This document is a translation from the official Japanese version.

2022Admission Guide
for Department of Creative Informatics
Graduate School of
Information Science and Technology
The University of Tokyo

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
office@ci.i.u-tokyo.ac.jp

Department's website for Entrance Examinations:
Visit https://www.i.u-tokyo.ac.jp/index_e.shtml
Admissions > Departments and Faculty > Creative Informatics > Admissions

Note 1: In addition to this document, carefully read Admission Guide for Graduate School of Information Science and Technology (read the guide for the applicant's program: Master's program, Doctoral program, or Doctoral program [Special selection for working students]), as well as the Guidelines for Submission of TOEFL Scores.

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

Note 3: The contents of this document and Admission Guide for Graduate School may be changed to prevent the spread of new coronavirus infection. In that case, the change will be posted on the website of the graduate school and/or the department. Regularly check it.

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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.

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2. Master's program

2.1 Examination schedules and examination subjects

i) Summer entrance examination

(1) Document screening

Document screening will be conducted based on the submitted documents. Regarding the notification of the screening, refer to Admission Guide for Graduate School.

(2) General education subjects

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

Those who are absent from the examination in the general education subject are considered to have withdrawn from the entrance examination.

Subject	Date and location	Description
Mathematics	Refer to Admission Guide for Graduate School	
Programming	Friday, August 6, 2021 13:00 – 17:00 School of Engineering; Bldg. No. 6 (Details will be posted at the main entrance to the School of Engineering Bldg. No. 6 on the day of the examination)	The basic skills of programming is examined. The applicants must bring their own laptop PCs and write programs for the given topics. They may use their preferable programming languages. Answering time is 150 minutes in total. .

Notes:

A programming environment must be installed in the laptop PCs used during the programming examination. The applicants may bring one copy of printed book about programming and they may refer to that book during the examination. The applicants 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).

(3) Foreign language

TOEFL iBT/TOEFL iBT(SHE) scores will be used to evaluate the applicants' English skills. For details, refer to "Guidelines for Submission of TOEFL Test Scores; Graduate School of Information Science and Technology, The University of Tokyo," which is enclosed in the common admission guide.

(4) Specialized subjects

Applicants shall select one of the following four specialized subjects at the time of application. The applicants not selecting Creative Informatics should find out the details by referring to Admission Guide for the corresponding department.

Those who are absent from the examination in specialized subjects are considered to have withdrawn from the entrance examination.

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Subject	Dates and locations	Description
Creative Informatics	Monday, August 23, 2021 13:00 – 17:00 School of Engineering Bldg., No. 6 (Details will be posted at the main entrance to the School of Engineering Bldg. No. 6 on the day of the examination)	Applicants solve three problems in the fields related to software/algorithms, computer hardware, and information systems, and other related fields. Answering time is 150 minutes in total.
Computer science	Refer to Admission Guide for Department of Computer Science.	
Information Physics and Computing	Refer to Admission Guide for Department of Information Physics and Computing.	
Information and Communication Engineering	Refer to Admission Guide for Department of Information and Communication Engineering.	

(5) Oral examination

The oral examination is conducted online on Wednesday, August 25 2021 (when the examination ends depends on the number of applicants). The oral examination schedule will be posted on the website by the day of the examination. In the oral examination, applicants will be asked about the issues such as the written examinations, current research topics, and a research plan at the graduate school.

ii) Winter entrance examination

(1) Document screening

Document screening will be conducted based on the submitted documents. Regarding the notification of the screening, refer to Admission Guide for Graduate School.

(2) General education subject

The applicants must select programming for Winter entrance examination unlike Summer entrance examination. Those who are absent from the examination in the general education subject are considered to have withdrawn from the entrance examination.

Subject	Dates and location	Description
Programming	Wednesday, February 9, 2022 13:00 – 17:00 School of Engineering; Bldg. No. 6 (Details will be posted at the main entrance to the School of Engineering Bldg. No. 6 on the day of the examination)	Refer to the description for Summer entrance examination.

Note: Refer to the description for Summer entrance examination

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(3) Foreign language

TOEFL iBT/TOEFL iBT(SHE) scores will be used to evaluate the applicants' English skills. For details, refer to "Guidelines for Submission of TOEFL Test Scores; Graduate School of Information Science and Technology, The University of Tokyo," which is enclosed in the common admission guide.

(4) Specialized subject

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.

Subject	Dates and location	Description
Creative Informatics	Tuesday, February 8, 2022 13:00 – 17:00 School of Engineering, Bldg. No.6, (Details will be posted at the main entrance to the School of Engineering Bldg. No. 6 on the day of the examination)	Refer to the description for Summer entrance examination.

(5) Oral examination

The oral examination is conducted online on Thursday, February 10, 2022. (when the examination ends depends on the number of applicants). The oral examination schedule will be posted on the website by the day of the examination. In the oral examination, applicants will be asked about the issues such as the written examinations, current research topics, and a research plan at the graduate school.

2.2 Submission of Preference Card

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

2.3 Transfer to online examination

If a resident of a foreign country has a difficulty to take the onsite examination and he/she wants to apply for the transfer of the written examination to the online examinations, he/she must submit "Transfer application for the online written examinations". Carefully read the instructions before the submission. If the application is approved, the applicants must attend online connection rehearsals. The rehearsals are held on July 30th (Programming in summer), February 1st (Programming in winter), August 20th (Specialized Subject: Creative Informatics in summer), and February 1st (Specialized Subject: Creative Informatics in winter). For the details of the rehearsal for Mathematics, refer to Admission Guide for the Graduate School. The applicants who do not participate the rehearsal will lose their eligibility for the admission. The online examination will start earlier than the onsite one. The online examination for Winter examination may not be conducted depending on the situation of the pandemic.

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

3.1 Examination schedules

i) Summer entrance examination

(1) First round examination

Subject	Dates and location	Description
Specialized subject Creative Informatics	Monday, August 23, 2021 13:00 – 17:00 School of Engineering Bldg., No. 6 (Details will be posted at the main entrance to the School of Engineering Bldg. No. 6 on the day of the examination)	Applicants solve three problems in the fields related to software/algorithms, computer hardware, and information systems, and other related fields. Answering time is 150 minutes in total.
Oral examination	Tuesday, August 24, 2021 From 1:30 p.m. (When the number of applicants is large, the examination may be also held on Thursday, August 26. The start time when the examination ends depends on the number of applicants.) The oral examination is conducted online. Its schedule will be posted on the website by the day of the examination.	Applicants give a presentation on their Master's thesis or equivalent work and doctoral research plans (about 20 min.; slides can be used), and then they are asked questions on the presentation and other issues.

Notes:

(a) TOEFL iBT/TOEFL iBT(SHE) scores will be used to evaluate the applicants' English skills. For details, refer to "Guidelines for Submission of TOEFL Test Scores; Graduate School of Information Science and Technology, The University of Tokyo," which is enclosed in the common admission guide.

(b) Applicants are exempted from submitting the TOEFL scores and taking the examination in specialized subjects if they have graduated or they are expected to graduate Master's program at Graduate School of Information Science and Technology, The University of Tokyo.

(2) Second round examination

The second-round examination is conducted during the days for Winter examination. It is an oral examination. The applicants who have passed the first round will be informed later of the details. If the applicants are master students at Department of Creative Informatics, in principle, their second-round examinations are conducted from Thursday, January 27 to Friday, January 28, 2022. If the applicants expect to start their doctoral program in October, they have their Master's degree when they apply for the entrance examination, or they are expected to graduate their Master's program in September, their second-round examinations are conducted together during the oral examination for the first-round.

ii) Winter entrance examination

The first and second round examinations are conducted during the period from Tuesday, February 8 to Thursday 10, February, 2022. Only a limited number of applicants will be accepted. The examination method will be the same as the method for Summer entrance examination. The details of the examination in the specialized subject are subject to the corresponding examination for Winter entrance examination for the Master's program.

3.2 Preference surveys of applicants for the Doctoral program

The prospective applicants for the Doctoral program should keep in close contact with their prospective faculty advisor before the application period. Applicants must submit their Preference Card (for the Doctoral program) along with other application materials. A faculty advisor will be immediately assigned to an applicant (but subject to change) when he/she passes the first-round examination.

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

The applicants must submit a one- or two-page A4-size document, which summarizes major achievements during their employment, as "Outline of Work Achievements" listed in 6. Application Documents in Admission Guide: Doctoral Program [Special Selection for Professionals].

3.4 Transfer to online examination

If a resident of a foreign country has a difficulty to take the onsite examination and he/she wants to apply for the transfer of the written examination to the online examination, he/she must submit "Transfer application for the online written examinations". Carefully read the instructions before the submission. If the application is approved, the applicants must attend an online connection rehearsal. The rehearsal is held on August 20th (Specialized Subject: Creative Informatics in summer), or February 1st (Specialized Subject: Creative Informatics in winter). The applicants who do not participate the rehearsal will lose their eligibility for the admission. The online examination will start earlier than the onsite one. The online examination for Winter examination may not be conducted depending on the situation of the pandemic.

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

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

<table>
<tr><td>Program</td><td colspan="5">Master's program</td></tr>
<tr><td>Examinee's name</td><td colspan="2"></td><td>*Examination admission number</td><td colspan="2"></td></tr>
<tr><td>Graduating university</td><td colspan="5">University:_____ School: _____
Department: _____</td></tr>
<tr><td>Examinee contact address and phone number during the examination period</td><td colspan="5">Address:

TEL:
TEL (mobile phone):
E-mail:</td></tr>
<tr><td rowspan="2">Names of preferred advisors</td><td>Preference 1</td><td colspan="2"></td><td>Preference 2</td><td></td></tr>
<tr><td>Preference 3</td><td colspan="2"></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="3">I do not accept enrollment if another advisor offers to serve as my supervisor</td></tr>
<tr><td>Regular education subjects to be tested</td><td>Mathematics</td><td>Programming</td><td>Do you wish to enter the school in October 2021 ?</td><td colspan="2">Yes</td></tr>
<tr><td>Specialized subjects to be tested on the examination (Check)</td><td>Creative Informatics</td><td>Computer science</td><td>Information Physics and Computing</td><td colspan="2">Information and Communication Engineering</td></tr>
<tr><td>Residence Card</td><td colspan="3">Retain
Status: student／other (　　)
Expiration date of period of stay
Day,　Month,　Year 20</td><td colspan="2">Not Retain</td></tr>
<tr><td></td><td colspan="5">Attach a printed document clearly describing the research field you want to study, the reason for your application, the research plan after your enrollment, and your past activities and achievements. It must be one page of A4 or letter size paper and single-sided.
Figures and tables may be included.</td></tr>
</table>

- Submit this form along with your application.
- * Leave this box blank
- If you wish to enter the school in October 2021, who have not graduated from university by September 2021,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.

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

The 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(　　)
Expiration date of period of stay
Day,　Month,　Year 20</td><td colspan="2">Not Retain</td></tr>
<tr><td></td><td colspan="4">Attach a printed document clearly describing the research field you want to study, the reason for your application, the research plan after your enrollment, and your past activities and achievements. It must be one page of A4 or letter size paper and single-sided.
Figures and tables may be included.</td></tr>
</table>

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

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

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

<table>
<tr><td>Program</td><td colspan="3">Doctor’s program</td></tr>
<tr><td>Examinee’s name</td><td></td><td>*Examination admission number</td><td></td></tr>
<tr><td>Graduating university or graduate school</td><td colspan="3">University:_____School:_____
Department: _____
Graduate School:_____School: _____
Department: _____</td></tr>
<tr><td>Examinee contact address and phone number during the Examination period</td><td colspan="3">Address:

TEL:
TEL (mobile phone):
E-mail:</td></tr>
<tr><td>Names of preferred advisors</td><td colspan="3"></td></tr>
<tr><td>Application period (Circle the appropriate response)</td><td>Summer / Winter</td><td>Special selection for working students</td><td>Working student</td></tr>
<tr><td>Preferred time of entry (Circle the appropriate response)</td><td colspan="3">October 2021 / April 2022</td></tr>
<tr><td>Residence Card</td><td colspan="2">□ Retain
Status: student／other( )
Expiration date of period of stay
Day, Month, Year 20</td><td>□ Not Retain</td></tr>
<tr><td></td><td colspan="3">Attach a printed document clearly describing the research field you want to study, the reason for your application, the research plan after your enrollment, and your past activities and achievements. It must be one page of A4 or letter size paper and single-sided.
Figures and tables may be included.</td></tr>
</table>

- Submit this form along with your application.
- * Leave this box blank.
- If you wish to enter the school in October 2021, who have not earn Master’s degree by September 2021, 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.

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

Faculty Advisors and Concurrent Faculty Advisors (as of April 2021)

Your advisors must be selected among the faculty members in this list

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 Ryota Shioya
Computer Architecture, System Software, Information Security
Associate Professor Manabu Tsukada
Computer Network, Cyber Physical Systems
Associate Professor Nobuyuki Umetani
Computer Graphics, Physics Simulation
Associate Professor Tomoharu Ugawa
Programming Languages, Garbage Collection

Concurrent Faculty Advisors who belong to other departments

Associate Professor Shinpei Kato (Dept. of Computer Science)
Operating Systems, Supercomputing, Autonomous Driving
Professor Kunihiko Sadakane (Dept. of Mathematical Informatics)
Algorithms and Data Structures, Big Data Processing
Professor Hiroshi Nakamura(Dept. of Information Physics & Computing)
Computer System, IoT/Cyber-Physical System, Computer Architecture
Professor Kenjiro Taura (Dept. of Information & Communication Engineering)
Parallel and distributed computing, programming languages, big data processing, high-performance computing, and their applications
Professor Tatsuya Harada (Dept. of Mechano-Informatics)
Computer Vision, Machine Learning, Real-world Intelligent Information Processing

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Associate Professor Shin Matsushima
(Center for Education and Research in Information Science and Technology)
learning theory, convex optimization, knowledge discovery, large-scale learning, sparse learning, asynchronous optimization, generalized additive models, subspace clustering
Associate Professor Kohei Nakajima
(Center for Education and Research in Information Science and Technology)
Reservoir Computing, Physical Reservoir Computing, Soft Robotics, Nonlinear Dynamics, Embodiment

Computing Software Group

also known as Prof. Chiba Shigeru's Group

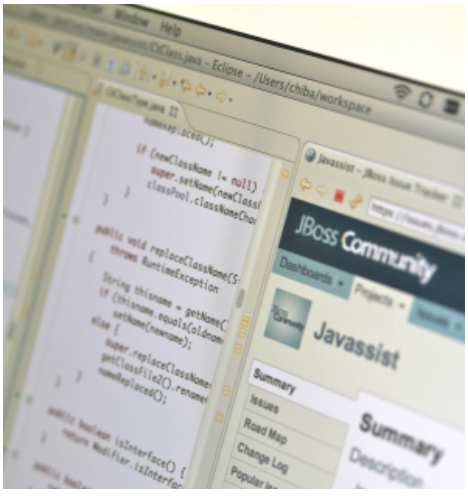
www.csg.ci.i.u-tokyo.ac.jp

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.

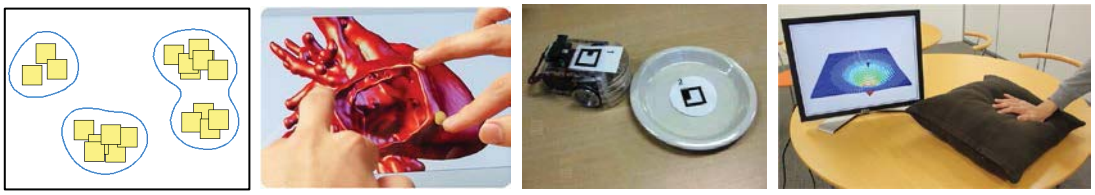
A more fundamental layer of software stack is also our research topic. Our interests cover a compiler, an interpreter, and a language virtual machine. A system service provided by the operating-system layer is also a research topic, such as security, virtualization, distributed and/or parallel computing. 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

Operations 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 so as to apply them to application problems in different fields such as machine learning.

Research Topics

●Global optimization for non-convex problems

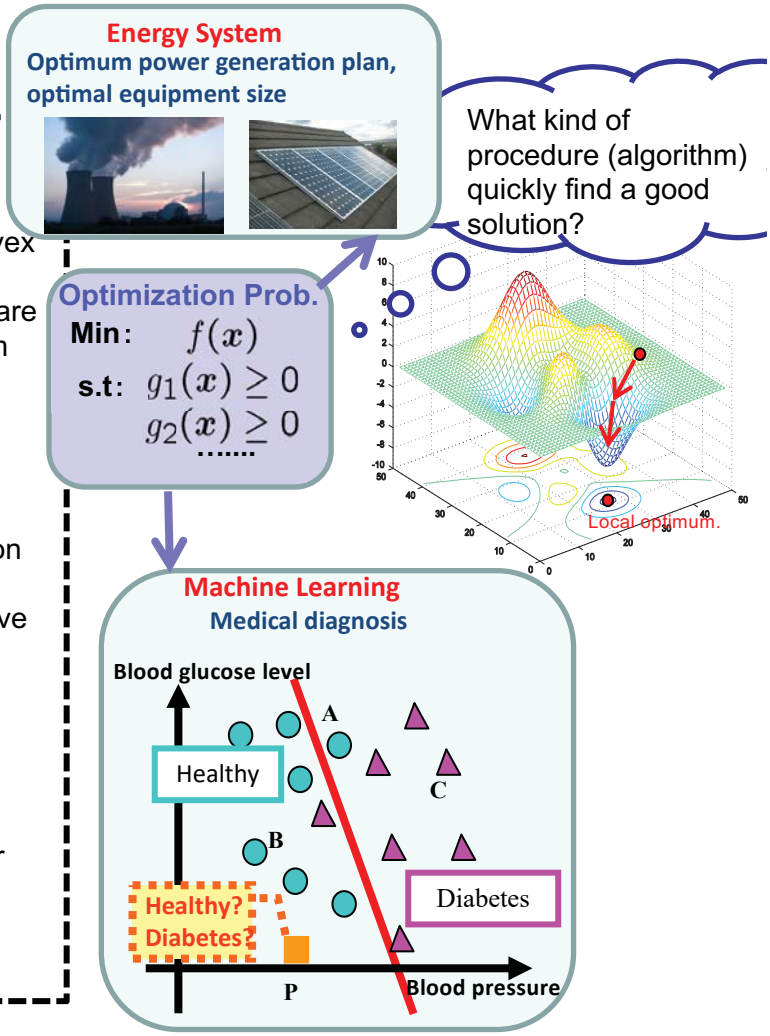
Problems in the real world often result in nonconvex continuous optimization problems. Algorithms for efficiently finding almost global optimal solutions are required. We are developing an efficient algorithm that exploits the features of the problem well.

●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. Especially in machine learning, large-scale, non-convex and/or non-smooth optimization problems are often discussed. We propose efficient algorithms with some theoretical guarantee for such problems.



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 our research group. 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

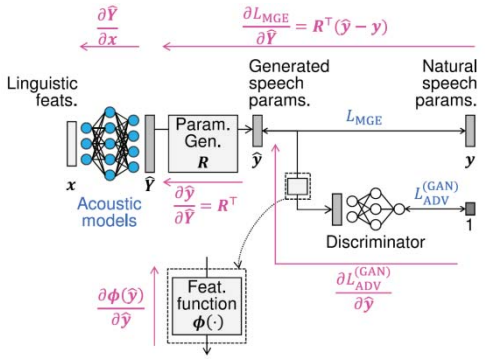
In Saruwatari Laboratory, we mainly address an innovation in new signal processing and information processing systems, focusing our attention on understanding, processing, and control of sound media (speech, music, etc.). For example, theories on new statistical modeling and machine-learning-based algorithms 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.

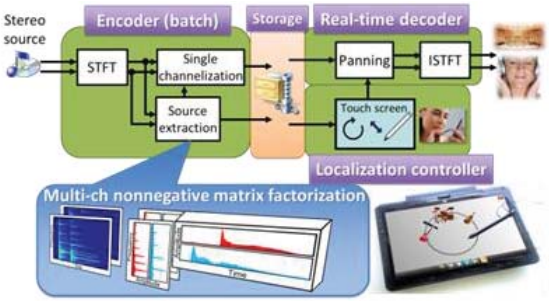
Speech Information Processing Based on Deep Learning

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.

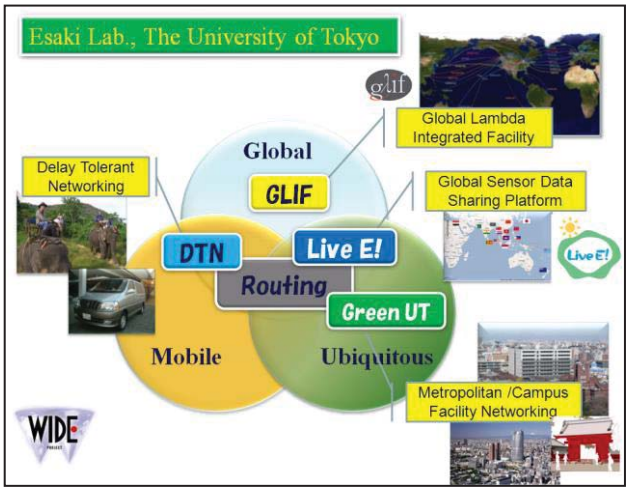
Related Projects

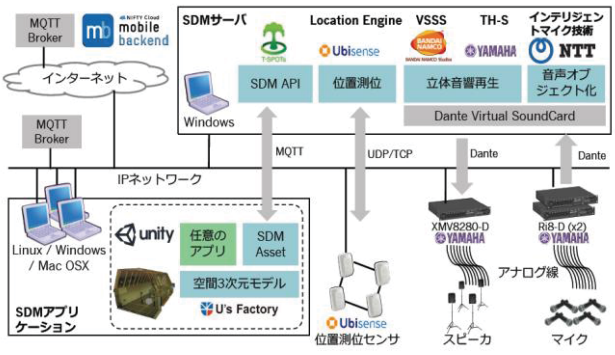
[1] WIDE Project (www.wide.ad.jp/), [2] Green University of Tokyo Project (www.gutp.jp/),
[3] SDM Project (www.sdm.wide.ad.jp/), [4] IPv6 Promotion Council (www.v6pc.jp/)

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.

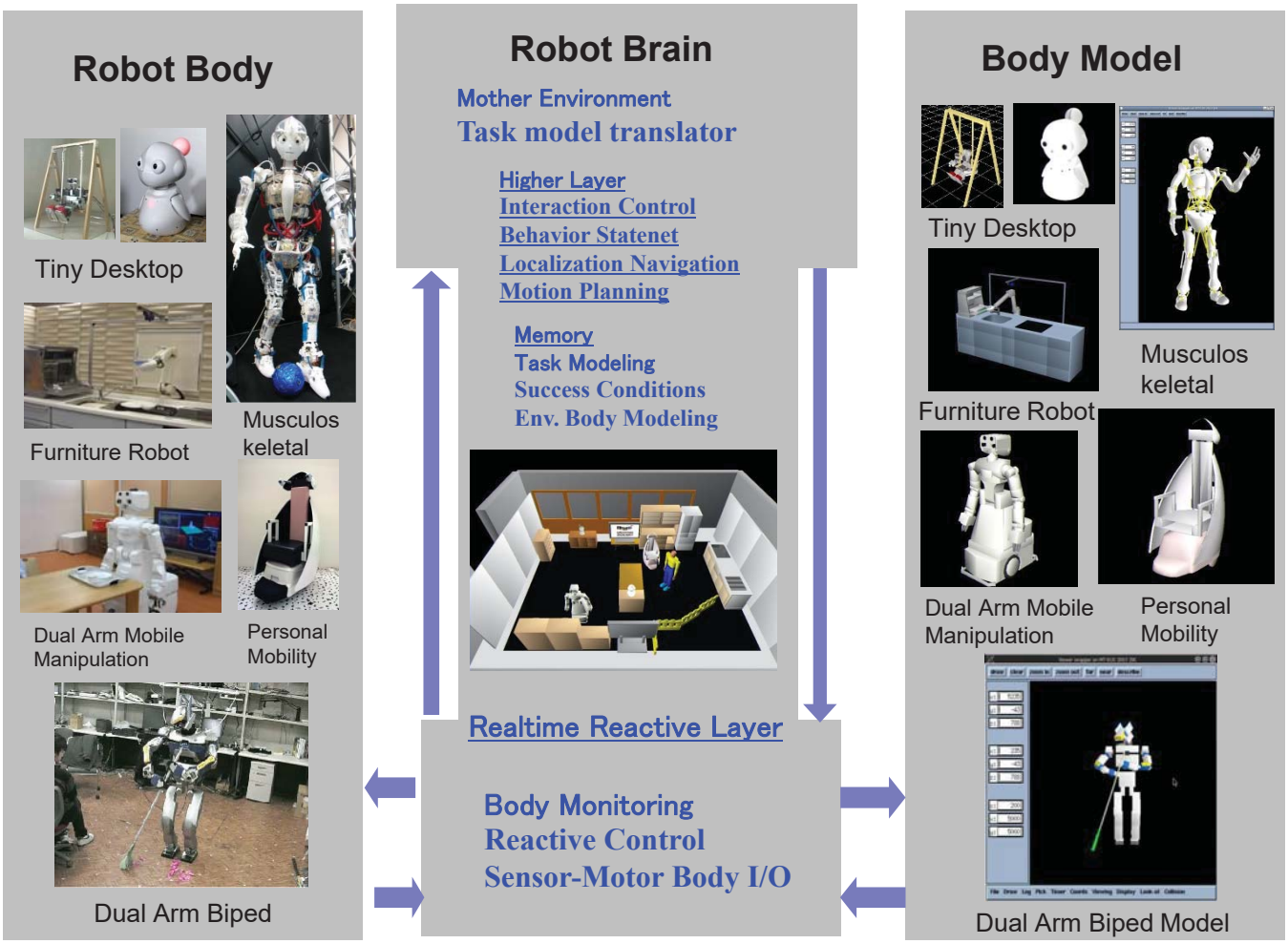
(3) Embedded robotics devices: soft flesh or deformable tactile sensor devices, integrated IMU sensors, perception devices, embedded CPU for flying robots, onbody communication LAN system, power system for intelligent robots. etc.

(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.

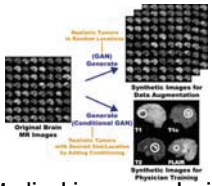
In Nakayama lab., we are aiming to establish such techniques, and conducting researches from both theory and application perspectives. This field is not mature enough and there are many unsolved problems, which makes it very attractive and challenging. We are eagerly waiting for ambitious and creative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

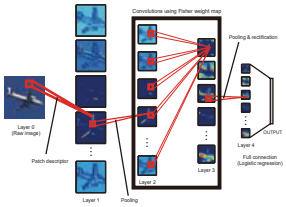
Multi-language character recognition



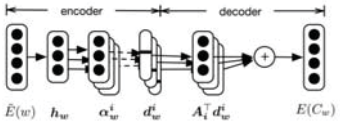
Medical image analysis

Deep Learning

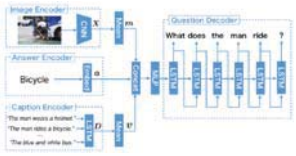
To enhance utility and availability of deep learning, we are making various improvements for fast computation, memory reduction and robust learning. In addition, we are also developing flexible neural models to integrate various modalities, not only images but also natural language and others.



Fast initialization of CNNs



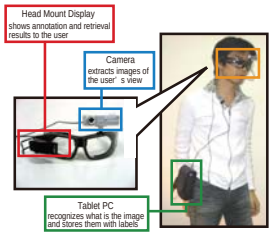
Parameter compression via quantization network



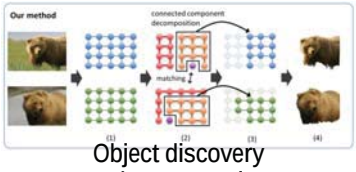
Multi-modal deep learning

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

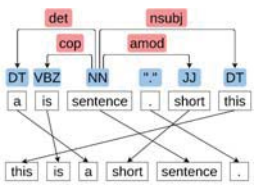


Object discovery and segmentation

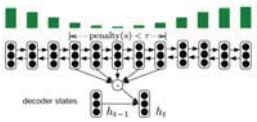
Transfer learning

Natural Language Processing

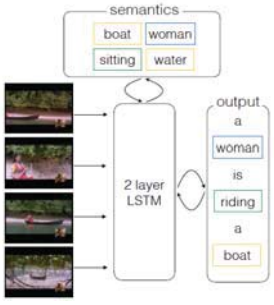
One of the keys to realize computers being able to understand natural language is how to implement world knowledge on them. To this end, we believe it is important to employ not only lingual data but broader multi-modal information. Particularly, we are trying to establish a frontier spanning language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



Syntactic word embedding



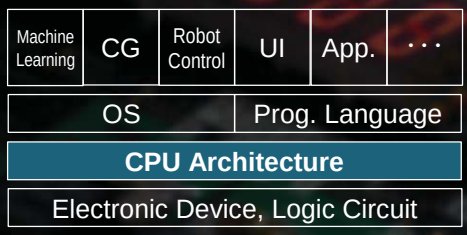
Neural machine translation



Movie captioning

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

Ryota Shioya's Group

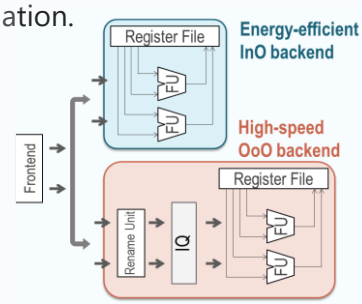


Our group's mission is to improve the performance, energy efficiency, and security of computer systems. We conduct research focusing on CPU architecture and a wide range of relevant topics including program languages, operating systems, and applications.

- 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.

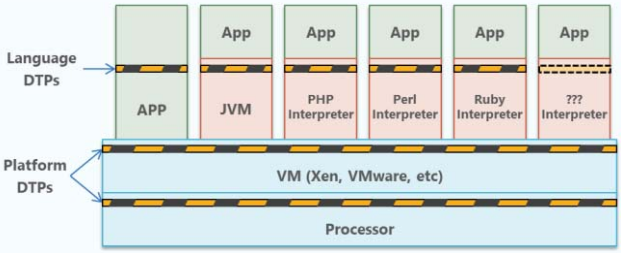
Energy-efficient Hybrid CPU

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



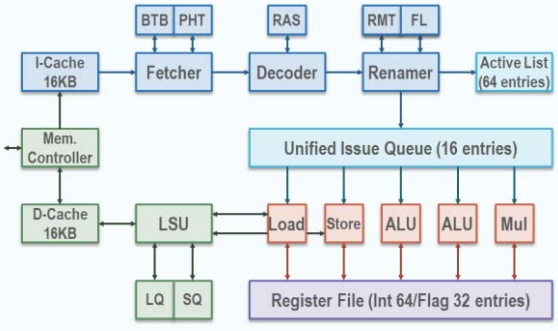
Dynamic Information Tracking for Security

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.

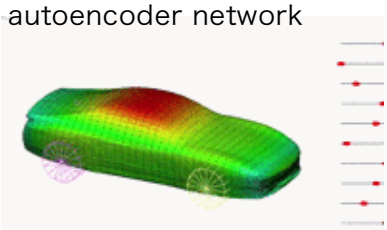
Name：Nobuyuki Umetani	Research Interests：Computer Graphics, Physics Simulation

Interactive Graphics & Engineering Group

http://www.nobuyuki-umetani.com/

Our group is working on computational fabrication, physics-based animation, digital contents creation. Computational prototyping machine such as 3D printers are widely available but it is still difficult for the novice users to design functional objects. Using physics simulation and machine learning techniques, we aim to achieve an interactive interface to facilitate the user's creative design. We welcome students how have interest in computer graphics or computational physics to develop new technologies together!

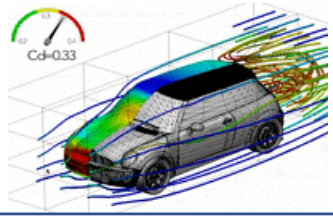
Machine learning on 3D geometry using autoencoder network



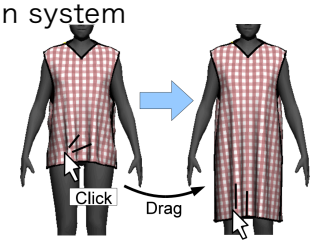
Design of wind-instruments using resonance simulation

Robust simulation of flexible rods

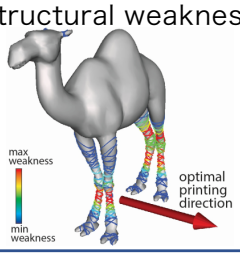
Machine learning aerodynamics



Interactive clothing patter design system



Detection of structural weakness



Code of conduct:

Pursuit your own interest

- We encourage each student to set up his/her own research subject through extensive literature survey. This is an essential skill to become an independent researcher.

Research communication skill

- We practice scientific writing and presentation a lot through paper submission and practice talk. Your awesome research worth nothing if the audience cannot understand it.

Applied math and programming

- Techniques in computer graphics can solve many practical problems. We put emphasis on math and programing skills to acquire these techniques and apply them for new problems.

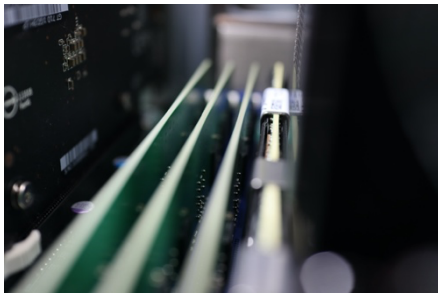
Our group encourage international collaboration, joint collaboration with industry, and cross-disciplinary research. There are many opportunities in Japan as the graphics and manufacturing industries a strong (e.g., game and car). Highly motivated and skilled students are always welcome.

Tomoharu Ugawa Programming Languages, Garbage Collection, Implementation

Almost every aspect of our lives today depends on computer systems. Every system depends on the programming languages it is written in. My research goals are to improve the performance of interpreters and virtual machines for programming languages. My research topics include performance optimization, garbage collection and implementation of high-level languages on embedded systems and new hardware.

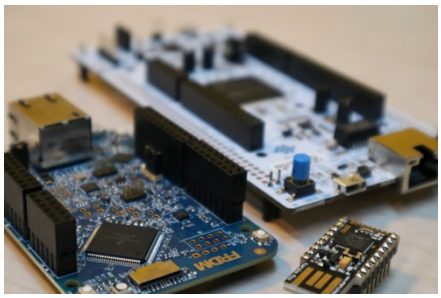
https://tugawa.github.io/

Persistent Heaps for Java using Non-Volatile Memory



Big-data applications desire high-performance persistent storage systems. We exploit new Non-Volatile Memory (NVM) technologies, which can preserve memory contents without power. For example, we are developing mechanisms for Java to recover data even after a sudden power loss. With this system, data can be held in memory thus improving access speed compared with traditional database systems, where data is stored in a disk. We are also researching techniques to minimize performance degradation while using NVM, which although much faster than old-fashioned flash memory is slower than normal DRAM.

A Tailor-Made JavaScript Virtual Machine for Embedded Systems



JavaScript is a widely-used programming language in browsers. This research aims at making JavaScript available on embedded systems and IoT devices, with limited computational resources (CPU power and memory). JavaScript programs are executed on virtual machines called JavaScript engines. Our approach is to specialize the virtual machine to the JavaScript program being run.

I welcome students who like programming, algorithms, or engaging with complex systems.

This document is a translation from the official Japanese version.

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	Kunihiko Sadakane	Research Fields	Algorithms and Data Structures, Big Data Processing
In Sadakane laboratory at the Department of Mathematical Informatics, we develop algorithms and data structures for processing big data. Especially, we focus on succinct data structures which can process data in a compressed form. Not only the theory of algorithms, but we also aim to implement and apply them to real data.			

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.			

This document is a translation from the official Japanese version.

name	Kenjiro Taura	Research Fields	Parallel and distributed computing, programming languages, big data processing, high-performance computing, and their applications
(Visit our homepage at https://tinyurl.com/taulab) Central topics of Taura group are software to deliver high-performance computing to everyone and high-performance applications. A pillar is designing programmer-friendly programming languages or libraries and their high-performance implementations with SIMD, multicores, GPUs, and supercomputers. The challenge is to attain both productivity and performance on complex hardware. They include domain-specific systems for machine learning, pattern extractions and N-body problems, general-purpose systems for load balancing and distributed shared memory and libraries for special-purpose hardware such as digital annealer (digital implementation of quantum annealer). Another pillar is big data processing and its applications. They include mining of company home pages for finding good business succession and analysis of electronic medical records for reducing medical accidents, around which we are seeking good synergies with research on machine learning frameworks and/or big data processing.			

name	Tatsuya Harada	Research Fields	Computer Vision, Machine Learning, Real-world Intelligent Information Processing
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.			

name	Shin Matsushima	Research Fields	learning theory, convex optimization, knowledge discovery, large-scale learning, sparse learning, asynchronous optimization, generalized additive models, subspace clustering
Our laboratory focuses on both the practical application and fundamental theory of machine learning. Our key approach is to develop efficient algorithms that can easily be used by anybody. As for research into the theory, we evaluate statistical properties of machine learning methods and the efficiency of learning algorithms. We do this via statistical learning and optimization theory with a view towards developing methods that guarantee favorable behaviors in the real world. As for research into the applications, we develop methods and algorithms tailored to the properties and structure of real world data with the goal of knowledge discovery and value creation. Please feel free to contact us through our web page (https://ml.c.u-tokyo.ac.jp) for lab viewing, possible research topics, personal career plans, etc.			

This document is a translation from the official Japanese version.

name	Kohei Nakajima	Research Fields	Reservoir Computing, Physical Reservoir Computing, Soft Robotics, Nonlinear Dynamics, Embodiment
Our laboratory pursues the nature of information processing by capitalizing on the relationship between physics and its information processing capability, both theoretically and experimentally. The key topics are the concept of embodiment and the framework of reservoir computing or physical reservoir computing. In particular, the framework of physical reservoir computing allows us to exploit physical dynamics as a computational device, and we have proposed a number of platforms based on this framework, including muscular-hydrostat computers, spintronics reservoir computing, and quantum reservoir computing. Our lab members are from all kinds of fields, including biology, physics, mathematics, and machine learning/robotics, and aim to explore the nature of information processing.			

This document is a translation from the official Japanese version.

Required Documents（Department of Creative Informatics）

	Summer Examination		Winter Examination	
	Documents to be Submitted	Who to Submit	Documents to be Submitted	Who to Submit
Master's Course	Preference Card (Summer Entrance Examination for Master's Program)	All Applicants	Preference Card (Winter Entrance Examination for Master's Program)	All Applicants
	TOEFL iBT/TOEFL iBT(SHE) Score	All applicants	TOEFL iBT/TOEFL iBT(SHE) Score	All Applicants
	Transfer application for the online written examinations	Only applicants for online examination	Transfer application for the online written examinations	Only applicants for online examination
Doctoral Couse	Preference Card (Summer/Winter Entrance Examination for Doctoral Program)	All Applicants	Preference Card (Summer/Winter Entrance Examination for Doctoral Program)	All Applicants
	TOEFL iBT/TOEFL iBT(SHE) Score	All applicants except: ・those who have completed (or are expected to complete) a Master's program in the Graduate School of Information Science and Technology, the University of Tokyo	TOEFL iBT/TOEFL iBT(SHE) Score	All applicants except those who have completed (or are expected to complete) a Master's program in the Graduate School of Information Science and Technology, the University of Tokyo
	Transfer application for the online written examinations	Only applicants for online examination	Transfer application for the online written examinations	Only applicants for online examination
Doctoral Course <Special Selection for Professionals>	Preference Card (Summer/Winter Entrance Examination for Doctoral Program)	All Applicants	Preference Card (Summer/Winter Entrance Examination for Doctoral Program)	All Applicants
	Major achievement during employment (no more than 2 pages in A4-size)	All Applicants	Major achievement during employment (no more than 2 pages in A4-size)	All Applicants
	TOEFL iBT/TOEFL iBT(SHE) Score	All applicants except: ・those who have completed (or are expected to complete) a Master's program in the Graduate School of Information Science and Technology, the University of Tokyo	TOEFL iBT/TOEFL iBT(SHE) Score	All applicants except those who have completed (or are expected to complete) a Master's program in the Graduate School of Information Science and Technology, the University of Tokyo
	Transfer application for the online written examinations	Only applicants for online examination	Transfer application for the online written examinations	Only applicants for online examination