Department of Informatics

5-year Ph.D. course / 3-year Ph.D. course

2020—2021
Earn a Ph.D. at the National Institute of Informatics

The National Institute of Informatics (NII) offers 3-year and 5-year PhD within The Graduate University for Advanced Studies, SOKENDAI in which it constitutes the Department of Informatics.

The Department of Informatics provides a unique educational and research system where the National Institute of Informatics allows students access to advanced IT facilities and leading researchers in an international atmosphere.

Informatics Changing the World

Director General, National Institute of Informatics
KITSUREGAWA, Masaru

Toward realizing "super smart society (Society 5.0)" where information technology is expected to help the creation of new value and services, the field of informatics is becoming more and more important. Rising from the traditional foundations of information science and engineering, informatics represents a comprehensive, interdisciplinary research field that examines information-related issues, including issues in the data, the humanities, and the social sciences.

The Department of Informatics established at the National Institute of Informatics (NII), which is the only comprehensive academic informatics institute in Japan, offers a Ph.D. program in informatics to educate and cultivate researchers in order to develop a solid grounding in advanced informatics and expertise across a broad range of disciplines, as well as flexibility in perspective and sophisticated technical knowledge. Candidates for the Ph.D. program are also expected enter the ranks of international and interdisciplinary professionals well-versed in informatics.

NII has a clear vision of the students we hope to cultivate: researchers with a keen interest in informatics – an interdisciplinary field encompassing the natural sciences, humanities, and social sciences – dedicated to realizing an advanced information-based society, and capable of serving as leaders in the field of informatics. We seek students with the aptitude to become sophisticated professionals devoted to the development of information technologies that will contribute to societal progress, as well as members of society with a strong interest in acquiring broader perspectives and deeper technical knowledge as they serve in the workforce.

In the Department of Informatics, we expect our future students to meet the challenges of the 21st century. We are confident that the progress and advancement of these students in informatics will change the world.

Pushing Informatics Ahead

Chair, Department of Informatics
SUGIMOTO, Akihiro

The department of Informatics consists of six multi-disciplinary research fields: Foundations of Informatics, Information Infrastructure Science, Software Science, Multimedia Information Science, Intelligent Systems Science, and Information Environment Science. These fields cover not only the traditional domains of computer science and information engineering, but also the domains in data science such as artificial intelligence or mathematical modeling, and even issues in the humanities and the social sciences. Our department is aiming at resolving problems in these domains from basic, applied, and practical points of view, and, at the same time, at educating and fostering not only researchers but also highly-skilled professionals, who will be eligible for next leaders in the field of informatics.

Our department has the five-year Ph.D. course and the three-year Ph.D. course: the former is for students having a bachelor degree where students can take plenty of time to develop their research subjects, while the latter is for students who earned a master degree where students can concentrate on research themes through enriching their research experiences. Our dual-degree program provides students with opportunities to go abroad to be supervised on their Ph.D. research topics at our partner universities/institutions. Moreover, as members of the National Institute of Informatics (NII), students can study in an internationally collaborative environment on a daily basis, participate in various research projects at NII, and are trained to become international researchers. The fact that we have a high percentage of foreign students is also an important feature of our department. Many of lectures are available in English, seminars at quite a few laboratories are held in English, and cross-cultural communication is frequently exchanged.

By offering an enriched cross-cultural environment, we aim at having our students trained with global perspectives and visions in building their extensive knowledge and high expertise in the field of informatics.
What is SOKENDAI?

The Graduate University for Advanced Studies, SOKENDAI is a graduate university with no undergraduate programs that consists of departments housed in affiliated Inter-University Research Institutes and the School of Advanced Sciences attached directly to SOKENDAI. The Inter-University Research Institutes are research centers for joint use by universities throughout Japan in their various research fields. As such, these institutes serve as centers of advanced research in their respective research fields and as nodes of scholarly communication that support international joint research.

SOKENDAI was founded in October 1988 on the internationally unprecedented idea of educating graduate students at outstanding centers of research to cultivate future generations of scholars.

What is the National Institute of Informatics?

The National Institute of Informatics (NII) is an inter-university research institute corporation and a research organization of information and systems. The mission of this unique national academic research institute is to “create future value” in the new academic field of informatics. From the basic methodology of informatics to cutting-edge themes such as artificial intelligence, Big Data, the Internet of Things (IoT), and information security, NII features in a wide range of research activities. We push forward with fundamental research valued from the long-term view as well as practical studies aimed at resolving current social problems.

As an inter-university research institute corporation, NII has taken on the task of building and running essential research and education information infrastructures for Japan’s academic community.

Relation Between the Dept. on Informatics and the National Institute of Informatics

<table>
<thead>
<tr>
<th>Founding Institution</th>
<th>ROIS: Research Organization of Information and Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>NII</td>
<td>Faculty: 33 Profs, 28 Assoc. Profs, 14 Asst. Profs</td>
</tr>
<tr>
<td></td>
<td>Principles of Informatics Research Division</td>
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<tr>
<td></td>
<td>Information Systems Architecture Research Division</td>
</tr>
<tr>
<td></td>
<td>Digital Content and Media Sciences Research Division</td>
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<tr>
<td></td>
<td>Information and Society Research Division</td>
</tr>
</tbody>
</table>

Relation Between Each Dept. at SOKENDAI and Each Inter-University Research Institute

The Graduate University for Advanced Studies, SOKENDAI

National University Corporation | Schools | Departments | Inter-University Research Institutes | Inter-University Research Institute Corporations
---|---|---|---|---
Cultural and Social Studies | | Regional Studies | National Museum of Ethnology |
| | Comparative Studies | | |
| | Japanese Studies | International Research Center for Japanese Studies |
| | Japanese History | National Museum of Japanese History |
| | Japanese Literature | National Institute of Japanese Literature |
Physical Sciences | | Structural Molecular Science | Institute for Molecular Science |
| | Functional Molecular Science | | |
| | Astronomical Science | National Astronomical Observatory |
| | Fusion Science | National Institute for Fusion Science |
| | Space and Astronomical Science | Institute of Space and Astronomical Science |
High Energy Accelerator Science | | Accelerator Science | Accelerator Laboratory-Applied Research Laboratory |
| | Materials Science | Institute of Materials Science |
| | Particle and Nuclear Physics | Institute of Particle and Nuclear Studies |
Multidisciplinary Sciences | | Statistical Science | The Institute of Statistical Mathematics |
| | Polar Science | National Institute of Polar Research |
Informatics | | Genetics | National Institute of Genetics |
| | Basic Biology | National Institute for Basic Biology |
| | Physiological Sciences | National Institute for Physiological Sciences |
| | Evolutionary Studies of Ecosystems | National University SOKENDAI (Hayama campus) |
Life Science | | | | |
Advanced Sciences | | | | |
Students of the Department of Informatics are taught and guided by top-level, world class researchers of the National Institute of Informatics. They also have the opportunity to use advanced research facilities not found at any other university. The high ratio of professors to students means close personal attention. A full-scale, thorough guidance system is in place: for their research, students are assigned one advisor, and two sub-advisors, meaning they can receive guidance and instruction from three professors.

Accepted students can apply to work as a Research Assistant (RA) at the National Institute of Informatics, and are eligible to receive financial assistance (except for working students and government scholarship recipients). Additional hourly wages are paid to students who show outstanding research abilities. The Graduate University for Advanced Studies, SOKENDAI also has a system for course-fee waiver applications.

Many degree recipients of the Department of Informatics are engaged in research, both in Japan and abroad. Not only does NII feature cutting-edge research facilities for students but, with a large contingent of foreign students, it also has an international atmosphere. Many students attend the numerous lectures and seminars given in English. For students looking to become researchers on the international stage, there is no better atmosphere to prepare them for this than the atmosphere provided at NII.

The department of Informatics has been installed in the National Institute of Informatics (NII). Each student belongs to the laboratory of a supervisor, and engages in research activities as a researcher of NII. For this purpose, NII actively employs student as a research assistant (except students with full-time jobs and government-sponsored foreign students). Students study ever-progressing theories and technologies of informatics, while they receive research advice from their supervisors and advisors, then make presentations at top-level international conferences and write papers for international journals, and finally should complete excellent and original PhD work at NII. It is the mission of the department of Informatics that the researchers of NII educate and foster world’s top-level researchers at NII.

The Department of Informatics is based on the National Institute of Informatics, which has international exchange programs with about 100 universities and institutions in the world. Visited by many students and researchers from foreign countries every year, NII conducts collaborative researches in a full spectrum of informatics. In our department, more than half of the students are from foreign countries, and a large part of the curriculums and research supervisions are provided in English. We also have various kinds of scholarship programs, as well as support for internships abroad. Students are encouraged to present their research results in high-level international conferences. By offering an enriched cross-cultural environment, we aim to have our students trained with global perspectives and visions in building their extensive knowledge and high expertise in the field of informatics.

The following schedule for the five-year and three-year Ph. D. course have been set by the Department.

<table>
<thead>
<tr>
<th>Requirements for Ph.D. Degree</th>
<th>1st Year</th>
<th>2nd Year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First-Year Ph.D. Course</strong></td>
<td>Admission</td>
<td></td>
</tr>
<tr>
<td>Number of course credits for completion</td>
<td>18 or more</td>
<td></td>
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<tr>
<td></td>
<td>10 months</td>
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</tr>
<tr>
<td><strong>First-Year Ph.D. Course</strong></td>
<td>Admission</td>
<td></td>
</tr>
<tr>
<td>Number of course credits for completion</td>
<td>18 or more</td>
<td></td>
</tr>
<tr>
<td></td>
<td>17 months</td>
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</tbody>
</table>

| **Intermediate Evaluation**   |          | 4 months |          |          |
| **Dissertation Progress Report** |          |          |          |          |

| **Intermediate Evaluation**   |          | 5 months |          |          |
| **Dissertation Progress Report** |          |          |          |          |

| **Second term**               |          |          |          |          |

<table>
<thead>
<tr>
<th><strong>Enriched Global Research Environment in NII</strong></th>
<th>Vice chair, Department of Informatics (In charge of International Affairs)</th>
<th>AIZAWA, Akiko</th>
</tr>
</thead>
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</table>
The Department of Informatics provides a unique educational and research system where the National Institute of Informatics allows students access to advanced IT facilities and leading researchers in an international atmosphere. In order to pass the Ph.D. program in the Department of Informatics, students are expected to complete a certain number of credits from taught courses, to receive the necessary level of research guidance, and to pass a thesis examination.

The number of course credits for completion:

- Five-year Ph.D. Course: 10 or more
- Three-year Ph.D. Course: 40 or more

**Curriculum**

- **Spring Admission**
  - 2nd Year: 7 months
  - 1st Year: 5 months
  - 2 months

- **Second Term**
  - 3rd Year: 6 months
  - 3rd Year: 6 months
  - 2 months

- **Interim Presentation 1, Interim Presentation 2**
  - 4th Year: 5 months

- **Preliminary Evaluation**
  - 5th Year: 2 months

- **Preliminary Evaluation**
  - 5th Year: 2 months

- **Final Evaluation**
  - 5th Year: 2 months

**Course Schedule**

- **3rd Year**
  - 22 months

- **4th Year**
  - 26 months

- **5th Year**
  - 22 months

**Website of the Dept.**

https://www.nii.ac.jp/graduate/en/curriculum/timetable/

**SOKENDAI syllabus system**

Image
Foundations of Informatics concerns theoretical underpinnings of informatics. In addition to their intrinsic importance, basic theories in informatics serve as foundations for all application areas, including networks, software, artificial intelligence, and information extraction. Special emphasis is placed on mathematical theories about computer programs, data structures and algorithms, numerical computation, natural language, quantum computation and communication, and biological data processing.

### Research Field and Advisors at the Dept.

#### Foundations of Informatics

**Developing Mathematical Theories Underpinning All of Informatics**

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**HAYAMI, Ken**  
Professor  
[Keywords] Numerical Analysis, Numerical Linear Algebra, Iterative Solution of Systems of Linear Equations and Least Squares Problems, Numerical Solution of Inverse Problems  
[Titles of Papers]  
- Cluster Gauss-Newton method for finding multiple approximate minimisers of nonlinear least squares with applications to parameter estimation of pharmacokinetic models  
- Implementation of interior-point methods for LP based on Krylov subspace iterative solvers with inner-iteration preconditioning

**KAWARABAYASHI, Kenichi**  
Professor  
[Keywords] Discrete Math, Graph Theory, Algorithm, Theoretical Computer Science  
[Titles of Papers]  
- Maximizing Time-Decaying Influence in Social Networks  
- Coloring 3-Colorable Graphs with Less than n^(1/5) Colors

**NEMOTO, Kae**  
Professor  
[Keywords] Quantum Information and Computation, Quantum Optics, Theoretical Physics  
[Titles of Papers]  
- Fault-Tolerant High Level Quantum Circuits: Form, Compilation and Description  
- High-fidelity spin measurement on the nitrogen-vacancy center

**TATSUTA, Makoto**  
Professor  
[Keywords] Programming Logic, Lambda Calculus, Type Theory, Constructive Logic, Software Verification  
[Titles of Papers]  
- Equivalence of Inductive Definitions and Cyclic Proofs under Arithmetic  
- Decision Procedure for Entailment of Symbolic Heaps with Arrays

**UNO, Takeaki**  
Professor  
[Keywords] Algorithms, Computation, Optimization, Data Mining, Data Engineering  
[Titles of Papers]  
- Micro-Clustering by Data Polishing  
- Listing Maximal Independent Sets with Minimal Space and Bounded Delay

**KISHIDA, Masako**  
Associate Professor  
[Keywords] Control Theory, Optimization, Uncertain Systems, Networked Systems  
[Titles of Papers]  
- Event-triggered control for discrete-time nonlinear systems using state-dependent Riccati equation  
- On problems involving eigenvalues for uncertain matrices by structured singular values

**MATSUMOTO, Keiji**  
Associate Professor  
[Keywords] Quantum Information, Quantum Computation, Statistics, Information Theory, Entanglement  
[Titles of Papers]  
- Entanglement and Quantum Information Processing  
- Hypothesis testing for an entangled state produced by spontaneous parametric down conversion

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**YOSHIDA, Yuichi**  
Associate Professor  
[Keywords] Algorithms, Theoretical Computer Science, (Combinatorial) Optimizations  
[Titles of Papers]  
- A Characterization of Locally Testable Affine-Invariant Properties via Decomposition Theorems  
- Testing Assignments to Constraint Satisfaction Problems

**FUJII, Kaito**  
Associate Professor  
[Keywords] Combinatorial Optimization, Algorithms, Machine Learning  
[Titles of Papers]  
- Beyond adaptive submodularity: Approximation guarantees of greedypolicy with adaptive submodularity ratio  
- Fast greedy algorithms for dictionary selection with generalized sparsity constraints

**HIRAHARA, Shuichi**  
Assistant Professor  
[Keywords] Computational Complexity Theory, P versus NP Problem, Minimum Circuit Size Problem, Kolmogorov Complexity, Pseudorandomness  
[Titles of Papers]  
- Non-Black-Box Worst-Case to Average-Case Reductions within NP  
- NP-hardness of Minimum Circuit Size Problem for OR-AND-MOD Circuits

**IGARASHI, Ayumi**  
Assistant Professor  
[Keywords] Algorithmic game theory, Fair division, Multi-Agent System  
[Titles of Papers]  
- Almost Envy-free Allocations with Connected Bundles  
- Fair Allocation of Indivisible Goods and Chores

**YOKOI, Yu**  
Assistant Professor  
[Keywords] Algorithms, Mechanism Design, Combinatorial Optimization  
[Titles of Papers]  
- Envy-free Matchings with Lower Quotas  
- Finding a Stable Allocation in Polymatroid Intersection

---

**IGARASHI, Ayumi**  
Assistant Professor  
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[Titles of Papers]  
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- Micro-Clustering by Data Polishing  
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[Keywords] Control Theory, Optimization, Uncertain Systems, Networked Systems  
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- Event-triggered control for discrete-time nonlinear systems using state-dependent Riccati equation  
- On problems involving eigenvalues for uncertain matrices by structured singular values

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[Keywords] Quantum Information, Quantum Computation, Statistics, Information Theory, Entanglement  
[Titles of Papers]  
- Entanglement and Quantum Information Processing  
- Hypothesis testing for an entangled state produced by spontaneous parametric down conversion
Computer systems and information-communication networks form the foundation of information systems. In Information Infrastructure Science field, lectures and research instructions are provided to address the theoretical and practical issues in the topics of computer architecture, parallel and distributed processing, high-performance and dependable computing, network architecture, protocol, security, resource management, and performance evaluation methodology.

AIDA, Kento
Professor

Parallel and Distributed Computing, Grid Computing, Cloud Computing

A Portable Load Balancer for Kubernetes Cluster
Virtual Cloud Service System for Building Effective Inter-Cloud Applications

GOSHIMA, Masahiro
Professor

Computer Architecture, Microarchitecture, Digital Circuit

Skewed Multistaged Multibanked Register File for Area and Energy Efficiency
Application of Clocking Scheme That Enables Dynamic Time Borrowing

JI, Yusheng
Professor

Network Architecture, Resource Management, Quality of Service, Mobile Computing

AVE: Autonomous vehicular edge computing framework with ACO-based scheduling
Accurate location tracking from CSI-based passive device-free probabilistic fingerprinting

TAKAKURA, Hiroki
Professor

Cyber Security, High Performance Network, Secure Networking, Data Mining

SPINZ: A Speculating Incident Zone System for Incident Handling
Construction of Secure Internal Networks with Communication Classifying System

URUSHIDANI, Shigeo
Professor

Network Architecture, Network Service Systems

Optimization model for designing multiple virtualized campus area networks coordinating with a wide area network
Robust optimization model for backup resource allocation in cloud provider

YONEDA, Tomohiro
Professor

Asynchronous Systems, Dependable Systems, Cad Tool Development, Formal Verification, Real-Time Systems

MTJ-Based Asynchronous Circuits for Re-initialization Free Computing against Power Failure
The synchronous vs. asynchronous NoC routers: an apple-to-apple comparison between synchronous and transition signaling asynchronous designs

ABE, Shunji
Associate Professor

Information Networks, Network Performance Analysis, GoS Control

Estimating Available Bandwidth in Mobile Networks by Correlation Coefficient
New Directions for a Japanese Academic Backbone Network

FUKUDA, Kensuke
Associate Professor

Internet Protocol, Traffic Measurement, Analysis and Modeling, Scale-Free Network, Small-World Network

Mining causality of network events in log data
An Evaluation of Darknet Traffic Taxonomy

KANEKO, Megumi
Associate Professor


Distributed Resource Allocation with Local CSI Overhearing and Scheduling Prediction for OFDMA Heterogeneous Networks
Throughput Analysis of CSMA With Imperfect Collision Detection in Full Duplex-Enabled WLAN

KOIBUCHI, Michihiro
Associate Professor

Parallel Computers, Interconnection Networks, Network-on-Chip, System Area Networks, High Performance Computing

A Case for Random Shortcut Topologies for HPC Interconnects
High-Bandwidth Low-Latency Approximate Interconnection Networks

KURIMOTO, Takashi
Associate Professor

Network Protocol, Network Node Architecture

SINET5: A Low-Latency and High-Bandwidth Backbone Network for SDN / NFV Era
Multi-campus ICT equipment virtualization architecture for cloud and NFV integrated service

TAKEFUSA, Atsuko
Associate Professor

Parallel Computers, Interconnection Networks, Network-on-Chip, System Area Networks, High Performance Computing

Virtual Cloud Service System for Building Effective Inter-Cloud Applications
Construction Scheme of a Scalable Distributed Stream Processing Infrastructure Using Ray and Apache Kafka
Software technology is the foundation of all industries and daily activities, whose key factor is achieving high quality and providing highly functional and reliable software systems. This field addresses the important academic issues of software science, which is indispensable for developing next generation information systems in the era of AI, from basic research to application research and from fundamental software technologies such as programming languages, software engineering, and distributed systems to advanced software technologies such as data engineering (especially data mining) and signal processing.

**Keywords**

- Human Interface
- Man-Machine Interface
- Digital Signal Processing

**Titles of Papers**

- GPS Signal Generation Platform for Seamless Localization
- Time-of-arrival-based Smartphone Localization Using Visible Light Communication
<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Keywords</th>
<th>Titles of Papers</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARAI, Noriko</td>
<td>Associate Prof</td>
<td>Knowledge Sharing, Distance Learning</td>
<td></td>
</tr>
<tr>
<td>SATO, Imari</td>
<td>Associate Prof</td>
<td>Image-based Modeling and Rendering, Computational Photography</td>
<td></td>
</tr>
<tr>
<td>SUGIMOTO, Akihiro</td>
<td>Associate Prof</td>
<td>Computer Vision, Digital Geometry, Human-Computer Interaction</td>
<td></td>
</tr>
<tr>
<td>AIHARA, Kenro</td>
<td>Associate Prof</td>
<td>Human-Computer Interaction, User-Centered Design</td>
<td></td>
</tr>
<tr>
<td>GOTODA, Hironobu</td>
<td>Associate Prof</td>
<td>3D Modeling, Rendering, Animation</td>
<td></td>
</tr>
<tr>
<td>KODAMA, Kazuya</td>
<td>Associate Prof</td>
<td>Image Sensing, Image Restoration / Reconstruction, Image / Video Coding, Visual Communications</td>
<td>Efficient Reconstruction of All-in-Focus Images Through Shifted Pinholes from Multi-Focus Images for Dense Light Field Synthesis and Rendering, Robust removal of fixed pattern noise on multi-focus images</td>
</tr>
<tr>
<td>ZHENG, Yingjiang</td>
<td>Associate Prof</td>
<td>Geometric Computer Vision, 3D Reconstruction, Photometric Computer Vision, Hyperspectral Imaging, Mathematical Optimization</td>
<td>Camera Pose Estimation with Unknown Principal Point, Deeply Learned Filter Response Functions for Hyperspectral Reconstruction</td>
</tr>
<tr>
<td>ANDO, Ryoichi</td>
<td>Associate Prof</td>
<td>Computer Graphics, Physics Simulation, Computational Fluid Dynamics (CFD)</td>
<td>A Stream Function Solver for Liquid Simulations, Highly Adaptive Liquid Simulations on Tetrahedral Meshes</td>
</tr>
<tr>
<td>IYAMA, Kazusuke</td>
<td>Associate Prof</td>
<td>Computer Vision, Digital Geometry, Human-Computer Interaction</td>
<td></td>
</tr>
<tr>
<td>KIHARA, Masahiro</td>
<td>Associate Prof</td>
<td>Human-Computer Interaction, User-Centered Design</td>
<td></td>
</tr>
<tr>
<td>TAKAYAMA, Kenso</td>
<td>Associate Prof</td>
<td>Computer Graphics, Shape Modeling, Geometry Processing, Animation</td>
<td></td>
</tr>
<tr>
<td>YU, Yi</td>
<td>Associate Prof</td>
<td>Representation Learning, Deep Generative Models, Multimedia Content Analysis, Artificial Intelligence</td>
<td>Cross-Modal Correlation Learning for Audio and Lyrics in Music Retrieval, Category-Based Deep CCA for Fine-Grained Venue Discovery from Multimodal Data</td>
</tr>
</tbody>
</table>

This field studies a variety of different problems from “media”: theories and technologies that are necessary for processing target information consisting of different media; theories and technologies as the foundation for efficiently handling large amounts of media information; basic technologies for media processing in general, such as pattern recognition and signal processing; and media utility for interactions between people and information systems or among people.
Intelligent Systems Science
AI Technology Enhancing Human Intelligent Tasks

Artificial Intelligence (AI) is an emergent technology which enhances human intelligent tasks by intelligent computer systems. The intelligent systems science course offers studies on intelligent systems to give students a full understanding of various advanced research topics in the field and aims to foster human resources to create core technology on intelligent systems.

AIZAWA, Akiko
Professor
Keywords:
- Natural Language Interface, Natural Language Understanding, Knowledge Acquisition, Document Analysis, Semantic Parsing, Dialogue Systems
- An Annotated Corpus of Reference Resolution for Interpreting Common Grounding
- An Evaluation Dataset for Identifying Communicative Functions of Sentences in English Scholarly Papers

INOUUE, Katsumi
Professor
Keywords:
- Artificial Intelligence, Knowledge Representation and Reasoning, Machine Learning, Logic Programming, Constraint Programming, Multi-Agent Systems
- Linear Algebraic Characterization of Logic Programs
- Learning from interpretation transition

PRENDINGER, Helmut
Professor
Keywords:
- Artificial Intelligence, Human-Machine Interaction, Unmanned Aircraft Systems Traffic Management
- Speedup of Deep Learning ensembles for semantic segmentation using a model compression technique
- An experimental space for conducting controlled driving behavior studies based on a multiuser networked 3D virtual environment and the Scenario Markup Language

SATO, Ken
Professor
Keywords:
- Reasoning, Knowledge Representation, Multi-Agent Systems, Machine Learning, Computational Logic, Legal Reasoning
- Obligation as Optimal Goal Satisfaction
- Modelling Last-act Attempted Crime in Criminal Law

TAKEDA, Hideaki
Professor
Keywords:
- Semantic Web, Knowledge Sharing, Community-Support System, Design Theory
- Presenting and preserving the change in taxonomic knowledge for linked data
- Understanding massive artistic cooperation: the case of Nico Nico Douga

YAMADA, Seiji
Professor
Keywords:
- Human-Agent Interaction, Human-Robot Interaction
- Response Times when Interpreting Artificial Subtle Expressions are Shorter than with Human-like Speech Sounds
- Expressing Emotions through Color, Sound, and Vibration with an Appearance-Constrained Social Robot

BONO, Mayumi
Associate Professor
Keywords:
- Sociolinguistics, Conversational Informatics, Utterance, Embodied Action, Sign Language, Conversation Analysis, Social Interaction
- Challenges for Robots Acting on a Stage: Creating Sequential Structures for Interaction and the Interaction Process with the Audience
- The Practice of Showing ‘Who I am’: A Multimodal Analysis of Encounters between Science Communicator and Visitors at Science Museum

ICHISE, Ryutaro
Associate Professor
Keywords:
- Machine Learning, Data Mining, Semantic Web
- Skill-based Curiosity for Intrinsically Motivated Reinforcement Learning
- Generalized Translation-based Embedding of Knowledge Graph

INAMURA, Tetsunari
Associate Professor
Keywords:
- Human-Robot Interaction, Intelligent Robot, Human Behavior Modeling, VR based Neurorehabilitation
- Development of VR Platform for Cloud-based Neurorehabilitation and its application to research on sense of agency and ownership
- On-Line Simultaneous Learning and Recognition of Everyday Activities from Virtual Reality Performances

MIZUNO, Tatsunari
Associate Professor
Keywords:
- Econophysics, Complex networks, Computational social science, Economic big data, Finance
- Using technology for due diligence
- Structure of global buyer-supplier networks and its implications for conflict minerals regulations

SUGIYAMA, Mahito
Associate Professor
Keywords:
- Machine Learning, Data Mining, Statistics, Knowledge Discovery, Bioinformatics
- Tensor Balancing on Statistical Manifold
- Legendre Decomposition for Tensors

SUGAWARA, Saku
Assistant Professor
Keywords:
- Natural language processing, computational linguistics, natural language understanding, machine reading-comprehension, task design, machine learning
- Assessing the Benchmarking Capacity of Machine Reading Comprehension Datasets
- Evaluation Metrics for Machine Reading Comprehension: Prerequisite Skills and Readability
The information environment is a new concept for viewing the following as a whole: information, information-communication infrastructures, information management, circulation and retrieval systems, people, and social foundations. It has been regarded as an indispensable academic system for achieving the information society. This field sets digital documents and academic information environments as the core subjects and studies the basics to application.

### Visiting Professors

<table>
<thead>
<tr>
<th>Name</th>
<th>Department</th>
<th>Position</th>
</tr>
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<tr>
<td>HIU, Zhenjiang</td>
<td>Software Science</td>
<td>Visiting Professor</td>
</tr>
<tr>
<td>ICHIKAWA, Fuyuki</td>
<td>Software Science</td>
<td>Visiting Associate Professor</td>
</tr>
<tr>
<td>SATOH Shinya’ichi</td>
<td>Multimedia Information Science</td>
<td>Visiting Professor</td>
</tr>
<tr>
<td>HOULE, Michael E.</td>
<td>Intelligent Systems Science</td>
<td>Visiting Professor</td>
</tr>
<tr>
<td>PLANAS, Emmanuel</td>
<td>International Relations</td>
<td>Visiting Professor</td>
</tr>
<tr>
<td>ECHIZEN, Isao</td>
<td>Multimedia Security, Multimedia Forensics, Biometrics, and Privacy</td>
<td>Professor</td>
</tr>
<tr>
<td>KANDO, Noriko</td>
<td>Information Retrieval, Information Access Technologies, Text Processing, Evaluation Methodology and Metrics</td>
<td>Professor</td>
</tr>
<tr>
<td>OYAMA, Keizo</td>
<td>Information Retrieval, Information Systems, Web Information Processing, Information Access Technology, Text Processing</td>
<td>Professor</td>
</tr>
<tr>
<td>YAMAJI, Kazutsuna</td>
<td>Scholarly Communication, Database, Open Science, Research Data Management</td>
<td>Professor</td>
</tr>
<tr>
<td>NISHIZAWA, Masaki</td>
<td>Scientometrics, Bibliometrics, Research Trends, Statistical Analysis</td>
<td>Associate Professor</td>
</tr>
<tr>
<td>OKADA, Hitoshi</td>
<td>Electronic Commerce, IT-enabled Services, Electronic Money</td>
<td>Associate Professor</td>
</tr>
<tr>
<td>SUN, Yuan</td>
<td>Personalized Learning, Cognitive Diagnostic Modelling, Bibliometrics, Statistical Methods</td>
<td>Associate Professor</td>
</tr>
<tr>
<td>SATOH Shin’ichi</td>
<td>Multimedia Information Science</td>
<td>Visiting Professor</td>
</tr>
</tbody>
</table>

### NII Open House

Every June, the National Institute of Informatics holds an open house where they present results from their latest research to the public. The event draws around 1,000 people annually. At this event students from the Department of Informatics have the opportunity to display posters detailing results of their own research and introduce their work to a large audience.

### Ceremony to Present Commemorative Medals to Graduates

A special ceremony for students graduating with a Ph.D. degree in Informatics from SOKENDAI will be held at the National Institute of Informatics. Each graduate will be presented individually with a medal to commemorate their achievement.
MASUOKA, Yukihiro
Enrolled in 2018, 5-year Ph.D. course
Main supervisor: Prof. TATSUTA, Makoto

I study basic theory for software verification.
Software verification is to mathematically prove that programs satisfy requirements.
Especially, I am interested in verification with separation logic and cyclic proofs both of which come from mathematical logic, and I study mathematical properties of them. Actually, basic properties of cyclic proofs are not known, so I am eager to study it.

\[
P \vdash Q \quad P \star S \vdash Q \star S
\]

DG, Thi Ha Ly
Enrolled in 2017, 5-year Ph.D. course
Main supervisor: Assoc. Prof. KANEKO, Megumi

Given the ever-increasing number of wireless subscribers and the expansion of IoT communications, the volume of mobile data traffic is expected to grow exponentially. However, radio spectrum scarcity poses a major challenge for the design of future wireless communication systems, required to support such a deluge of data while guaranteeing excellent performances.

My research addresses this issue by investigating spectrum and energy-efficient resource management for distributed cloud & fog access networks, which will be part of next-generation wireless networks. Specifically, I am aiming at designing intelligent resource-allocation and interference management methods leveraging both mathematical optimization and machine learning techniques, in order to support application-specific heterogeneous Quality of Service requirements, while improving global network performances.

LUONG, Hieu Thi
Enrolled in 2017, 3-year Ph.D. course
Main supervisor: Prof. YAMAGISHI, Junichi

A Text-to-Speech (TTS) is an automatic system which generates speech given a text content. The development of such system normally required several hours of a quality-controlled recording speech.

My research involves creating new methodology to build TTS systems of a target voice using as little as 30 seconds of speech by utilizing the ability of disentangling style from content of deep differentiable neural structure.

This adds the scalability to the TTS so the technology could be integrated into many more applications such as personalized virtual assistant or immersive virtual content like video games or audiobooks.

The risks of misuses is also considered to open up the discussion about countermeasures for potential harmful practices.

PHUA, Yin Jun
Enrolled in 2019, 3-year Ph.D course
Main supervisor: Prof. INOUE, Katsumi

Recent years have seen a surge in machine learning applications within various fields. As practitioners seek to utilize machine learning methods in areas that affect our daily lives, accountability and verifiability are still seen as the biggest obstacle to mass adoption of machine learning technologies. On the other hand, machine learning methods that utilize symbolic logic has always been verifiable, however their poor accuracy with real world data has limited their applicability.

By combining neural network and symbolic logic, my research aims to produce an artificial intelligence technology that is both accurate, verifiable and applicable in the real world.

NGUYEN, Trong Bach
Enrolled in 2019, 5-year Ph.D course
Main supervisor: Assoc. Prof. HASUO, Ichiro

Bidirectional transformations (BXs) serve to maintain consistency between two representations of related and often overlapping information, one referred to as the source and the other as the view. When the view is modified, the source may need updating to restore the consistency. BXs are applied in many fields, for instance, databases, user interface design and model-driven development.

My research is mainly related to bidirectional programming which are means of constructing well-behaved BXs. I have proposed different interpretation methods to optimize the evaluation of bidirectional programs especially those formed by composing simpler programs.

Currently I am studying the synthesis of bidirectional programs from given specifications that can be a set of input-output examples or refinement types.

GAN, Wenbin
Enrolled in 2019, 3-year Ph.D course
Main supervisor: Assoc. Prof. SUN, Yuan

Intelligent tutoring systems (ITS) have provided students with substantial opportunities to learn and perform exercises individually. One of the key issues in such systems is knowledge tracing (KT), which is essential for adaptive learning to obtain students’ current states of knowledge for the purpose of providing adaptive service.

My research involves creating new methodologies to assess and trace students’ knowledge states based on their past performance in exercise-solving. I have proposed a KT model that traces the evolution of students’ knowledge acquisition over time by explicitly modeling their learning and forgetting behaviors as well as the cognitive item difficulty. The new model I proposed and related results will potentially benefit the development of online learning systems and related research on educational management.
I enrolled SOKENDAI as a working adult student to get Ph.D. while working at a private IT company. My motivation to enroll was that I was very interested in leakage of sensitive information through unintentional posting in Social Networking Services (SNS) such as Twitter and Facebook, and that I wanted to research privacy protection corresponding to user’s contents in SNS based on the research in my master’s program. And then, I was introduced SOKENDAI and Prof. Isao Echizen laboratory by a professor in my master’s program. As a result, I could start my research under Professor Echizen’s supervision.

After enrolling the school, we, students, usually face various difficulties. For instance, there are research steps how to effectively proceed research and technical difficulties to resolve a research questions. We also sometimes need to answer essence of our own research. When we faced difficulties like these, there is a high possibility to get rid of them through communication with professors. Because SOKENDAI usually assigns several professors per a student to coach. In fact, my first research difficulty was “What is Privacy in SNS” which was essence of my research. And then, I also resolved this and others step by step while referring to ideas and comments provided by Prof. Echizen and other professors.

Professors of SOKENDAI concurrently hold the post of professors in National Institute of Informatics (NII) as well. Therefore, students can get more opportunities to present own research progress in workshops such as NII Open House and workshops organized by your professor aside from other domestic/international conference. So, SOKENDAI is the best environment for you to easily confirm and correct on the right research path through many presentations and comments provided by audiences.

Furthermore, as one of characteristics of SOKENDAI, many international students and interns are studying in the school. We can spend with them in our research/ school life which tends to be alone, and sometimes get clues to resolve a research question through discussion of research topics with them. It is one of strengths that we can naturally learn different cultures and English from daily small talk.

Lastly, Jimbocho where SOKENDAI is located is very good location for working adult students who have limited time to study because the area is easy to access from main office areas in Tokyo. In my case, as the area was fortunately within a working distance, I visited the school after my work every day, and I secured my research time adding weekend.

In the end, SOKENDAI is a very attractive school for not only students focusing on study but also working adult students.
Scholarship Programs

SOKENDAI Research Assistant (RA)
This program is a student employment system in which students work on a specific research topic under the guidance of an academic supervisor.
NII will basically employ new students (excluding working students and government scholarship recipients)
*Relevance to academic research is considered.

[Employment status]

47 of 48 Students
(excluding working students and government scholarship recipients)
(as of April 2020)

Hourly pay
for students enrolled in the 1–2 year of 5-year course
1,100 yen
(Approx. 90,000 yen/month)

for students enrolled in the doctoral program or equivalent
1,200 yen
(Approx. 100,000 yen/month)

[SOKENDAI Tuition Exemption System]
SOKENDAI has a tuition/admission fee exemption system for students who has financial difficulties but are proven to have outstanding academic performance.

Other Scholarship Program
Scholarship by private foundation

Support for Internship and Int’l Conference

SOKENDAI Student Dispatch Program
SOKENDAI provide financial support for a short-term research opportunity abroad and/or a long-term collaborative research project in and outside Japan.

Financial Aid Program for SOKENDAI Students to Attend “Top Conference”
Dept. of Informatics establishes a financial aid program to encourage students to participate in prominent international conferences (Top Conference).

[Amount of provision]
Approx. 70,000–100,000 yen/month

*Student can apply through SOKENDAI after enrollment.

Accommodation Information
Although the Dept. don’t have dormitories, students can apply for public accommodation such as UR (Urban Renaissance) apartment or the Tokyo International Exchange Center, which is located in bay area of Tokyo.
SOKENDAI also has a “Comprehensive Renters’ Insurance” for Int’l students who wish to rent an apartment through an agency.
https://www.soken.ac.jp/en/campuslife/international/supports/
Research Environment

Network
- Wireless / Wired networks are available at each floor.
- Research resources are accessible from outside of NII by using Virtual Private Network (VPN)
- Wireless network (Eduroam) at other university/institutes in Japan or abroad are available by using NII account

Research Cloud
A high performance cloud system set up by NII for internal research uses.

Library
The library located on the 18th floor is open 24 hours a day. Books can be checked in and out at any time.

Available Main Online Journals
ACM Digital Library (Association for Computing Machinery), APS online (American Physical Society), IEL (IEEE, IEE), MathSciNet (American Mathematical Society), Springer Link (Springer Nature), Science Direct (Elsevier B.V.), Wiley Online Library (John Wiley & Sons.)

Campus Environment

Lecture Room
The lecture room at NII is designed so that lectures at the Department have an intimate, one-to-one feel. Students can also attend lectures remotely.

Student Room
Student room with private desk is available for students. It is open for 24 hours a day.

Cafeteria
Provides light meals and refreshments; also serves as a venue for small informal parties organized by students.

Dining Hall
The dining hall is a bright, clean space where students can take their meals in comfortable surroundings.

Lounge
Located on the 14th and 18th floor, Tokyo Skytree can be seen from the lounge. Mixer events for students and researchers are held in this area.

International Seminar House for Advanced Studies
Students can use the International Seminar House for Advanced Studies in Karuizawa for study retreats.
Overview of Admissions

Department of Informatics, SOKENDAI offers several enrollment options for international students who are seeking to obtain a Ph.D. degree.

- **General Admission**
  This program is for applicants residing in Japan. The entrance examination is composed of an on-site interview.
  https://www.soken.ac.jp/en/admission/general_admission/

- **Special Admission for Applicants Residing Abroad**
  This program is for applicants residing abroad. The interview is administered via internet, thus applicants need not to come to Japan for the application and the exam.

- **Admission with Japanese Government Scholarship (MEXT scholarship)**
  MEXT scholarship Priority Graduate Program (MEXT PGP)
  This scholarship is offered for the special program “Interdisciplinary PhD Program on AI and Data Science for Global Leaders”, which has been granted to SOKENDAI by Ministry of Education, Culture, Sports, Science and Technology (MEXT). The program aims at developing next-generation global researchers and highly skilled professionals who should lead researches on Artificial Intelligence (AI) and Data Science (DS) as well as many scientific fields that apply AI and DS.

- **Embassy Recommendation Process for MEXT Scholarship**
  Scholarship recipients are recruited and initially screened by a Japanese embassy. The students who passed the initial screen first enroll in a nondegree program of SOKENDAI Department of Informatics, and then apply to our graduate program through the General Admissions System.

Access

Our campus is conveniently situated in the center of Tokyo, near the Imperial Palace and within 2km distance from Tokyo station.

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