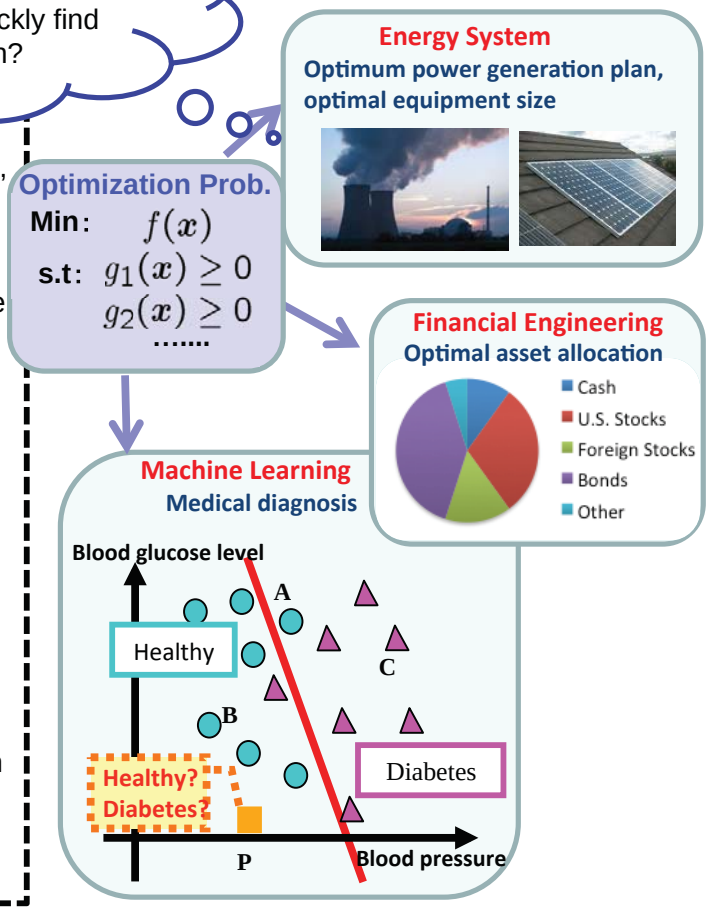
Research Topics

What kind of procedure (algorithm) quickly find a good solution?

●Efficient algorithms for non-convex optimization
Problems in the real world often result in large scale, nonlinear and nonconvex continuous optimization problems. Algorithms for quickly finding highly accurate solutions are required. We are developing an efficient algorithm that exploits the features of the problem well.

●Decision-making method under uncertainty
When constructing a mathematical optimization model using uncertain data, robustness against uncertainty of data is required. Robust optimization models and stochastic programming models are useful in such situations. We aim to efficiently solve such optimization problems and contribute to real world problem solving.

●Applying optimization methods to other fields
The application range of the mathematical optimization method is diverse, and it is also used in fields such as energy system, financial engineering, machine learning and so on. We propose efficient algorithms for problems to be solved in such fields.



Knowledge and ability necessary for conducting research

Linear algebra is indispensable for conducting research in our field. More abstract mathematics is rarely necessary and we often use elementary mathematics to develop optimization algorithms. In addition, basic knowledge of programming is required when implementing optimization algorithms in the process of research.

What to expect from students

In order to create something new as a research, a very steady effort is necessary. The range of activities will not be confined to the laboratory. I expect that students will participate in research meetings, domestic and overseas conferences, etc. We will gladly cooperate.

Name	Prof. Hiroshi Saruwatari	Research Field	Acoustic & Statistical Signal Processing, Machine Learning

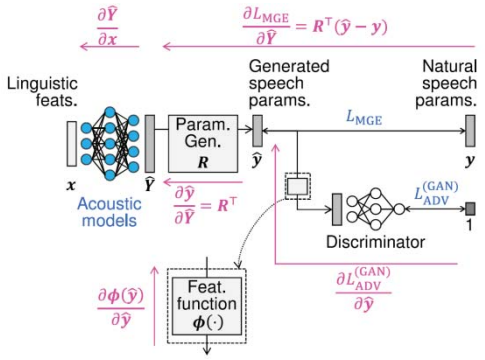
In Saruwatari Laboratory, we mainly address an innovation in new signal processing and information processing systems, focusing our attention on understanding, processing, and control of sound media (speech, music, etc.). For example, theories on new statistical modeling and machine-learning-based algorithms are of interest for us to solve the optimization problems under acoustical generative models and physical constraint. Through the innovation, we realize expansion of human hearing systems, new man-machine interface systems as well as new contribution to music art creation.

Auditory Communication Augmentation Based on Unsupervised/Semi-supervised Learning Systems

We realize versatile unsupervised source separation based on *Independent Low-Rank Matrix Analysis* combining statistical estimation theories and low-rank modeling. Also, we address *Independent Deeply Learned Matrix Analysis* as a new harmony of deep learning and spatial acoustics, which can be applied to semi-supervised source separation. Thanks to these methods, human interface and auditory communication augmentation systems can be developed.

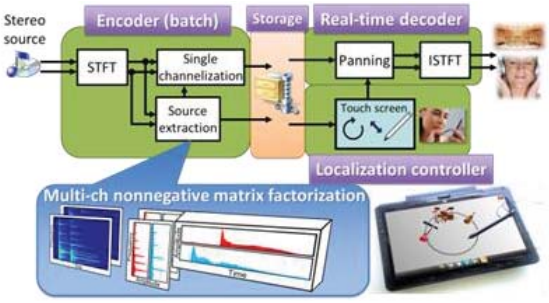
Speech Information Processing Based on Deep Learning

We address theories on signal processing and machine learning for high-quality speech synthesis/conversion as a means of flexible human-human and human-machine communication. We have proposed Generative-Adversarial-Network-based DNN speech synthesis/conversion systems as the world's first attempt and apply them to generation of a complex human voice. Furthermore, by modeling a natural fluctuation in singing voice, we can realize audio virtual reality systems with high expression capability.



User-Oriented Music Information Processing

We realize high-quality music signal processing systems based on spatio-temporal signal analysis by applying machine-learning algorithms, e.g., nonnegative low-rank approximation and sparse representation to various multidimensional data. Using the systems, we establish versatile user-oriented information processing in order to contribute toward new creation of music art.



Sound Virtual Reality & Augmented Reality

We create a high-accuracy reproduction theory for complex acoustic fields by introducing the unified mathematical representation of acoustical sound sensing, transmission, transformation, and reproduction. In particular, statistical estimation and super-resolution theories based on spherical harmonic analysis can be introduced to cope with unreliable sensing problems. Finally, we develop an ultra-realistic sound virtual reality system and an augmented reality system that can be applicable to man-machine interaction.

Our laboratory mainly focuses our attention on the theoretical innovation for mathematical modeling of acoustic sounds, and welcomes students who are interested in such a research and big- & small-data processing.

Laboratory: Engineering Bldg. No.6, Hongo Campus WEB: http://www.sp.ipc.i.u-tokyo.ac.jp/

Esaki Laboratory (www.hongo.wide.ad.jp)

Principle Advisor; Hiroshi Esaki, Ph.D <hiroshi-sec@hongo.wide.ad.jp>
Location of Laboratory; Faculty of Engineering Building No.2, Hongo Campus

Overview of Esaki Laboratory

Our laboratory researches widely distributed computer systems, the most well known being the Internet. We cover physical system development/deployment to user applications. Of our many research topics, we focus on a future Internet architecture and the (physical) Internet system. Our motto is "research in our right hand, operation in our left hand". We show this motto in our working and professional operate-able system development.

Esaki Lab is one of primary laboratories in the WIDE Project (www.wide.ad.jp), which is a research and development consortium working on large scale Internet system and technologies. Established in 1988, WIDE has been a leading project exploring the Internet in Japan as well as across the world. The WIDE project counts more than 100 private companies and more than 400 active researchers in academia and industry as members. Laboratory members participate in practical, professional and global WIDE project activities; while operating our hand-made nation-wide R&D testbed, which is a part of a greater global R&D testbed.

Key words of recent Esaki Lab's research topics are "Global", "Mobile" and "Ubiquitous". Our concrete research areas are Sensor and Facility Networking, Routing Architecture, Network Protocol Stack Architecture, Traffic Analysis and Virtualization, Software Defined Media.

Esaki Lab provides working opportunities at collaborating oversea research organizations, such as CNRS/INRIA (France), Cornell University/USC-ISI (USA), UCL(UK), HUT(Finland). These overseas research opportunities may be long term on-site research projects. Esaki Lab also hosts several oversea students each year from across the world.

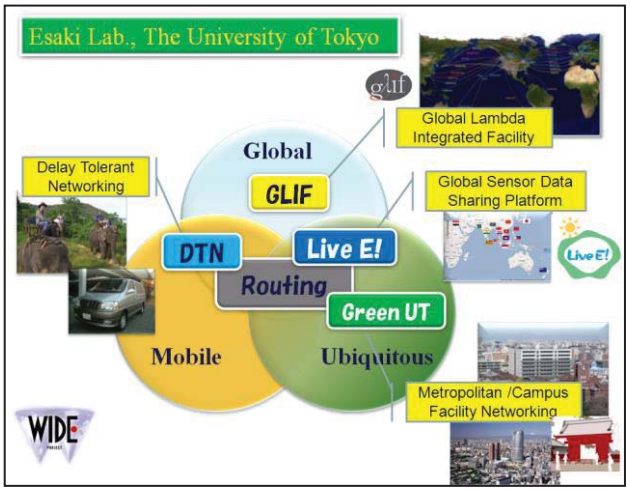
Related Projects

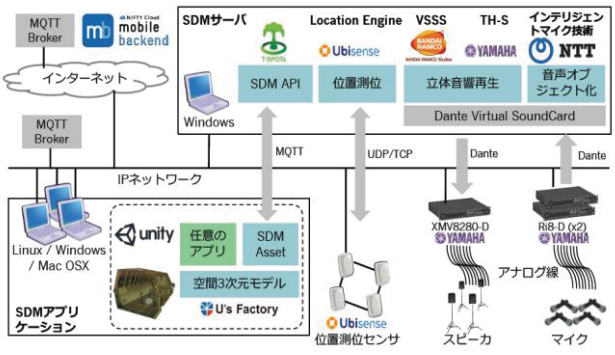
[1] WIDE Project (www.wide.ad.jp/), [2] Green University of Tokyo Project (www.gutp.jp/),
[3] SDM Project (www.sdm.wide.ad.jp/), [4] IPv6 Promotion Council (www.v6pc.jp/)

Example Topics of Thesis

Future Internet Architecture: DTN, Label Switching, Sensor Networks, Wireless Network, Facility Networking, Mobile Networking, P2P, Software Defined Media, IoT

- Distributed Operating Systems: Virtualization, Cloud Computing, File System
- Future Internet Applications: SmartGrid, Ad Hoc and Nomadic Computing, Green ICT
- Traffic Measurement and Analysis





Destinations after graduation

The University of Tokyo, Keio University, CITI Group, IBM, MRI, NTT Communications, KDDI, NTT DoCoMo, NTT Data, Mitsubishi, Canon, Yokogawa, METI, MPT, NPA

Note: Easki lab requires all its students to have a working knowledge of UNIX or a UNIX like OS as it will be the primary working platform.

Name	Professor Masayuki Inaba	Research Fields	Intelligent Robot, Humanoid

Research in this laboratory is focusing on the fundamental functions and systems necessary for future intelligent robots that will live and work in the daily life field and human society. The members are challenging something new through their own integrated robot systems and learning how to build sustainable systems for the future with each other.

(1) Daily life support humanoid platform : recognition of situations in human life environments, using tools, dishes, tablewares, and appliances, learning from humans, conversation with humans, etc.

(2) Musculoskeletal tendon-driven humanoid : humanlike musculoskeletal body with very many joints and numerous redundant sensors aiming at powerful and supple motions like human, design principle of humanoid body structure, autonomous development of complex sensory-motor system, etc.

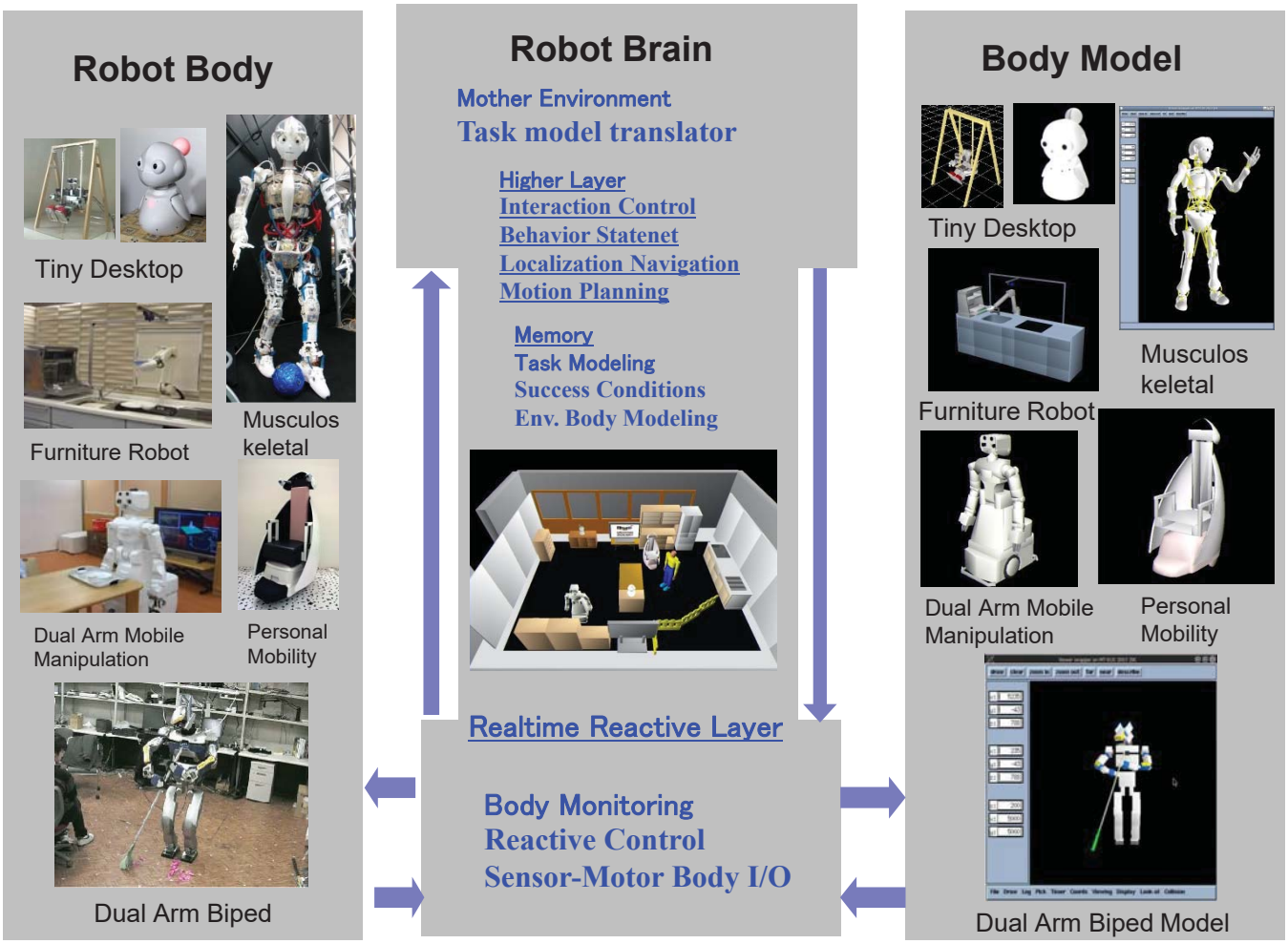
(3) Embedded robotics devices: soft flesh or deformable tactile sensor devices, integrated IMU sensors, perception devices, embedded CPU for flying robots, onbody communication LAN system, power system for intelligent robots. etc.

(4) Dynamics whole body control humanoid : integrating high-torque, high-speed motor drive circuit, high-speed 3D recognition system, dynamics whole-body.

(5) IRT (Information and Robot Technology) to support human and aging society: through fusing IT and RT systems, personal mobility robots, affectionate watching appliance are conducted for supporting the future life society

(6) Robot Open Software System: design and development of open-source type intelligent robot for mobile manipulation robot.

(7) Creative Robotics : Architecture design and development for hardware and software of new robots: wheel-legged body, combine-deformable transform robot, inflator robots etc.



Fundamental Robot System Architecture: Mother Environment, Robot Brain, Robot Body, Robot Operating System, Developmental System Architecture

Name	Mary Inaba	Research Fields	High speed network, Accelerator, Optimization

Mary Inaba Group

High Speed Communication and Acceleration

http://akashi.ci.i.u-tokyo.ac.jp/lab-e/

Real-World Communication on a Long Fat Pipe Network

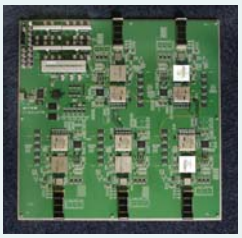
Internet Land Speed Record

Data Reservoir Project (2000 --)

with Prof. Kei Hiraki

We monitor network packets using tools developed by our group, leading to new analyses, new concepts, and new methods for stable and fast data transfer. We evaluate our ideas with international experiments using over 30,000km real network, connecting Tokyo, U.S., and Europe.

URL: http://data-reservoir.adm.s.u-tokyo.ac.jp



Network testbed

Accelerator for High Performance Computing

Accelerators for Heavy Edge Computation are now in high demand
We propose and investigate hardware solution for this problem

Our Past Projects

Grape-DR Project (2004 -- 2010)

with Prof. Makino, Dr. Namura, Prof. Hiraki and Dr. Sugawara

We developed a low power consumption super computer system using our novel accelerator board with the "Grape-DR-Chip" designed by Prof. Makino.

2010(May) Little Green 500 1st place (815.43 MFLOPS/Watt)
2010(Nov) Green500 2+ place (1448.03 MFLOPS/Watt)

Planned Serendipity (2014 – 2019)

Development of an ultra-high speed cell sorter for bio-medical applications.
We focus on the information system of the sorter and on cell recognition.

URL: http://www.jst.go.jp/impact/serendipity/en/index.html

Grape-DR system

Evaluation board for Grape-DR

Optimization Algorithms and Software Development

Search problems, geometric problems, community extraction, etc.
We focus on practical algorithm and coding
We encourage students to participate world competitions

Our PhD. Students success in international competitions.

SAT solver competition

2011 Tomohiro Sonobe, Gold Medal in the MiniSAT Track
2016 Seongsoo Moon, Best Crafted Benchmark Solver in the Main Track

ACM-IEEE MEMOCODE Design Contest

2015 Kenichi Koizumi, 1st Place (Continuous Skyline Computation)

SAT competition

motto: 学而不思則罔、思而不学則殆

Assoc. Prof. Hideki Nakayama	Research Topics: Machine Perception, Natural Language Processing, Deep Learning

Toward computer systems that can intelligently process gigantic multimedia data to realize cognitive understanding of the world

Human can instantly recognize various sensory information such as vision and audio, and describe it by language. However, the mechanism of such abilities is almost totally unknown. Although modern computers have made a remarkable progress in terms of computational powers, it has a still long way to go to rival real-world human intelligence in many aspects.

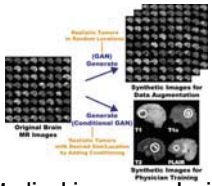
In Nakayama lab., we are aiming to establish such techniques, and conducting researches from both theory and application perspectives. This field is not mature enough and there are many unsolved problems, which makes it very attractive and challenging. We are eagerly waiting for ambitious and creative students to tackle the future of AI together!

Large-scale Multimedia Recognition

We are mainly focusing on the development of mathematical foundations to realize automatic recognition and understanding of various multimedia such as image, movie, speech etc. For example, high-level feature extraction for medias, and machine learning or pattern recognition methods are important topics.

Multi-class fine-grained image categorization

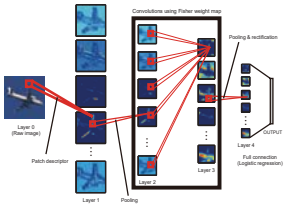
Multi-language character recognition



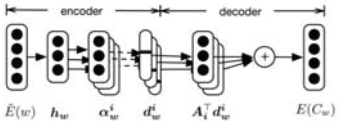
Medical image analysis

Deep Learning

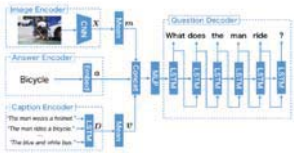
To enhance utility and availability of deep learning, we are making various improvements for fast computation, memory reduction and robust learning. In addition, we are also developing flexible neural models to integrate various modalities, not only images but also natural language and others.



Fast initialization of CNNs



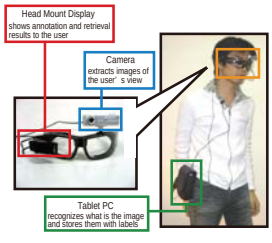
Parameter compression via quantization network



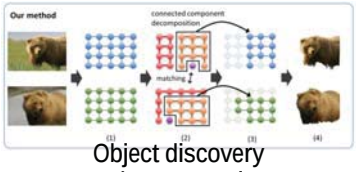
Multi-modal deep learning

Open-world Intelligent Systems

While modern AI systems based on machine learning have become able to achieve high recognition performance for given concepts, they are hopeless when they face unknown concepts in the real world. To autonomously and incrementally acquire new knowledge in the open world, we are developing many techniques in both software and hardware aspects.



Wearable interface

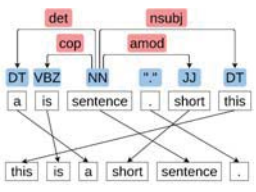


Object discovery and segmentation

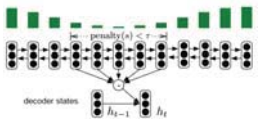
Transfer learning

Natural Language Processing

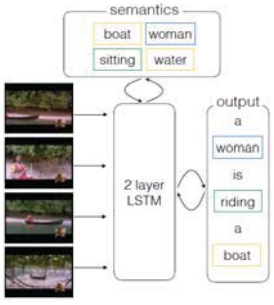
One of the keys to realize computers being able to understand natural language is how to implement world knowledge on them. To this end, we believe it is important to employ not only lingual data but broader multi-modal information. Particularly, we are trying to establish a frontier spanning language and vision toward AIs with deep understanding of the world.



Syntactic word embedding

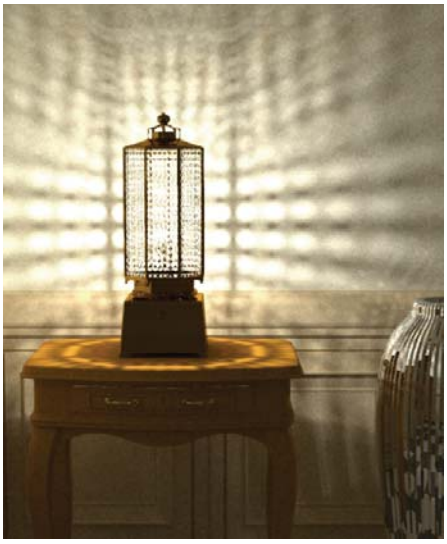


Neural machine translation



Movie captioning

Name	Toshiya HACHISUKA (Associate Prof.)	Fields	Computer graphics, Computational statistics



Computer Graphics Group

rendering, geometry, animation, measurement, parallel computation, simulation, fabrication

Some policies

- Work on a topic that is interesting for everyone, including yourself.
- Nobody micromanages you - you manage yours.
- The advisor should not “use” students to do research, but “help” them to work on theirs.
- Focus on publication.
- Polish presentation skills.

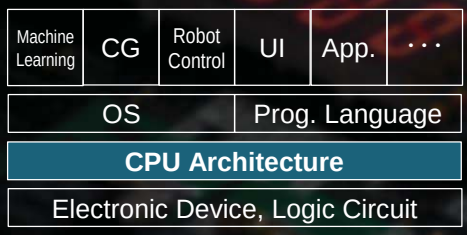
Our group is working on practical and theoretical aspects of computer graphics.

Computer graphics is important technology used in our daily life in the form such as video games, movies, and industry design. It is in fact an intellectually stimulating research field which requires you to combine wide and deep knowledge of various other fields such as physics, mathematics, computer science, perception, and arts. Even with such technical depth as a research field, it is worth noting that the results of research in computer graphics are easy to understand such as photorealistic images in movies. Visit the website if you are interested.

www.ci.i.u-tokyo.ac.jp/~hachisuka/

| Name：Ryota Shioya (Associate Prof.) | Field：Computer Architecture |

Ryota Shioya's Group

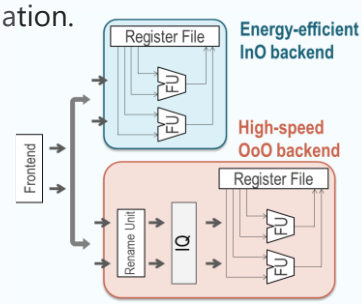


Our group's mission is to improve the performance, energy efficiency, and security of computer systems. We conduct research focusing on CPU architecture and a wide range of relevant topics including program languages, operating systems, and applications.

- A CPU, which executes programs and performs calculations, is the heart of a computer. Research in computer architecture is to explore novel techniques to improve computer systems including CPUs.
- This field is at the boundary between hardware and software. We explore techniques to improve hardware considering software or those to improve software considering hardware.
- We welcome students who have interests in computer hardware or a fundamental layer of software stack such as a compiler, interpreter, virtual machine and OS.

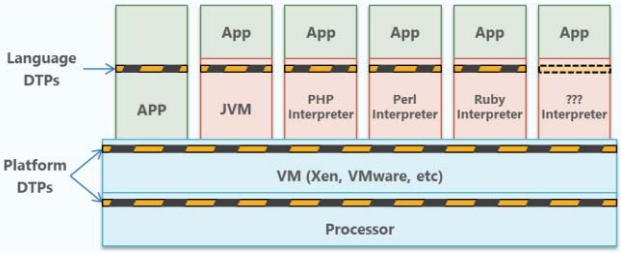
Energy-efficient Hybrid CPU

We introduce different CPUs specialized to various situations, and improve energy efficiency by cherry-picking the specialized CPUs for each situation.



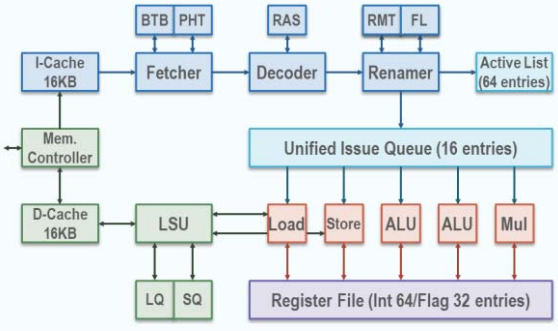
Dynamic Information Tracking for Security

Instead of relying on endless fixes of security vulnerabilities, we explore a "fundamentally secure" system by tracking dynamic information flows.



Advanced RISC-V CPU "RSD"

RISC-V is an open CPU standard, which has recently appeared. This is analogous to the appearance of Linux against a closed OS. We are conducting research and development of advanced RSIC-V compatible CPU "RSD" that introduced our research results.



Other Research Topics

- Hardware Assist for Scripting Languages
- Lightweight Memory Protection for WEB Browser
- Instruction Fetch Techniques for Server Apps.
- Multiport Memory Construction Method for FPGA
- SRAM Circuit Simulator
- CPU Pipeline Visualization Tool

Name	Manabu Tsukada	Research Fields	Computer Network, Cyber physical systems

Tsukada Laboratory was founded in 2019 as a part of Department of Creative Informatics. The laboratory focuses on **computer network** and **cyber-physical systems**, and have engaged in the fields of **transportation** and **live entertainment**. Transport research includes Intelligent transportation systems (ITS) and autonomous driving. Live entertainment research includes VR remote transmission of live music and platform for object-based media.

http://tlab.hongo.wide.ad.jp/

Transportation

– Network-assisted autonomous driving –

GCL MUSCAT

http://gcl-muscat.jp/

In ITS, research and development of autonomous driving have been actively carried out, but many of them are standalone mode autonomous driving that sensors and computers merely replace human perception, judgment, and operation. On the other hand, in the network-assisted autonomous driving, vehicles are connected by networks, and information on places which cannot be seen by automotive onboard sensors can be obtained, so further safety and efficiency can be achieved.

Keyword: Cooperative ITS, Wireless networking, Edge-cloud computing, Dynamic map, Ad-hoc networking, fifth-generation mobile communication system (5G), ISO/ETSI standards

Live entertainment

– Internet audio-visual media –

Software Defined Media

http://sdm.wide.ad.jp/

The objective of this study is to create an audio-visual software space that creates a global scale sense of unity over the Internet. Converting from large-size media and streaming services that are highly unidirectional, we will drastically transform the participation experience of remote audience in musical lives by supporting large-scale and distributed audience interactions with the venue.

Keyword: audio-visual media, immersive technologies, object-based audio, open data, VR/AR, Building Information Modeling（BIM）

Workshop with autonomous vehicle (Hongo, 2018)

With old colleagues at Vehicular conference (Nice, 2017)

Recording of Keio University's classic concert (Hiyoshi, 2016)

Demonstration in Interop Tokyo with industry partners (Makuhari, 2018)

Think globally from different points of view

During my undergraduate and master's course in Japan, I conducted three international research internships in Australia and France. Then, I worked in France for 6 years as a foreign researcher before coming to the University of Tokyo. Since 2013, I have been working at the University of Tokyo as a faculty member of the Global Creative reader (GCL) education program which is designed to educate leaders who will bring about social innovation driven by cooperation between different fields based on ICT. From my foreign experience and international collaboration, we consider diversity and different way of thinking is essential for social innovation. We are more than happy to help students to go abroad for their research works.

Research with academic-industry collaboration

The collaboration between academic and industry brings mutual benefits to both sectors. We established consortiums to discuss real issues in the research and business domain. Also, we conduct demonstration experiments, deployments of research achievements, and business trials.

Concurrent Faculty Advisors who belong to other departments

name	Shinpei Kato	Research Fields	Operating Systems, Supercomputing, Cyber-Physical Systems
We conduct research on computing platforms underlying creation of disruptive innovations. Examples of our research projects include the following: (1) On many-core architectures integrating million cores on a chip and their operating systems (2) On supercomputing and distributed data processing for peta-scale real-world and real-time information (3) On self-driving systems and artificial intelligence technology			

name	Kenji Yamanishi	Research Fields	Information-theoretic Learning Theory, Data Mining, Anomaly Detection
In Yamanishi's laboratory, major research topics are 1) information-theoretic machine leaning theory, and 2) data mining applications. As for 1), we aim at developing novel machine learning technologies on the basis of information theory, and statistics. Our research targets include statistical model selection, latent variable modeling, anomaly detection, change detection, etc. As for 2), we aim at developing novel big data analysis methodologies for market analysis, traffic risk mining, web mining, healthcare, etc. on the basis of 1). We bring up data scientists who are strong both in theoretical and practical aspects.			

name	Hiroshi Nakamura	Research Fields	Computer System, IoT/Cyber-Physical System, Computer Architecture
We mainly address high-performance, dependable, and low-power computer system to realize advanced interaction between physical and cyber worlds. - IoT/Cyber-Physical System: Optimization of total computer systems by integrating sensors and server systems in IoT world. - Ultra Low Power Computer System: Ultra low power VLSI systems and high-performance and low-power computing through co-optimization between circuit technology, computer architecture, system software, and algorithm.			

name	Shuichi Sakai	Research Fields	Computer Systems and Applications
Professor Shuichi Sakai conducts wide-ranging and innovative research activities on the new information processing system. The current research theme is a computer architecture, secure information processing, dependable information processing, human computer interactions (HCIs) and so on for the future smart society. Especially, advanced architecture of microprocessors, the optimized compiler, many-core processors, secure computing, ultra-dependable processors and smart HCIs are specific subjects; his lab continues to produce world-class research results in these fields. In addition to presenting papers in international journals and major conferences, the researches continuously produces intellectual properties and the seeds of new products to the industry.			

name	Tatsuya Harada	Research Fields	Real World Intelligent Systems
Our laboratory focuses on machine intelligence. Our goal is to invent hyper-intelligent systems by combining useful but infinite information in the physical space with a huge amount of data and powerful computational resources in the cyberspace. To tackle this challenging problem, we utilize all resources in the area of computer science including machine learning, computer vision, natural language processing and robotics.			