

NII 2021 Overview

Inter-University Research Institute Corporation
 Research Organization of Information and Systems
 National Institute of Informatics

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Yutaka
Kuroki
2021

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Top Message

Taking on the Challenge of Pursuing Leading-edge Approaches NII Alone Can Make

KITSUREGAWA, Masaru

Director-General, National Institute of Informatics
Inter-University Research Institute Corporation
Research Organization of Information and Systems



There is no sign yet of the novel coronavirus disease (COVID-19) being brought under control, let alone disappearance of its threat. No one could have imagined that such a situation would be prolonged to this extent. As long as the COVID-19 pandemic continues, getting vaccinated every year is inevitable and it appears unlikely that we will return to our previous lifestyle. As members of nations and dwellers on Earth, we and many others are faced with the difficulty of picturing a bright future.

The protracted pandemic has forced us to shift the main core of our activities from the real world to the cyberworld; that is, it has forcibly prompted society's digital transformation and given an even greater role to online communication. Against that background, we feel that expectations are growing day by day regarding the role of the National Institute of Informatics (NII), the only comprehensive academic research institute in the field of informatics in Japan. At a symposium and related events held online on December 3 and 4 in 2020, commemorating the 20th anniversary of NII's establishment, as many as 5,500 people participated. In addition, the Science Information NETWORK (SINET), built and operated by NII, is used routinely not only for data searches in academic studies, but also for online academic meetings, communication for online classes, and similar activities.

Starting on March 26, 2020, NII has been holding a series of symposiums titled "Symposium on DX at Educational Institutions—Cyber-Symposium on Online Education and Digital Transformation at Universities and Other Institutions" (originally titled the "Cyber-Symposium for Information Sharing on Remote Teaching Efforts at Universities since April") with the goal of ensuring higher education does not come to a halt, and these events are continuing to draw wide attention.

Our original intention with this series of symposiums was mainly to introduce precedents of online classes being held at seven national universities and share cases of their failures. Having held more than thirty now, we have witnessed the contents of the symposiums expand to a great extent, with participating educational institutions introducing instances of their online classes and their efforts for digital transformation (DX), both abundant in ingenuity, thus taking a step toward the next stage. Recently, advanced approaches were introduced by some universities, including online clinical training of a professor's round at Kobe University's School of Medicine and hybrid physical education combining online lessons and face-to-face classes to hone practical skills at Ryutsu Keizai University. The Symposium on DX at Educational Institutions is a truly valuable opportunity for us to listen directly to voices on the educational scene, and, each time, we gain a great deal of inspiration from the participants' presentations.

As an inter-university research institution, NII develops various services such as building and operating state-of-the-art academic information infrastructure systems that are required by universities, as well as providing academic content. It is also evolving into an entity on which elementary and secondary education institutions increasingly rely in the wake of the COVID-19 pandemic. An example is "virtual school excursions." Amid successive suspensions and scale-downs of

school events across the country, NII implemented a "remote dream travel experience" project as a class program at 9th Junior High School in Tokyo's Adachi Ward in cooperation with Japan Airlines Co. (JAL), enabling students to enjoy virtual trips. In the project, each classroom was used as a mock aircraft cabin, with a flight attendant in place. Each attendant showed students around two locations within Japan and five spots abroad live on screen through video links. The project generated enthusiastic reactions from the students, for whom this was the first experience of its kind. NII will henceforth strive to draw on the strength of IT to support not only university education but also elementary, junior and senior high school education.

The greatest challenge of these IT-based initiatives is how to ensure security. At the Center for Cybersecurity Research and Development, set up by NII in 2016 amid the evolution of data-driven society, we render the latest detected computer viruses harmless and make use of them for academic research, while protecting our SINET. Simultaneously, we have contributed toward providing various services at a level of security comparable to that of commercial security services.

In the current fiscal year, we will shift from SINET5 to SINET6, and, in the next fiscal year, the access points nationwide will be linked by a communication speed of 400 Gbps. Ahead of this, we brought into operation our research data management infrastructure GakuNin RDM in February 2021. Along with research papers, this system is also capable of safely storing and managing research data, academic materials, and more through SINET. In the future, for data that can be made public, we will link it to open science by creating an infrastructure that works in conjunction with our publishing and search infrastructures.

Moreover, in connection with the publishing of science information, we are restructuring NII's service that provides identification of the location of each academic resources catalog, stored mainly at university libraries throughout the country. The infrastructure system of this digital catalog information service is now set to be provided through the bookstore chain Kinokuniya Company. Through this joint effort by the public and private sectors, we will develop the system as a platform intended to contribute to the digitalization of academic information and its international distribution.

In August 2020, when Their Majesties the Emperor and Empress participated online in the "International Online Conference to Address Water-related Disaster Risk Reduction under the COVID-19 Pandemic," organized by the National Graduate Institute for Policy Studies and other institutions, we provided backroom assistance to help ensure their majesties' online participation for the first time would run smoothly without any issues. It is safe to say that this initiative could only have been realized by NII, with its long experience of building and operating secure communication infrastructures.

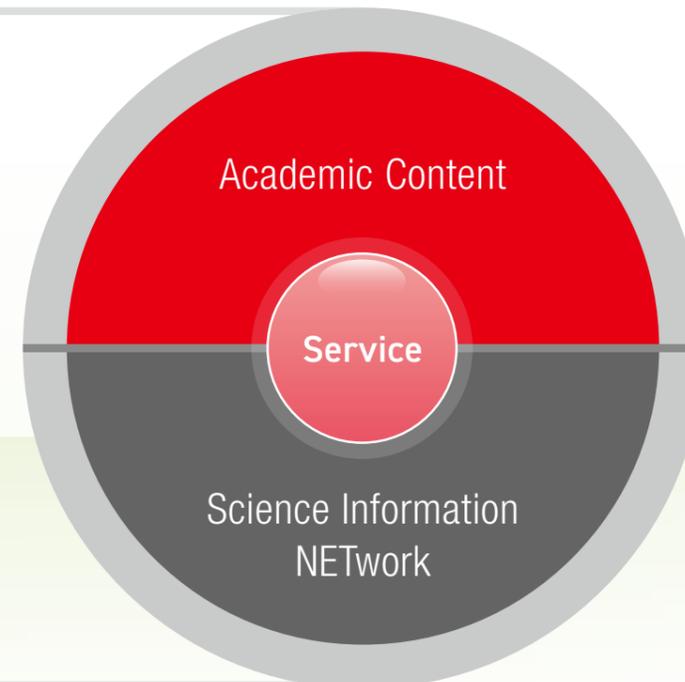
Heading into the future, NII will continue in this way to dauntlessly take on the challenge of tackling unprecedented, trailblazing issues that only NII can address. We appreciate your ongoing interest and support.

May 2021

Weaving Information into Knowledge

Informatics to Create Future Value on the Wheels of “Research” and “Service”

The National Institute of Informatics (NII) under the Inter-University Research Institute Corporation Research Organization of Information and Systems is the only academic research institute in Japan dedicated to creating future value in informatics, a new academic field. From the basic theory of informatics to cutting-edge fields such as artificial intelligence, big data, internet of things, and information security, NII carries out long-term basic research as well as practical studies that attempt to address current social issues. Furthermore, NII is undertaking diverse services, including development and operation of the Science Information NETWORK (SINET) and other essential academic information infrastructures used by the entire academic community in Japan for research and education. It is also providing academic content and service platforms, as well as improving research data infrastructure. NII is thus committed to services based on leading-edge technologies through mutual feedback of knowledge obtained from those services and from academic studies. Through these activities, NII is committed to human resource development and social/international contribution, and conducts its operations with an emphasis on collaboration and cooperation between universities, research institutes, and private sector businesses in Japan and globally. Furthermore, NII is engaged in graduate education with the aim of fostering original world-class academic research and pioneering advanced fields of study.



Research

Comprehensive research from basic theory to cutting-edge technology

Merging computer science and information engineering with the humanities, social sciences, life sciences, and many other disciplines, informatics is a new domain of study that is involved in all aspects of society. Having established four Research Divisions and 16 Research Centers, NII is carrying out research comprehensively on everything from the basic theory of informatics to cutting-edge fields such as artificial intelligence, big data, internet of things, and information security. NII is also focusing its efforts into international exchange and collaboration with overseas universities and research institutes, as well as collaboration between industry, government, and academia, in order to help implement its research achievements in the real world.

Service

Supporting academic research and education

In collaboration with universities and research institutes as well as research communities, NII builds and operates the Science Information NETWORK (SINET). Leveraging the SINET network's ultra-high speed, high reliability, and multifunctionality, NII works to expand and provide an authentication federation platform, cloud adoption and utilization supports, and an academic content platform, as well as to promote open science and develop next-generation academic research platforms. Furthermore, NII Security Operation Collaboration Services (NII-SOCS) contribute to building the framework enabling national universities and other academic institutions to respond quickly to cyber security incidents and other issues.

Graduate Program

Fostering new leaders for an advanced information society

The graduate program at NII is carried out in three ways: (1) participating in SOKENDAI (the Graduate University for Advanced Studies), (2) collaborating with other graduate schools, and (3) accepting research students for special collaboration. SOKENDAI is the first graduate university in Japan established to foster original, world-class academic research that transcends traditional disciplines and to pioneer advanced fields of study that create new lines of scientific inquiry. NII has joined with SOKENDAI to establish the Department of Informatics in the School of Multidisciplinary Sciences in order to offer graduate programs with three-year and five-year Ph.D. courses. The Department of Informatics encompasses six research fields; at the Department, students can take lectures and obtain research advice according to their field of study.

Collaboration with Industry, Government, and Academia

NII carries out goal-oriented research and development to address real social issues and fosters collaboration between industry, government, and academia to help implement its research achievements in the real world. NII actively promotes collaborative work between industries, local governments, and universities by using a system that includes open calls for collaborative research, comprehensive partnerships, and joint research units that are set up to operate special research laboratories under corporate partnerships. To create new collaboration and licensing opportunities for its research accomplishments, NII holds seminars to present the seeds of its cutting-edge research and to discuss corporate and social needs. It is also engaged in academic consulting by researchers and human resource development for the IT sector.

International Exchange

To promote organization-wide international research exchange with overseas universities and research institutes, NII has set up the Global Liaison Office (GLO), which conducts various activities, including forming international exchange agreements through Memoranda of Understanding (MOUs), and the management of the MOU/Non-MOU Grant for research exchange assistance and the NII International Internship Program. In addition, NII holds the NII Shonan Meeting, a series of seminars where top-class researchers from around the world come to Japan for intensive discussions on the field of informatics. NII is also actively accepting researchers through the German Academic Exchange Service (DAAD) and the Japanese-French Laboratory for Informatics (JFLI).

Research Divisions

NII established four Research Divisions—Principles of Informatics Research Division, Information Systems Architecture Science Research Division, Digital Content and Media Sciences Research Division, and Information and Society Research Division—in order to accommodate various types of research across the broad discipline of informatics. Each research division conducts specialized studies ranging from basic to applied research.



Principles of Informatics Research Division

Director: UNO, Takeaki

Seeks new principles and theories of informatics using algorithms and computational complexity theory, as well as artificial intelligence, robotics, and quantum computing. Conducts research to develop new technologies that will sustain societies of the future and break new ground in the field of informatics.

Fields of Research

Algorithms, artificial intelligence, machine learning, deep learning, big data analysis, data mining, mathematical modeling, numerical analysis, computational science, web informatics, neuroscience, quantum information, and leading-edge research that creates possibilities for discovering new principles or theories and new applications at the frontiers of these fields



Information Systems Architecture Science Research Division

Director: JI, Yusheng

Aiming at boosting the performance, quality, and functionality of computers and networks, the building blocks of information technology, conducts research ranging from creating groundbreaking technologies in software and hardware architectures to implementing their working systems.

Fields of Research

R&D on post-Internet, cybersecurity infrastructure, software and hardware architecture, distributed and cloud computing, programming languages, system performance and log analysis infrastructure, dependable systems, Internet of Things (IoT), and network and cloud visualization



Digital Content and Media Sciences Research Division

Director: SATO, Imari

Carries out research on analyzing and generating content and media, including symbolic and patterned media; storing, retrieving, and organizing content with platform technologies; and analyzing social media and interactions among humans and knowledge.

Fields of Research

R&D on natural language processing, computer vision, image processing, acoustic information processing, computer graphics, databases, human interaction, web mining, social media, community analysis, media clone generation and recognition, machine learning and deep learning applications, among others



Information and Society Research Division

Director: ECHIZEN, Isao

Conducts cross-disciplinary research based on emerging information and system technologies such as big data analytics to achieve the required levels of trustworthiness in a cyber-physical society where the cyberspace and real-world phenomena are related more closely than before.

Fields of Research

R&D on protection and use of privacy information, next-generation anonymization, data governance, next-generation IR infrastructure theory, data policy theory, data use in human resource development theory, digital humanities, IT healthcare, data reliability evaluation, crowdsourcing, digital education, and open innovation platforms, as well as research in humanities and social sciences related to these topics

Research Centers

NII established 16 Research Centers in order to remove barriers between Research Divisions and respond quickly to critical social issues, creating a system where researchers with various areas of expertise can collaborate across disciplines to focus on exploring key research domains.

Services and Operations

Research and Development Center for Academic Networks

<https://www.nii.ac.jp/en/research/centers/network/>

Develops and provides new services and features to enhance the operations and efficiency of the Science Information NETWORK (SINET), a crucial backbone network of more than 900 universities and research institutes in Japan.

Director: URUSHIDANI, Shigeo (Vice Director-General, NII; Professor, Information Systems Architecture Science Research Division)

GRACE Center: Center for Global Research in Advanced Software Science and Engineering

<http://grace-center.jp/?lang=en>

Integrates research, practice, and education using collaborations between Japanese and overseas research institutions, as well as collaborations between industry and academia, with the goal of developing the software infrastructure of the twenty-first century, and also fosters the next generation of world-class researchers and engineers.

Director: HONIDEN, Shinichi (Project Professor, NII)

Center for Cloud Research and Development

<https://www.nii.ac.jp/en/research/centers/ccrd/>

Promotes IT-based research and education by advancing joint R&D with researchers at universities and research institutes, in order to provide state-of-the-art scientific information infrastructures using cloud technologies on the Science Information NETWORK (SINET).

Director: AIDA, Kento (Professor, Information Systems Architecture Science Research Division)

Center for Cybersecurity Research and Development

<https://www.nii.ac.jp/en/research/centers/cybersecurity/>

Works to ensure the security and operational efficiency of university research environments in cyberspace, and to develop the human resources needed for this work in collaboration with universities, through R&D that leverages the knowledge gained from building and operating scientific information infrastructures.

Director: TAKAKURA, Hiroki (Professor, Information Systems Architecture Science Research Division)

Research Center for Knowledge Media and Content Science

<https://www.nii.ac.jp/research/centers/kmcs/>

Promotes cutting-edge research on the analysis and extraction of knowledge from research papers and other academic content, and carries out empirical R&D to encourage the distribution of academic knowledge.

Director: AIZAWA, Akiko (Vice Director-General, NII; Professor, Digital Content and Media Sciences Research Division)

Research Center for Community Knowledge

Collects and analyzes the process of forming shared knowledge between humans, as well as that between humans and machines, carries out activities to promote the use of the outcome of such research, and conducts empirical R&D to encourage the next generation of information sharing.

Director: ARAI, Noriko (Professor, Information and Society Research Division)

Center for Dataset Sharing and Collaborative Research

<https://www.nii.ac.jp/en/research/centers/dsc/>

Collects datasets that are useful for informatics research and makes them available to researchers, conducts R&D on building datasets and a platform for their use, and promotes collaborative research in informatics using shared datasets.

Director: OYAMA, Keizo (Vice Director-General, NII; Professor, Digital Content and Media Sciences Research Division)

Research Center for Open Science and Data Platform

<https://rcos.nii.ac.jp/en/>

Conducts joint international R&D on platforms for managing, publishing, and searching research data, which will serve to promote a paradigm shift in the way research is carried out towards open science, and deploys these platforms jointly with universities and research institutes in Japan to encourage their use.

Director: YAMAJI, Kazutsuna (Professor, Digital Content and Media Sciences Research Division)

Major Research Projects

Global Research Center for Quantum Information Science

<https://qis1.ex.nii.ac.jp/qi/>

An international hub for cutting-edge research on quantum information science and technology, advancing the science of quantum information and exploring the potential of quantum information technologies. Also cultivates the development of international human resources who will lead medium- to long-term research projects focused on specific goals.

Director: NEMOTO, Kae (Professor, Principles of Informatics Research Division)

Global Research Center for Systems Design and Mathematics

<http://group-mmm.org/eratommmsd/en/>

Research base for JST ERATO's HASUO Metamathematics for Systems Design Project. Aims to provide support to manufacturing, ranging from developing specifications for industrial products to their design, production, and maintenance, by incorporating the knowledge of formal methods from software engineering into manufacturing.

Director: HASUO, Ichiro (Associate Professor, Information Systems Architecture Science Research Division)

Global Research Center for Cyber-Physical Systems

Advances R&D on social cyber-physical systems (CPS) by tackling real-world challenges through industry-government-academia collaboration, with the goal of addressing social issues and creating new value by linking the real world and cyberspace.

Director: TAKASU, Atsuhiko (Assistant Director-General, NII; Professor, Digital Content and Media Sciences Research Division)

Research Center for Medical Bigdata

<http://research.nii.ac.jp/rc4mb/>

Undertakes the construction of big data cloud platforms for medical imaging using the Science Information NETWORK (SINET) built and operated by NII, and develops artificial intelligence (AI) that analyzes large collections of medical images to assist doctors with diagnosis.

Director: MORI, Kensaku (Visiting Professor)

Global Research Center for Big Data Mathematics

<https://bigdata.nii.ac.jp/wp/english/>

Research base for JST ERATO's Kawarabayashi Large Graph Project. A world-class hub for research on big data mathematics focused on developing high-speed algorithms, conducting advanced research and human resource development.

Director: KAWARABAYASHI, Ken-ichi (Professor, Principles of Informatics Research Division)

Global Research Center for Synthetic Media

<http://research.nii.ac.jp/~iechizen/synmediacenter/en>

With a view to realizing an AI society focused on human beings, we promote research and development for generating synthetic media covering face, voice and various other modalities, detecting fake media, ensuring the media's reliability, and supporting decision-making.

Director: ECHIZEN, Isao (Director, NII; Professor, Information and Society Research Division)

Industry-Academia Collaboration

Center for Robust Intelligence and Social Technology

<https://www.nii.ac.jp/en/research/centers/cris/>

Carries out basic R&D on information technologies to address social issues including disaster preparedness, education, and support for the disadvantaged, with a particular emphasis on robust intelligence and social technology in order to develop the intellectual capability and resilience to cope with the constantly changing and diverse real-world environment.

Director: KITSUREGAWA, Masaru (Director-General, NII)

Research Center for Safe, Secure and Healthy Society

To realize a safe, secure, and healthy society, the center scrutinizes issues that informatics should address in collaboration with society by investigating and analyzing them from a broad perspective. It further promotes technological development, application of developed technology for social use and the nurturing of human resources, among other activities, by applying the outcomes of state-of-the-art informatics research.

Director: KITSUREGAWA, Masaru (Director-General, NII)

Principles of Informatics Research Division

<Mathematical Informatics>

Assistant Professor
IGARASHI, Ayumi
Ph.D. (Computer Science)



Specialties: Algorithmic game theory; Fair division theory; Cooperative game theory
Research themes: Research on algorithmic game theory. Design of suitable algorithms that can satisfy many people with different objectives, such as assignment of customers to taxis and multi-task scheduling.

Professor
UNO, Takeaki
Director
Ph.D. (Science)



Specialties: Development of high-speed algorithms for large-scale computation in data mining and genome informatics; Analysis of computation for distributed and especially enumeration algorithms, methods for building and accelerating industrial computation models, scheduling, facility placement, etc.
Research themes: Program theory (algorithms) for processing large amounts of information quickly. Efficiently finding data features. Technology to make data more easily comprehensible. Many applications including matchmaking, advertising, and intestinal bacteria.

Professor
KAWARABAYASHI,
Ken-ichi



Director, Global Research Center for Big Data Mathematics
Ph.D. (Science)
Specialties: Graph coloring problems in discrete math; Structural graph theory and its applications to algorithms; Network flow and disjoint path problems
Research themes: Discrete mathematics, particularly graph theory and theoretical computer science. Global research in discrete graph theory. Many themes requiring mathematical theory. Also interested in application to needs in society at large.

Associate Professor
INAMURA, Tetsunari
Ph.D. (Engineering)



Specialties: Human-robot interaction; Synthetic study of robot intelligence based on stochastic information processing; Neurorehabilitation using VR
Research themes: Intelligent robots that communicate with humans via words and physical gestures. Research platforms enabling communication with robots in VR spaces is in development with the aim of realizing intelligence that takes into account social embodiment through large-scale communication over many hours.

Professor
INOUE, Katsumi
Ph.D. (Engineering)



Specialties: Artificial intelligence platform; Knowledge representation and inference; Induction and abduction; Relational learning; Logic programming; Constraint programming
Research themes: Artificial intelligence approaching a theory of intelligence. Building a theory for inference and learning, developing efficient algorithms and implementing them with computers to contribute to the advancement of science and understanding in society.

Professor
SATO, Ken
Ph.D. (Science)



Specialties: Artificial intelligence; Juris-informatics
Research themes: Logic-based artificial intelligence for many years. More recently, as a part of the new field integrating the law and informatics, called juris informatics, implementing the Japanese theory of presupposed ultimate facts in the logic programming language PROLEG.

Associate Professor
KISHIDA, Masako
Ph.D.



Specialties: General control theory and related topics
Research themes: Mathematical methods for control and optimization, focusing on uncertainty. Recently also particularly interested in building a new theory of networked control, for performing control through networks, and developing mathematical approaches to solving various problems.

Assistant Professor
HIRAHARA, Shuichi
Ph.D. (Information Science and Technology)



Specialties: Complexity theory; Minimum circuit size problems; Kolmogorov complexity; Average-case complexity
Research themes: Research on complexity theory, the theory underlying cryptographic security. Aiming to solve open problems that ask the limits of computation including the P vs NP problem with minimum circuit size problems serving as the axis of research.

Assistant Professor
FUJII, Kaito
Ph.D. (Information Science and Technology)



Specialties: Combinatorial optimization; Machine learning; Approximation algorithm; Online algorithm
Research themes: Efficient algorithms for solving combinatorial optimization problems. In particular, designing algorithms with theoretical approximation guarantee and their applications to machine learning.

Associate Professor
SUGIYAMA, Mahito
Ph.D. (Informatics)



Specialties: Machine learning; Data mining
Research themes: Fundamental theory and practical technologies related to data analysis methods, focusing on machine learning theory, such as data mining and statistical methods. Special attention is given to statistical theory for preserving the reliability of information gained from data.

Professor
TAKEDA, Hideaki
Ph.D. (Engineering)



Specialties: Knowledge sharing systems; Semantic Web; Design theory
Research themes: Artificial intelligence coexisting and co-creating with society. Building and applying large-scale knowledge graphs as semantic Web research that will enable smooth sharing of information between people and computers.

Assistant Professor
YOKOI, Yu
Ph.D. (Information Science and Technology)



Specialties: Distributed algorithms; Combinatorial optimization; Matching theory; Market design
Research themes: Matching theory applied to, for example, university advancement selection systems and medical residency assignment systems, and approaches combining computer science and combinatorial optimization. Design of efficient algorithms for avoiding improper participation and producing fair matching.

Associate Professor
YOSHIDA, Yuichi
Ph.D. (Informatics)



Specialties: Constant time algorithms; Property testing; Constraint satisfaction problems; Discrete optimization
Research themes: Theory and application of algorithms for analyzing large-scale data quickly. Focus on theoretical guarantees of computing time and accuracy using theoretical tools such as randomized computation and discrete optimization.

Professor
TATSUTA, Makoto
Ph.D. (Science)



Specialties: Software verification; Separation logic; Theory of programs; Type theory; Constructive logic
Research themes: Theory of types in programming languages and their abstraction, "type theory." In 2007, solved the 20th of 22 important and difficult type theory problems. Research results are being used in implementing large-scale high-quality programs.

<Quantum Information>

Professor
NEMOTO, Kae
Director, Global Research Center for Quantum Information Science
Ph.D. (Science)



Specialties: Quantum information and computation; Quantum optics; Theoretical physics
Research themes: Creation and discovery of new physics generated by quantum computers, and their applications. In addition, realizing a scalable quantum information system and elucidating the quantal essence that is held by such a system through constructing a theoretical basis of that scalable quantum information system and a dispersible quantum information system.

Associate Professor
MATSUMOTO, Keiji
Ph.D. (Mathematical science)



Specialties: Quantum information and computation
Research themes: Search for potential for quantification by introducing information theoretical approaches to entanglement research. The goal is to produce new concepts by integrating quanta and information, as well as physics and information science at a deep level.

<Intelligent Informatics>

Associate Professor
ICHISE, Ryutarō
Ph.D. (Engineering)



Specialties: Machine learning; Knowledge systems; Data mining
Research themes: Combining diverse information, generating useful knowledge from that, and then conducting research on artificial intelligence using that. Development of revolutionary technology to integrate differing types of data, and that for data mining and knowledge discovery.

Information Systems Architecture Science Research Division

<Network Architecture>

Associate Professor ABE, Shunji
Head, Advanced ICT Center
Ph.D. (Engineering)

Specialties: Performance analysis and quality control methods through communication traffic measurement; IP network communication performance improvement; Network architecture

Research themes: Development of methods for controlling communication volume to realize efficient and secure communication networks and improving performance. Work on SINET, from design and construction to operations and management. Increasing efficiency of information and communications, also contributing to reducing energy consumption and environmental impact.



Associate Professor FUKUDA, Kensuke
Ph.D. (Engineering)

Specialties: Measurement and analysis of Internet traffic; Network science

Research themes: The Internet as an autonomous distributed system. When the overall volume of communication is measured, it increases and decreases, fluctuating according a 1/f law. Searching for possible overall control of the Internet by understanding this mechanism.



Professor URUSHIDANI, Shigeo
Vice Director-General; Director, Research and Development Center for Academic Networks
Ph.D. (Engineering)

Specialties: Dynamic resource optimization technologies for multi-layer networks; Universal switching system architecture

Research themes: Innovative network architecture and service control and management technology with the goal of implementation on SINET. Development of original NII functionality in collaboration with system vendors. Development of various services such as the world's first L1 on-demand service.



Associate Professor KANEKO, Megumi
Ph.D. (Engineering), HDR (Habilitation à Diriger des Recherches)

Specialties: Wireless communication engineering; Wireless resource allocation; Protocol design for mobile communication systems

Research themes: Data volume is expected to increase explosively and radio resources (bandwidth) are approaching their limits. Research on allocation of radio resources and prevention of interference for 5G mobile communications systems and next-generation wireless access networks.



Professor JI, Yusheng
Director
Ph.D. (Engineering)

Specialties: Network architecture; Radio resource management; Communication service quality control

Research themes: Construction of information and communication networks, which are infrastructure for many advanced activities in society, and in particular, implementing fast, high-quality, and sustainable wireless access services supporting the demands of future mobile communications traffic.



Assistant Professor SHIMIZU, Sayako
Ph.D. (Informatics)

Specialties: Authentication and authorization; Information security; System operation technology; Data Science

Research themes: More reliable authentication required to provide various services, and technology for handling the information associated with it. At the same time, aiming to reflect the research result in NII's authentication-related services.



<Computer Architecture>

Professor AIDA, Kento
General Manager, Cyber Science Infrastructure Development Department; Director, Center for Cloud Research and Development
Ph.D. (Engineering)

Specialties: Parallel and distributed computing; Cloud computing; Grid computing

Research themes: Parallel-distributed computing platform technology enabling multiple computing resources connected by a network to be used as a single resource. Promising for use in consolidating advanced information platforms such as clusters, grids, and clouds.



Associate Professor KOIBUCHI, Michihiro
Ph.D. (Engineering)

Specialties: Computer system networks; Large-scale parallel computing systems

Research themes: Design of lossless networks, which connect computer systems to networks efficiently without the loss of data. Liquid submersion cooling technologies for computers. One dream is to design the world's first supercomputer network.



<Information Network>

Assistant Professor AOKI, Shunsuke
Ph.D.

Specialties: Autonomous driving; Cyber-physical systems; Real-time embedded systems; Internet-of-things

Research themes: Autonomous driving and real-time systems for autonomous mobile robots and computing platforms; also, task scheduling and allocation of computing resources, for the realization of "cyber-physical systems" in which computer components and the real world are deeply intertwined.



Associate Professor KURIMOTO, Takashi
Ph.D. (Engineering)

Specialties: Network system architecture; Network protocols

Research themes: New network services using NFV, SDN, and other technologies with the goal of increasing reliability and stability while reducing costs. Also, realizing safe high-speed network services in cooperation with SINET.



Professor TAKAKURA, Hiroki
Director, Center for Cybersecurity Research and Development
Ph.D. (Engineering)

Specialties: Cybersecurity; High-reliability networks; Anomaly detection

Research themes: Security measures to protect confidential information from cyberattacks, which become more ingenious each year. In addition to preventing damage before it happens, it is also important to take measures to minimize damage. Continuous pursuit of changing attacker methods and designing measures that are flexible and dynamic.



Professor GOSHIMA, Masahiro
Ph.D. (Informatics)

Specialties: Processor architecture; Memory architecture; Digital circuit technology

Research themes: The unrelenting acceleration of computers as the foundation of development of the information society. Even over the past ten years, when clock speeds remained relatively stable, effective speeds have increased by a factor of ten. Ongoing research to extend this trend for another ten or twenty years.



Professor TAKEFUSA, Atsuko
Ph.D. (Science)

Specialties: Parallel and distributed processing; Cloud infrastructure technologies; IoT; Cyber-physical systems

Research themes: Building a new information platform that securely connects multiple computers in different environments ranging from mobile to cloud computing, thus making advanced analysis easier. Also, R&D on software that supports the development of a program for highly efficient IoT data collection and analysis, and on technology for building a computing environment using container-based virtualization.



<Software Infrastructure>

Professor ISHIKAWA, Yutaka
Ph.D. (Engineering)

Specialties: System software; Operating systems; Communication and File I/O middleware; Parallel and distributed processing

Research themes: The system software stack, such as operating system, communication and file I/O middleware, have become fatter and fatter. We review such a system software stack in order to build the next-generation system software for smart devices and server systems. The new system software stack will be constructively designed from the aspect of security and energy consumption.



Professor HASHIZUME, Hiromichi
Ph.D. (Engineering)

Specialties: Digital signal processing; Indoor navigation; Visible light communication

Research themes: The need for special technologies, besides GPS, for indoor navigation where GPS signals cannot reach. Focus on new positioning technologies using sound waves, light, and radio waves and their applications for use on smartphones.



Assistant Professor KATO, Hiroyuki
Ph.D. (Engineering)

Specialties: Optimization for casual queries to database; Fundamental issues for optimizing queries to XML databases

Research themes: The huge information space formed with the proliferation of the Internet. Mechanisms are needed to extract the required information from databases in many varied formats in order to utilize them effectively. Advancing research on the query language XQuery to improve usability.



Professor YONEDA, Tomohiro
Vice Director-General
Ph.D. (Engineering)

Specialties: Asynchronous circuit technology and dependable VLSI platform technologies

Research themes: Asynchronous circuit technology, which addresses various issues associated with using a global clock in synchronous circuits and makes it easier to implement faster low-power circuits. Also, technologies to improve hardware reliability and security.



Assistant Professor SEKIYAMA, Taro
Ph.D. (Informatics)

Specialties: Programming language theory; Type systems; Software verification

Research themes: Research integrates static and dynamic verifications that use type systems. The integration of static verification able to conduct comprehensive inspections and dynamic verifications able to use information during execution will realize flexible program validation systems tailored to the requirements of software and the development phase.



<Software Engineering>

Associate Professor HASUO, Ichiro
Director, Global Research Center for Systems Design and Mathematics
Ph.D. (Computer Science)

Specialties: Informatics infrastructure; Computer systems and networks; Algebra

Research themes: Mathematical methods (formal methods) for software design. Through investigating the mathematical logic in formal methods, abstraction, and generalization, overcoming software application categories to achieve broad application in areas such as industrial product design.



Associate Professor ISHIKAWA, Fuyuki
Ph.D. (Information Science and Technology)

Specialties: Software engineering; Formal methods; Testing; Autonomous and smart systems; Cyber-physical systems; Machine learning engineering

Research themes: The catch phrase for research is "smart systems and smart dependability assurance." In anticipation of leading-edge application systems, research into technologies that include verification, extrapolation, optimization, automatic test generation, and self-adaptation by utilizing a wide range of models with various requirements, specifications, and designs.



Digital Content and Media Sciences Research Division

<Foundations of Content Management>

Associate Professor
KATAYAMA, Norio
Ph.D. (Engineering)



Specialties: Data management technology for video corpus analysis
Research themes: Efficient high-speed analysis of multimedia databases storing large amounts of video data. Focusing on grid and SMP as key technologies, and devising databases and algorithms for them.

Associate Professor
KOMIYAMA, Yusuke
Ph.D. (Agriculture)



Specialties: Open science; Research data management; Semantic Web; Linked data; Bioinformatics
Research themes: Consolidation of the open science platform for management and sharing of research data from universities and research facilities, as an urgent issue in the academic infrastructure field. Provision of a research data management service with a high degree of safety and versatility by utilizing SINET, GakuNin, UPKI, the Cloud, and academic content.

Professor
TAKASU, Atsuhiko
Assistant Director-General; Director, Global Research Center for Cyber-Physical Systems
Ph.D. (Engineering)



Specialties: Data engineering; Structural matching; Series data analysis
Research themes: Analytical technology for identifying and extracting underlying knowledge in series data such as large-scale text data and sensor data, as well as data management technology that makes efficient analysis possible.

Professor
KITAMOTO, Asanobu
Ph.D. (Engineering)



Specialties: Data-driven science; Humanities informatics; Big data analysis of global environment and disasters; Open science; Image analysis
Research themes: Technologies such as image analysis, databases, and machine learning that are fundamental to the expansion of data-driven science into various fields such as the global environment, natural disasters, and the humanities, and "super-interdisciplinary expansion" of research results using open science approaches.

Associate Professor
KODAMA, Kazuya
Ph.D. (Engineering)



Specialties: Structure of multi-dimensional image information and communication systems of distributed shared image environment with real-time quality control
Research themes: Methods for freely changing the viewpoint or focal point after a photograph has been taken. Innovate technologies for capturing, storing, transmitting, and displaying 3D images using multi-dimensional signal processing of the light being viewed within the space producing the image, and building advanced viewing environments.

Professor
SATO, Imari
Director
Ph.D. (Interdisciplinary Informatics)



Specialties: Physics-based object shape and reflectance modeling; Creation of spatially immersive displays for human-computer interaction
Research themes: Extracting information from body and hand gestures. Imaging technologies for future living spaces that display images in preferred locations. Reproducing luster and other material qualities under different lighting environments. Optical correction technologies for projectors.

Professor
TAKANO, Akihiko
Ph.D. (Science)



Specialties: Association informatics; Algebra of programming; Archive informatics
Research themes: "想/IMAGINE," that dynamically connects highly reliable information sources with associative functions. Technology for building and using a digital archive as a "public good of knowledge." Research on an environment for dialogical thinking, which captures and deepens individual brainstorming, while securing a broad perspective into information space accumulated as cultural and social memories.

Professor
YAMAJI, Kazutsuna
Director, Research Center for Open Science and Data Platform
Ph.D. (Engineering)



Specialties: Research data sharing and metadata management; Platform system activating the research community
Research themes: Development of technology supporting open science for publishing and sharing research results such as papers and research data. Develop a world-leading research data infrastructure adapted to research work flows and provide services to universities and research facilities in Japan.

Professor
AIZAWA, Akiko
Vice Director-General; Director, Research Center for Knowledge Media and Content Science
Ph.D. (Engineering)



Specialties: Natural language analysis and automatic construction of language resources; Text mining and knowledge search; Intelligent language interfaces
Research themes: Methods for analyzing natural language text by using computers to obtain and use knowledge. Platform technology to acquire terminology, assessing uniformity, document structure, etc. Interfaces supporting reading and writing of documents by humans.

Professor
SATOH, Shin'ichi
Ph.D. (Engineering)



Specialties: Video analysis, retrieval, and knowledge discovery based on broadcast video archives; Image retrieval
Research themes: Building visual systems able to understand meaning in video similarly to how humans do. Technologies to determine names from facial images, and establishing search technologies for objects and events portrayed in video. Participating in overseas R&D projects and refining technologies.

Professor
SUGIMOTO, Akihiro
Ph.D. (Engineering)



Specialties: Sensing and understanding human activities in daily life; Real-time 3D environment recovery using RGB-D cameras; Computer vision under the existence of digitization errors
Research themes: Broad research on visual information processing from theoretical to system building, giving particular thought to the nature of "seeing." Especially, reexamining problems in computer vision from a mathematical and engineering perspective to build a visual mathematics.

Assistant Professor
TAKAYAMA, Kenshi
Ph.D. (Information Science and Technology)



Specialties: Computer graphics; User interfaces; Geometric modeling
Research themes: Intuitive interfaces for interactive 3D modeling. Mainly modeling technologies for the surface conditions and internal structure of 3D objects, and repartitioning input shapes into high-quality meshes.

Professor
OYAMA, Keizo
Vice Director-General; Director, Center for Dataset Sharing and Collaborative Research
Ph.D. (Engineering)



Specialties: Data analysis of web user behavior and improvement of access to information; Web information retrieval technology; Full-text search technology
Research themes: Technology to support efficient finding and extracting of information required by the user from the Internet and various other databases, using various data reflected in user behavior.

Associate Professor
KANAZAWA, Teruhito
Ph.D. (Engineering)



Specialties: Construction of infrastructure for Open Science Repository; Bibliography and person identification; Machine learning; Big data processing; Integrated metadata for Linked Open Data
Research themes: Analysis of logs of human interests and behavior, following the two main themes of Big Log Data Analysis, and Deep Log Data Analysis. Expand and deepen "mass customization", advancing smart technology to meet the individual needs of users. Cultivating new demand.

Assistant Professor
SUGAWARA, Saku
Ph.D. (Information Science and Technology)



Specialties: Natural language processing; Computational linguistics; Natural language understanding; Task design
Research themes: Designing highly descriptive evaluation tasks such as reading comprehension, recognizing textual entailment, and commonsense reasoning, while at the same time working on building a system that guarantees practical reliability and interpretability, with the goal of exploring human language understanding through computational modeling.

Assistant Professor
MO, Hiroshi
Ph.D. (Engineering)



Specialties: Case-based video indexing; Intelligent video structuring
Research themes: Development of essential technologies for active selection of broadcast programs, such as on-demand viewing. Devising and implementing schemes to clearly show what is in the image, index it, and automatically organize it. Building reliable archives and using video as knowledge.

Associate Professor
AIHARA, Kenro
Ph.D. (Engineering)



Specialties: Context analysis for cyber-physical systems; Planning support for lifelong learning in the humanities
Research themes: Context estimation platform technology through collection and analysis of behavior logs. Search for ways to support human creativity. R&D on learning systems utilizing intellectual resources such as culture and the arts. Dynamic understanding from tourism data.

Associate Professor
ANDRES, Frederic
Ph.D., HDR (Habilitation à Diriger des Recherches)



Specialties: Mulsemedia; Database; Collective intelligence; Data science; Big data
Research themes: Distributed collective intelligence (CI)-based applications, intelligent food and cooking recipes, CI-based semantics and social media ecosystems, community behavior detection, and early stress detection and monitoring.

Professor
YAMAGISHI, Junichi
Ph.D. (Engineering)



Specialties: Speech information processing; Speech synthesis; Speaker verification; Media forensics; Machine learning
Research themes: Reproducing the traits and characteristics of individuals as defined by voice, face, and writing by machine learning (digital cloning) and looking for new applications such as personal avatars, while at the same time considering a framework that achieves both security and privacy such as by biometric authentication using biometric sensor technologies.

Assistant Professor
ANDO, Ryoichi
Ph.D. (Design Engineering)



Specialties: Computer graphics; Physical simulations; Computational fluid dynamics
Research themes: Development of new computation methods for numerical fluid dynamics to implement beautiful computer graphics. Producing new algorithms that can handle spray and swirls efficiently and building mathematical models for describing such natural phenomena with simple mathematical formulas. Particularly interested in visual and mathematical beauty.

Assistant Professor
IKEHATA, Satoshi
Ph.D. (Information Science and Technology)



Specialties: Computer vision; Computer graphics
Research themes: Advanced 3D computer vision using digital cameras, distance sensors, and other technologies. Implementing practical 3D reconstruction technology that can be used in many fields such as geography, construction, medicine, and entertainment.

Professor
PRENDINGER, Helmut
Ph.D.



Specialties: Real-time multi-user multi-agent systems; Personified characters and avatars in virtual worlds; Distributed, highly extensible, highly efficient real-time systems; Cooperative human-machine interfaces; Multimodal interfaces
Research themes: The broad potential of drones as new social infrastructure. Development of core technologies for effective utilization in more fields using information engineering. Focusing effort on information processing research using collision

Professor
YAMADA, Seiji
Ph.D. (Engineering)



Specialties: Artificial intelligence; Human-agent interaction; Intelligent interactive systems
Research themes: Many AI agents do not operate independently, without human assistance. Development of systems with close cooperation between humans and AI agents. Interaction design technology incorporating GUI design and human cognitive models.

Assistant Professor
YU, Yi
Ph.D. (Information Science)



Specialties: Multimodal content analysis using artificial intelligence and deep learning
Research themes: Converting data with different modalities into a common semantic space and using deep learning and cross-modality correlation analysis, in order to establish embedding algorithms that straddle modalities and use data with multiple modalities together.

Information and Society Research Division

<Information Use>

Professor
ARAI, Noriko
Director, Research Center for
Community Knowledge
Ph.D. (Science)



Specialties: Information sharing, cooperative systems R&D; Artificial intelligence; Mathematical logic
Research themes: Information technology enabling information and knowledge to be shared smoothly. Research on the potential and limitations of artificial intelligence starting with the question: "What if a robot were to be admitted to the University of Tokyo?" Also, issuing skills needed for the 21st century from an education-oriented science research laboratory.

Assistant Professor
UEKI, Kouichirou
M.Sc.



Specialties: Development of next-generation information systems
Research themes: Methods for flexible information processing, specifically working on neural networks and genetic algorithms. The starting point for research is what we have learned about computers and primates at university and graduate school.

Professor
ECHIZEN, Isao
Director;
Director, Global Research Center
for Synthetic Media
Ph.D. (Engineering)



Specialties: Information security; Media security; Privacy protection technology
Research themes: Establishing security and privacy protection technologies at the boundary between cyberspace and real space. Contribution to increasing information security in society at large through research on biological information protection technology and technologies for generating and recognizing media clones.

Professor
KANDO, Noriko
Ph.D. (Library and
Information Science)



Specialties: Evaluation of information access technologies; Exploratory search and user interface; Cognitive research for exploratory search; Extracting attitudes and relations from text
Research themes: Search systems for cases when the answer cannot be anticipated, or when the user does not know where to start. The objective is to build a mechanism to gather useful information satisfying the underlying needs of a query.

Associate Professor
GOTODA, Hironobu
Ph.D. (Science)



Specialties: Stereoscopic displays; Acoustic rendering systems; Similarity search for 3D models
Research themes: Modeling, to recognize and draw objects using computers. Establishing a matching technology able to find two objects that are similar would enable, for example, computing 3D data from objects in photographs.

Associate Professor
BONO, Mayumi
Ph.D.



Specialties: Understanding multimodal interaction; Understanding conversational structures in multi-party interaction
Research themes: Creating a dataset for recording, analyzing, and researching the diverse expanse of sign language. Reexamination of communication theories, which have been created to deal with spoken language, by looking at the interactive behaviors of sign language, which has strong iconicity and conveys meaning by providing an image of the phenomenon within the scenario.

Associate Professor
MIZUNO, Takayuki
Ph.D. (Science)



Specialties: Computational social science; Econophysics; Complex network science
Research themes: Creation of a field that fuses informatics and social science. Resolution of economic, international political, and social issues through bigdata analysis and large-scale simulations. Building sustainable social systems on the strength of information technology and economic power.

<Science Information>

Associate Professor
SUN, Yuan
Head, NII Library
M.A. (Education)



Specialties: Education; Psychological statistics; Test theory; Bibliometrics
Research themes: Estimating the learning process of individual learners based on theoretical models of learning processes and learning behavior data, and developing algorithms for adaptive scheduling learning and teaching. Contributing to realizing optimal personalized learning.

Associate Professor
NISHIZAWA, Masaki
Ph.D. (Science)



Specialties: Quantitative investigation of academic research findings in media reports; Investigation study on network structure of information sciences related research and its trends; Empirical analyses on network for industry-government-university cooperation in Japan
Research themes: Search for the starting point of research that produces excellent results. Specifically, studying the research progression and what support was received in the past from a database of research papers. The objective is to be able to invest appropriately in R&D that has potential.

Associate Professor
FUNAMORI, Miho
M.Sc.



Specialties: Higher education policy; Scholarly communication policy; Open science; Research evaluation; Higher education in the digital age
Research themes: Analyzing the impact of digitization on higher education from the perspective of university management, research, and education. Investigating the relationship between massification and digitization of higher education, the process of digitization, the relationship between scholarly communication and research evaluation, and the outlook for higher education in the age of Society 5.0.

Assistant Professor
FURUKAWA, Masako
M.A. (Literature)



Specialties: Learning analytics and standardization; Development and evaluation of MOOC and other e-learning materials
Research themes: Building a system platform for collecting and analyzing learning logs, which contain learning behavior history data from university and other online learning sites and MOOCs, providing feedback to students, instructors, and educational institutions, and otherwise providing effective educational support using learning logs.

<Information Public Policy>

Associate Professor
OKADA, Hitoshi
Ph.D. (International Public
Policy)



Specialties: Critical growth factors of e-commerce and e-money; University Information Security Policy Portal (UISPP)
Research themes: Blockchain technology, which supports distributed virtual currencies, can be applied in wide ranging scenarios for transactions on the Internet. Building systems to demonstrate operating potential and performing validation tests. Scholarly analysis of issues such as legal systems, and demonstration of application in the economy and society.

Professor
SATOH, Ichiro
Ph.D. (Engineering)



Specialties: OS and middleware for distributed systems including cloud computing and IoT
Research themes: New network technologies and applications using mobile agent software, which can run processes while moving freely between computers. Mobile phone software development tools that are being used by major manufacturers.

Executives (related to research)

See p. 49 for the list of Executives.



Director-General
Director, Center for Robust Intelligence
and Social Technology;
Director, Research Center for Safe,
Secure, and Healthy Society
KITSUREGAWA, Masaru
Professor, National Institute of Informatics;
Professor Emeritus, University of Tokyo



Acting Director-General;
Vice Director-General
SHINOZAKI, Motoshi
Professor, National Institute of Informatics



Vice Director-General
ADACHI, Jun
Project Professor,
National Institute of Informatics;
Professor Emeritus,
National Institute of Informatics



Executive Director of Research
FURUI, Sadaoki
Project Professor,
National Institute of Informatics;
Honorary Professor,
Tokyo Institute of Technology



Chief Cyber Science Infrastructure Director
YASUURA, Hiroto
Project Professor,
National Institute of Informatics;
Professor Emeritus, Kyushu University



GL0 Acting Director
PLANAS, Emmanuel
Professor, National Institute of Informatics

Major Project Involvement

Japan Science and Technology Agency (JST) ERATO: Outstanding Research Leaders Strive to Generate the Seeds of Breakthrough New Technologies

HASUO Metamathematics for Systems Design Project

Research Director: HASUO, Ichiro (Associate Professor, Information Systems Architecture Science Research Division; Director, Global Research Center for Systems Design and Mathematics)

In the manufacturing industry today, efforts are underway to fundamentally transform the manufacturing process—from design to production—through automation and software support using advanced information processing technologies. In light of these changes, the HASUO Metamathematics for Systems Design Project aims to introduce the findings from the field of software science into traditional manufacturing technologies and build software tools that support the different aspects of industrial product development, from developing specifications to design, implementation, and maintenance.

Leveraging Formal Methods in Manufacturing

In particular, the project explores methodologies for software support, which are responsible for quality assurance and efficiency in industrial products such as vehicles, and other “physical information systems,” by bringing in the techniques of systems design in software science based on mathematics, called “formal methods.” Formal methods have so far been used with “discrete elements,” assuming calculations by computer, but in order to apply them to physical information systems, formal methods must be extended to encompass “continuous elements” of physical systems such as continuous dynamics, probability, and time (Figure). Our unique approach to this theoretically difficult problem is to mathematically analyze the process itself of extending formal methods and construct a higher-order (metalevel) theory in order to obtain universal knowledge, which may allow the various techniques of formal methods to be extended together. This metalevel approach is very theoretical and makes full use of a variety of abstract mathematical techniques, such as logic and category theory. However, another distinctive

feature of this project is its orientation towards application, with an ultimate goal of applying the outcome of these theoretical studies to the real problems faced by the industrial sector.

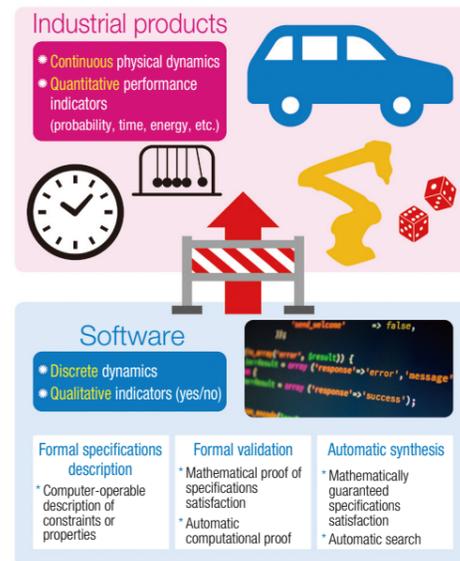


Figure: Extending formal methods from software to physical information systems

JST-Mirai Program “Super Smart Society (Society 5.0)” mission area

Prioritized Theme: Modeling and AI that Connects the Cyber and Physical Worlds

Engineerable AI Techniques for Practical Application of High-Quality Machine Learning-based Systems

Project Leader: ISHIKAWA, Fuyuki (Associate Professor, Information Systems Architecture Science Research Division)

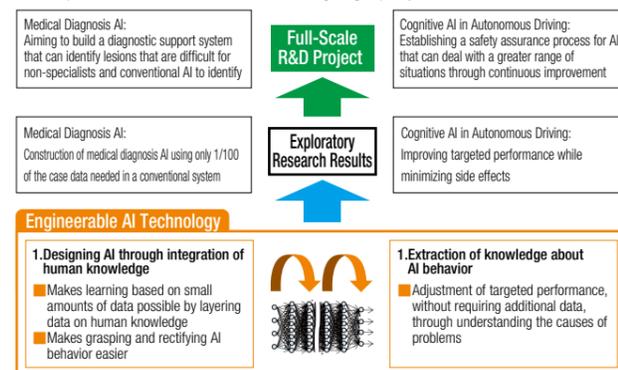
High expectations are placed on the application of Artificial Intelligence (AI) in various fields because it can find regularities hidden within a large amount of data, which can then be used for classification, predication, and anomaly detection. However, since conventional AI requires a large amount of data for training, it is difficult to deal with cases in which only a small amount of data can be obtained or where modifications are required. For example, when AI is used in the healthcare field, a problem is likely to arise since it easily overlooks atypical lesions, for which it is difficult to obtain a large amount of data. In addition, when errors have occurred in road sign recognition in autonomous driving using AI, it takes an enormous amount of time to correct the errors. In order to apply AI to critical fields like healthcare and autonomous driving, the solving of these issues becomes an urgent task. We are therefore aiming to establish a new general-purpose fundamental technology called “Engineerable AI (eAI)” to build up and enhance the safety and reliability of AI. In contrast to conventional AI based on learning and repetitive correction through the use of large amounts of data, eAI is a technology that guarantees and corrects AI operations by extracting and analyzing not only the technologies used in constructing AI that reflect human knowledge, but also factors that cause AI errors.

This research and development project is expected to bring into realization a diagnostic support system that can detect atypical lesions, even with a limited amount of data, thus contributing to alleviating the shortage of medical specialists and rectifying the irregular quality levels in healthcare. In the case of autonomous driving, the ability to extract and target specific AI performances that need to be corrected will reduce the time required for

system development and contribute to the improvement and assurance of safety in autonomous driving. Our aim is to demonstrate the effectiveness of eAI in solving problems in healthcare and autonomous driving and contribute to the establishment of internationally competitive production technology incorporating eAI.

Figure: Project overview

Establishing highly versatile technology through demonstrations in two domains
Toward problem solution and value creation through high-quality AI in all areas



Conventional AI: Requires a large amount of data for training. Difficult to adjust performance to meet needs.

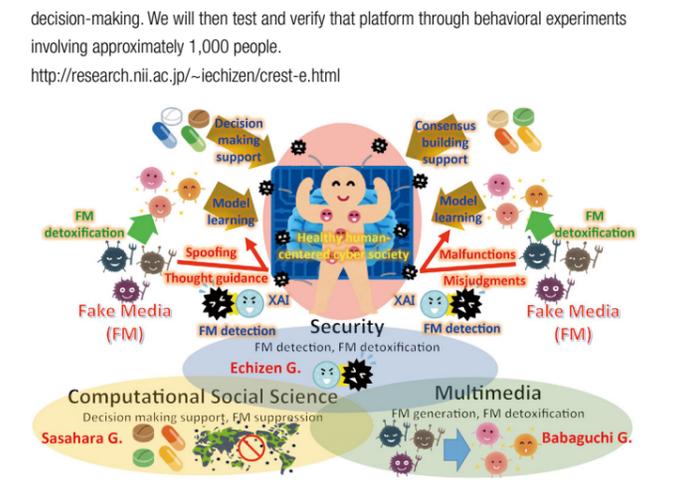
JST CREST: Network-Based (Team-Based) Research Giving Rise to Outstanding Results That Lead to Innovation in Science and Technology

[Reliable AI Systems] Core Technologies for Trusted Quality AI Systems

Social Information Technologies to Counter Infodemics

Project Leader: ECHIZEN, Isao (Professor, Information and Society Research Division; Director, Global Research Center for Synthetic Media)

This research aims to establish social information technologies that support diverse communication and decision-making, while dealing appropriately with the potential threats posed by AI-generated fake media (FM). Specifically, while we work to detect and defend against advanced attacks by FM through various AI-generated modalities, such as fake images, fake voices and fake documents, we will establish social information technologies that promote human decision-making and consensus building by actively incorporating various reliable media, and that lead to enhanced human immunity in cyberspace. In this research, we will address three types of AI-generated FM. In particular, we will focus on (1) media clone (MC) type FM, which is infinitely close to but not quite real; (2) propaganda (PG) type FM, which is generated by deliberately editing the real media for the purpose of manipulating public opinion; and (3) adversary example (AE) type FM, which is difficult for humans to identify and is generated for the purpose of causing AI technology to malfunction or misjudge. Our aim is to establish technologies to generate and detect these three types of FM. Furthermore, we will study “detoxification”, which consists of utilizing FM as normal media after processing it to prevent people being led toward false thoughts, as well as to prevent the FM from causing malfunction and misjudgment. Using these technologies, we will construct an experimental social media platform that presents information to support



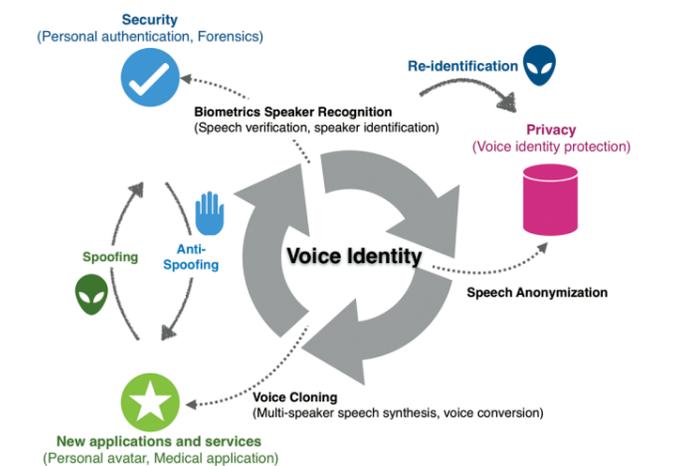
decision-making. We will then test and verify that platform through behavioral experiments involving approximately 1,000 people.
<http://research.nii.ac.jp/~iechizen/crest-e.html>

[Symbiotic Interaction] Creation and Development of Core Technologies Interfacing Human and Information Environments

VoicePersonae: Speaker Identity Cloning and Protection

Project Leader: YAMAGISHI, Junichi (Professor, Digital Content and Media Sciences Research Division)

Voice is a simple, natural, and intuitive modality. At the same time, voice is also a part of our identity and is considered as an important factor in a variety of fields such as biometrics, speech synthesis, voice quality conversion, and privacy. However, research in these fields is currently being conducted separately toward conflicting goals. This project removes the barriers between fields related to voice identity in order to (a) refine the speaker identity modeling technology; (b) enhance the security and robustness of authentication with voice biometrics, i.e., speaker recognition; and (c) provide new technologies for voice privacy protection. Detailed modeling of speaker identity is essential for avatars that reproduce personal characteristics of individuals and other applications. Conventionally, speech synthesis, voice quality conversion, speech enhancement, and other fields were studied separately. In this project, we aim to create a new model that integrates these fields as various tasks of speech generation for multiple speakers. Aside from speech generation, we are also studying integration with speaker recognition technologies. Moreover, we will conduct research on voice biometric sensors, which are technologies for automatic detection of voice spoofing, in order to improve the safety of speaker recognition. Furthermore, we will hold the world’s first challenge that will compete on voice anonymization and re-identification to accelerate research on voice privacy. We will also apply the results of our research to media other than audio-based and develop related technologies, including one to detect fake face video images known as Deepfake.



[Artificial Intelligence] Development and Integration of Artificial Intelligence Technologies for Innovation Acceleration

UNDERPIN: Understanding Psychiatric Illness through Natural Language Processing and Media Analysis

Project Leader: SATOH, Shin'ichi (Professor, Digital Content and Media Sciences Research Division)

Psychiatric disorders such as depression, schizophrenia, and dementia are diagnosed and treated through “words.” Understanding the patient’s words thoroughly and bringing out the characteristic symptoms are essential to making the correct diagnosis and treatment, but objectively evaluating and quantifying them are difficult. This research aims to quantify the

symptoms of psychiatric disorders using natural language processing and media analysis technologies, in order to deepen our understanding of these illnesses and eventually lead to better prevention, early detection, and other technological developments.

Major Project Involvement

JST PRESTO: Network-Based (Individual) Research Giving Rise to Wellsprings of Innovation in Science and Technology

[Social Design] Fundamental Information Technologies towards Innovative Social System Design Search and Decomposition of Higher-Order Interactions between Variables

Researcher: SUGIYAMA, Mahito (Associate Professor, Principles of Informatics Research Division)

Discovering and analyzing interactions between variables is a fundamental and essential challenge in analyzing multivariate data consisting of many variables. Sensors, IoT, and other information technologies have been rapidly developing in recent years. This has resulted in the acquisition and collection of multivariate data on various variables over a wide range of fields, from basic sciences such as genetics, neuroscience, and social sciences to applied sciences such as medicine. Analyzing the interaction between variables in such multivariate data is one of the most basic analytical procedures in descriptive data analysis for identifying the underlying phenomena behind the data, and is a crucial procedure in data science. To date, variable (feature) selection based on predictive analysis using linear models, such as Lasso, had been developed for machine learning, although it is not suitable for descriptive data analysis. Therefore, this research project will develop a methodology for searching and decomposing higher-order interactions between variables, as well as develop the basic theories and practical algorithms. Building discrete algorithms will enable efficient searches for higher-order interactions hidden in multivariate data consisting of many variables, as well as decomposition of these higher-order interactions using the theory of information geometry. This project's outcome will provide more sophisticated data analytics and can be applied to a wide range of fields that form the foundation of our social systems.

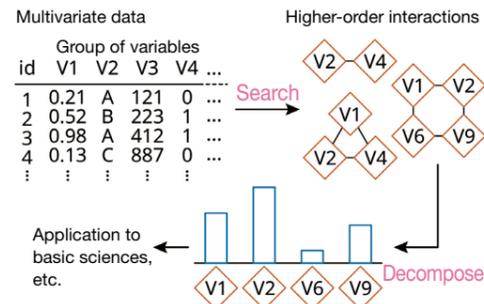


Figure: Searching and decomposing higher-order interactions for multivariate data

Cabinet Office Cross-Ministerial Strategic Innovation Promotion Program (SIP) Phase 2

Big-Data and AI-Enabled Cyberspace Technologies

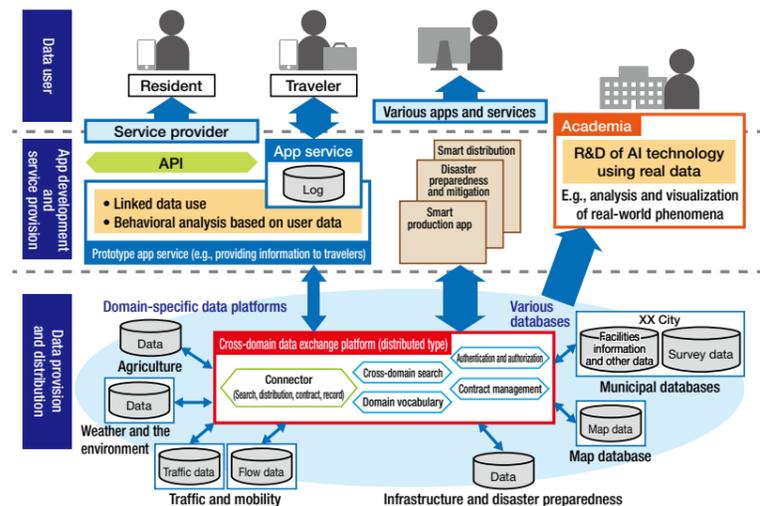
This project aims to establish the cyberspace platform technologies that will form the foundation of Society 5.0 in cyber-physical systems (CPS), in particular, (1) a highly sophisticated human interaction platform technology which will facilitate collaboration between humans and AI, (2) a cross-domain data exchange platform, and (3) inter-AI collaboration technology, with the goal of implementing CPS in the real world using big data and AI.

R&D of a Cross-Domain Data Exchange Platform based on Metadata Structuring by AI Technology and its Evaluation through Applications for Spatio-temporal Big Data

Head of R&D: TAKASU, Atsuhiko (Assistant Director-General, NII; Professor, Digital Content and Media Sciences Research Division)

Working together with industry partners, we are developing a technology for a cross-domain data exchange platform – one that will find and link data scattered across different fields – and conducting studies to boost the use of the technology to promote the sharing and utilization of such scattered data. The main points to be implemented are the design of architecture for a distributed-type data exchange platform; the realization of various functions making up that platform; the laying out of rules for its utilization; and the verification of the usefulness of the various functions and services of that platform through demonstration applications. NII is advancing particularly with research on the structural transformation of tabular data, which is the basis for linking data from multiple fields, as well as on support for the discovery of such data and their semantic identification. We are further applying those research results to the advancement of data search functions and information integration to help reduce the cost of providing data. By developing demonstration applications with an eye on cases where data from multiple fields are used, we are also enabling the platform functions usefulness to be confirmed and various operational problems to be identified. In this way, we are pushing forward on verification of their overall effectiveness.

Figure: Overview of the cross-domain data exchange platform and the R&D undertaken by NII



Development of a data exchange platform that can exchange and enhance municipal open data and data from various domains, and prototyping through applications

Kakenhi

Grants-in-Aid for Scientific Research (Kakenhi) Venturing into a wide range of basic to applied research

Kakenhi are funds that provide broad support for scientific research based on the free ideas of the researchers themselves, and covers a wide range of academic studies spanning from basic to applied research. Both faculty members and researchers actively apply to Kakenhi for grants, and many are approved. The grants obtained from Kakenhi are also distributed to researchers in other institutions (co-investigators) for collaborative research work. Similarly, many NII faculty members also participate as co-investigators in the Kakenhi-funded projects of researchers at other institutions.

Applications Accepted		(FY2020)
	No. of applications accepted	Amount (in thousands of yen)
Project Leader (Principal Investigator)	76	350,180
Co-investigator (Other institutions → NII)	68	92,006

[Model Cases of Research Funded by Kakenhi]

Grant-in-Aid for Scientific Research (S)

Large Graphs: Theory and Algorithms

Project Leader: KAWARABAYASHI, Ken-ichi (Professor, Principles of Informatics Research Division)

Collecting huge volumes of various types of data through sensors, images, audio, and other means, analyzing them, and applying information processing technologies hold great potential for solving many of the problems facing modern information society. However, many of these problems cannot be solved easily even with the use of supercomputers, because of the massive amounts of data involved. Overcoming such issues requires new innovations in algorithms. The most significant and urgent need on a common scientific foundation is for building and codifying innovative algorithm design techniques that are based on computational models and mathematical exploration. This research aims to strengthen the theoretical field of algorithms (mainly graph algorithms) by making full use of mathematical theory, and to speed up and make algorithms scalable using theoretical tools. Our three core research topics are as follows.

1. Submodular functions and their applications

We will work on solving real-world optimization problems such as robust optimization by incorporating combinatorial optimization techniques, such as approximation algorithm design methods and algebraic methods.

2. Exploration of basic mathematical theories: Directed graph minor theory

We aim to extend graph minor theory to digraphs.

3. Graph coloring problem

We aim to make essential contributions to central issues in discrete mathematics, the four color theorem and the graph coloring problem for graphs embedded in curved surfaces.

Reference: <https://bigdata.nii.ac.jp/kibans/english/>

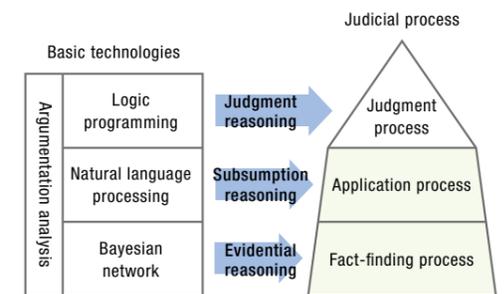
Grant-in-Aid for Scientific Research (S)

Advanced Reasoning Support for Judicial Judgment by Artificial Intelligence

Project Leader: SATOH, Ken (Professor, Principles of Informatics Research Division)

In the trial process, the intellectual work performed by judges can be broadly divided into three parts: the fact-finding process, the application process, and the judgment process. The fact-finding process is the process of finding the facts of what actually occurred in the case based on evidence. The application process is the process of making the facts correspond to legal concepts. The judgment process is the process of making a judgment according to the legal concepts corresponding to the facts, based on the text of the law or judicial precedent. Furthermore, judges determine the issues, make decisions, and resolve disputes through interactions with parties to the proceedings, since conflicts may arise between plaintiff and defendant or between prosecutor and the accused, and trial by lay judges involves the participation of the lay judges. Various complex and advanced human reasoning tasks are performed in the trial process. Such higher-order reasoning may be carried out faster and better with the support of artificial intelligence. This research aims to develop support systems that perform advanced reasoning for the three processes above, using the respective platform technologies given below, as well as a system that analyzes the issues in each process using argumentation theory (Figure).

1. Fact-finding process support system using evidential reasoning based on Bayesian network
2. Application process support system that obtains applicable rules based on natural language processing
3. Judgment process support system that extends the already developed civil code reasoning system PROLEG to handle criminal and administrative cases.
4. Argumentation analysis support system using argumentation theory for issues in each process



Kakenhi

Grant-in-Aid for Scientific Research (A)

Researches on Model-aided Learning Approaches for Reliable Realtime Control in Future Wireless Systems

Project Leader: JI, Yusheng
(Professor, Information Systems Architecture Science Research Division)

To support advanced applications and intellectual innovation in the Super-smart Society, it is necessary to further enhance the functionality, performance and reliability of the information and communication service infrastructure. Using conventional model-based approaches, it becomes more and more difficult to solve the centralized and/or distributed control problems in multidimensional space of dynamically configured wireless systems. In this research, we study signal processing, resource allocation, interference mitigation, autonomous access control, and mobility control problems in wireless communication systems, by means of integrated approaches based on mathematical models and machine learning. By comprehensively considering spatio-temporal constraints on network resources and seamlessly coordinating communication, computation, storage, and control functions, we aim to achieve highly reliable real-time processing capability at an end-to-end basis.

Grant-in-Aid for Scientific Research on Innovative Areas (Research in a Proposed Research Area)

Modeling of the motor recovery process and optimization of rehabilitation strategy using VR

Project Leader: INAMURA, Tetsunari
(Associate Professor, Principles of Informatics Research Division)

Rehabilitation for motor dysfunction has involved a lot of subjective elements and estimations on the part of physical therapists, who formulate rehabilitation policies by predicting the recovery conditions of the patients' physical functions. This research aims to realize a system that provides an optimum rehabilitation program in response to the individual patient's conditions by optimizing the interaction process between the physical therapist and the patient. Our goal is to model the rehabilitation process $Y=f(X)$, where the rehabilitation strategy f is applied to the current motor function state X – the current motor disability – to change the current motor function state into the desired motor function state Y . We can expect physical therapists to decide on highly effective rehabilitation strategies with the proposed rehabilitation process model.

Grant-in-Aid for Early-Career Scientists

Large-scale Fluid Simulations for Computer Graphics

Project Leader: ANDO, Ryoichi
(Assistant Professor, Digital Content and Media Sciences Research Division)

Our intention is to use an octree grid to conduct numerical simulation of liquid calculation, for which spatial discretization precision is dynamically changeable. It is known that the solution for liquid calculation can be obtained by solving certain partial differential equations called Navier-Stokes equations. But it cannot be solved analytically under arbitrary initial and situational conditions because it contains a nonlinear term known as an advection term. In this research, the Navier-Stokes equations are discretized through the use of a grid and their motion is solved numerically to attain an approximate solution. The calculation time is greatly reduced due to the use of an octree grid.



An example of calculating and generating animation of liquid through the use of an octree grid. The high resolution (high calculation accuracy) of the grid near the rear section of the seaplane's fuselage and the low resolution (low calculation accuracy) of the grid near other sections of the fuselage are visualized.

Grant-in-Aid for Scientific Research (B)

Study on Distributed Consensus by Using Synchronizing Vibration

Project Leader: SATOH, Ichiro
(Professor, Information and Society Research Division)

We will try to make distributed consensus more efficient by using a mechanism inspired from synchronization phenomena in vibrating systems in nature (e.g., the synchronization of the expansion and contraction cycle of the heart muscle and the transmission cycle of fireflies) into distributed systems. Distributed consensus serves as the basis for a variety of existing distributed algorithms, but it is known that the cost of reaching consensus increases significantly when multiple computers simultaneously demand consensus be reached, while simultaneously making other demands, because that many demands at one time cause the distributed consensus processing to be reworked. On the other hand, since most distributed consensus approaches tend to repeat multicast communication and replies to it in a sequential manner, thus resembling synchronization phenomena in vibrating systems in nature, we will propose and implement a method to introduce the synchronization mechanism in nature into distributed systems and will evaluate the proposed approaches.

Grant-in-Aid for Challenging Research (Exploratory)

Research on Fusion of Informatics and Political Science Using Human Flow-based Big Data to Achieve Multicultural Symbiotic Societies

Project Leader: MIZUNO, Takayuki
(Associate Professor, Information and Society Research Division)

We will conduct research on the fusion of informatics and international political science, which will deal with problems of exclusionary attitudes among global communities, deriving from ethnicity and other factors. Under the influence of globalization, communities that exist in the world economy are transforming from units confined in traditional nations or regions into cross-national ideological or ethnic units. To accurately grasp understanding of these communities, we will utilize big data on micro-connections of people. By introducing big data analysis technology of informatics to the field of international political science from the perspective of global human flow, we will visualize the structure of huge and complex social networks characterized by the "complex intertwining of ethnic groups in real space." In this way, we will detect isolated communities and identify areas in social networks where corrective measures need to be taken to realize multicultural symbiotic societies.

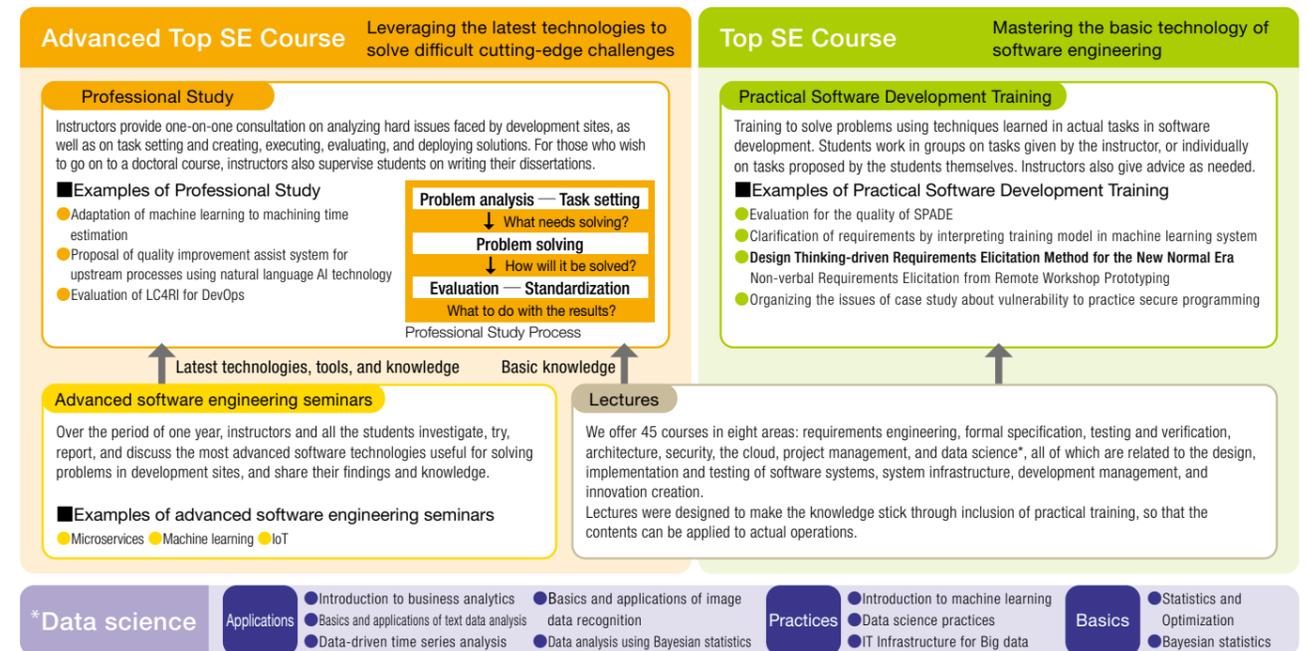
Human Resource Development

Top SE

Educational Services for Developing a Top-Level IT Workforce

GRACE Center provides a scientific educational program on intelligent manufacturing for professionals, so that they can master cutting-edge software engineering through learning basic theory and practical training. The program aims to cultivate world-class human resources in the IT field who have the foresight capable of creating IT innovations that meet the changes in the future.

We launched the Data Science Series, starting from the 2021 academic year. This is designed to provide a wide range of courses that, along with dealing with machine learning as a technology, also focus on its underlying statistics, its business applications, and domain-specific content.



Collaboration with Overseas Universities: UCL Training

In the eighth session (from October 29 to November 2, 2018), one engineer from each of the nine sponsoring companies joined a group of five to six students at University College London (UCL) to undergo project-based learning training in which they, as a team, designed and developed requirements for AR collected from doctors, including surgeons.

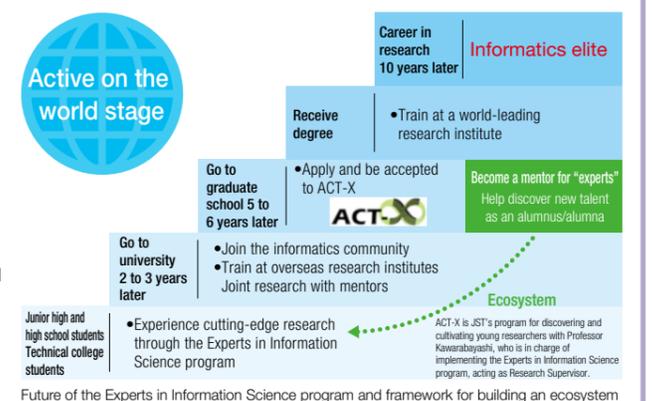


UCL students, partner company engineers, and faculty

Experts in Information Science: Public-Private Collaborative Training Program

Discovering and Nurturing Young Talent in the Field of Informatics

In April 2020, NII launched the Experts in Information Science program under the Global Science Campus (GSC) sponsored by the Japan Science and Technology Agency (JST), in collaboration with the Information Processing Society of Japan (IPSJ) and the Japanese Olympiad in Informatics (JOI). This is a program designed to provide junior and senior high school students and technical college students, who have excellent abilities in the field of informatics, with opportunities to come into contact with front-line research in informatics and to cultivate their knowledge and research skills within that field. Young researchers representing Japan, such as ACT-I and ACT-X researchers, will act as mentors to provide research guidance and advice to more than 40 junior and senior high school students and technical college students from all over Japan, who were selected from the general public through NII and the Information Processing Society of Japan, as well as from among those recommended by the Japanese Committee for the International Olympiad in Informatics. In the first stage of the training process, the students will learn online about research in state-of-the-art information science. In the second stage, they will conduct research under the guidance of mentors. Even after they go on to university, we will continue to follow up with those students who have made significant achievements, such as through publishing papers and other activities. We are also considering providing opportunities for such students to conduct research for a certain period of time at overseas research institutions.



Collaborative Research Promotion

NII actively conducts collaborative research with the private sector through external funds for commissioned research and other means.

In addition, through calls for applications for open collaborative research, we are further promoting informatics studies and breaking new ground in research in collaboration with other academic fields, with the aim of generating new theories, methodologies, and applications (future value) from informatics that will bring incalculable real value to people and society.



[Various Collaborative Research Projects with Private-sector Institutions]

Collaborative Research with the Private Sector

<https://www.nii.ac.jp/research/collaboration/minkan/>

NII receives researchers and research funds from outside institutions in the private sector to conduct joint research with NII faculty members. In principle, projects last one year, although multi-year contracts are also possible.

(1) Receiving researchers only

We accept researchers dispatched by outside institutions in the private sector to conduct collaborative research at NII while holding their regular jobs. Essential overhead expenses are covered by research fees up to a set limit.

(2) Receiving research funds only

We receive the research funds required for collaborative research from the private sector. Collaborating researchers conduct their research at their respective locations.

(3) Receiving researchers and research funds

We receive research funds and research fees to conduct collaborative research.

[Research to Build Broad Collaboration with Researchers and Create Value]

NII Open Collaborative Research

<https://www.nii.ac.jp/research/collaboration/koubo/>

NII conducts open calls for applications for collaborative research, with NII faculty members acting as liaison officers. The following three types of open collaborative research proposals are accepted in the second half of each fiscal year.

- **Strategic research proposals** based on strategic subjects set by NII
- **Proposals for research project meetings** with the aim of paving the way for new collaborations and advancements in research subjects, mainly through meetings at the International Seminar House for Advanced Studies in Karuizawa
- **Open subject proposals** where applicants are free to set their own research subjects

This open collaborative research program accepts applications mainly from researchers affiliated with institutions in Japan, researchers with a wide range of affiliations can become collaborative researchers, including faculty members of universities and institutions in Japan and abroad, technical colleges, researchers at private-sector corporations, as well as graduate students. We encourage everyone to take advantage of this open collaborative research program and take a new step forward.

[List of Strategic Research Themes (12 themes)]

1. Proposal for an innovative platform function and application services utilizing the Science Information NETWORK (SINET5)
2. Proposal for cybersecurity analysis technology utilizing NII-SOCS data
3. Proposal for a method to introduce a research data platform at universities to move into the age of open science
4. Proposal for building a "dataset" to act as a research resource and the platform for utilizing
5. Proposal for CPS/IoT services for greater efficiency in social activities and system infrastructure design
6. Proposal for an innovative medical information technology based on medical imaging big data
7. Proposal for an innovative model and algorithm that approximates human-like semantic understanding
8. Proposal for a technology for quality assurance of a machine learning application system
9. Proposal for technologies regarding UI for artificial intelligence and Explainable AI
10. Proposal for an innovative model and algorithm toward deeper utilization of cultural properties
11. Proposal for technologies related to education and IT, and utilization of learning data
12. Proposal for core technologies for the next-generation Internet

Intellectual Property

Through the creation, acquisition, and management of intellectual property, NII encourages contributions to society by means of industry–government–academia collaborations.

Number of Invention Reports, Patent Applications, and Registrations (total number since FY2004) (as of the end of March 2021)

No. of Reports		No. of Applications		No. of Registrations	
280	Ownership: Organization	265	317	Japan	261
	Ownership: Individual	15		Outside Japan	56
			133	Japan	102
				Outside Japan	31

List of Japanese Patents Owned

Title of invention	NII inventor	Sole application	Registration No.
Apparatus, method, and program for retrieving and displaying image information	KAJIYAMA Tomoko	●	4441685
Quantum key delivering method and communication apparatus	WATANABE Yodai	●	4231926
Time-series data analysis device and time-series data analysis program	ICHISE Ryutarō	●	4734559
Information-sharing system, information-sharing server, information-sharing method, and information-sharing program	HONIDEN Shinichi	●	4799001
Sequential content delivery device, sequential content receiving device, and method thereof	SONEHARA Noboru	●	4734563
Contents presentation apparatus, contents presenting method, and contents presentation program	SONEHARA Noboru	●	4403276
Text content presentation apparatus, text content presentation method, and text content presentation program	SONEHARA Noboru	●	4143628
Method and apparatus for evaluating communication traffic that uses fragmentary self-similarity process	Ji Yusheng	●	4081552
Imaging device and imaging method using out-of-focus structure	KODAMA Kazuya	●	4437228
Information resource retrieval device, information resource retrieval method, and information resource retrieval program	KANDO Noriko	●	4324650
Active content distribution system, active content distribution program, and active content distribution method	HONIDEN Shinichi	●	4392503
Device and method for generating traffic congestion prediction information, and route search system	HONIDEN Shinichi	●	4729411
Content selling device and method	SONEHARA Noboru	●	4304278
Document indexing device, document retrieval device, document classifying device, and method and program thereof	SONEHARA Noboru	●	4362492
Video provision device and method	AIHARA Kenro	●	4359685
Projection image correction system and correction information generation program	SATO Imari	●	4982844
Digital content registration distribution apparatus, system, and method	SONEHARA Noboru	●	4956742
Airing structure of three-dimensional integrated electrical circuit and layout method thereof	KOBUCHI Michihiro	●	5024530
Quantum key distribution method, communication system, and communication device	WATANABE Yodai	●	4862159
Time reference point information transmitting system and receiver	HASHIZUME Hiromichi	●	4621924
Collection/delivery route selection system	SATOH Ichiro	●	4374457
Device and method for learning data management, and vehicle air-conditioning device, and equipment control device	INAMURA Tetsunari	●	5224280
Air conditioner for vehicle and its control method	INAMURA Tetsunari	●	5177667
Route switching method, server apparatus, boundary node apparatus, road switching system, and switching program	URUSHIDANI Shigeo	●	5062845
Direct path establishing method, server device, sender network node device, direct path establishment network, and program thereof	URUSHIDANI Shigeo	●	4999112
Path management control method, path management control program, path management controller, and path management control system	URUSHIDANI Shigeo	●	4806466
Emission allowance trading system and emission allowance trading method	SATOH Ichiro	●	5207195
Quantum computing device and method for Ising model	YAMAMOTO Yoshihisa	●	5354233
Measuring device, measuring system, and measuring method	HASHIZUME Hiromichi	●	5593062
Information search/display apparatus, method, and information search/display program	SONEHARA Noboru	●	5599068
Information search/display apparatus, method, and information search/display program	SONEHARA Noboru	●	5608950
Information search/display apparatus, method, and information search/display program	SONEHARA Noboru	●	5608951
Information providing apparatus, method, and program	SONEHARA Noboru	●	5614655
Control server, control method, and control program	AOKI Michihiro	●	5682932
Doppler radar system, Doppler radar transmitter, and transmission wave optimization method	HASHIZUME Hiromichi	●	5704695
Speed/distance detection system, speed/distance detection device, and speed/distance detection method	HASHIZUME Hiromichi	●	5739822
Information processing apparatus, schedule determination method, and computer program	KAWARABASHI Ken-ichi	●	5733722
Search tree drawing apparatus, search tree drawing method, and program	Ji Yusheng	●	5754676
Encoding apparatus, method, program, and recording medium	ONO Nobutaka	●	5789816
Word-order rearrangement device, translation device, translation model learning device, method, and program	MIVAO Yusuke	●	5800206
Acoustic signal analyzing apparatus, method, and program	ONO Nobutaka	●	5807914
Data delivery system, data delivery apparatus, and method	FUKUDA Kensuke	●	5818262
Data distributed management system, apparatus, method, and program	FUKUDA Kensuke	●	5818263
Acoustic signal analyzing apparatus, method, and program	ONO Nobutaka	●	5911101
Image search apparatus, method, and program	SATOH Shin'ichi	●	5979444
Semiconductor chip and semiconductor chip connection system	YONEDA Tomohiro	●	6029010
Distance measuring method and radar device	HASHIZUME Hiromichi	●	6029287
State detection of superconducting qubits using light	NEMOTO Kae	●	6029070
Optical parametric oscillator, and random signal generator and Ising model calculator using the same	YAMAMOTO Yoshihisa	●	6029072
Word-order rearrangement device, translation device, method, and program	MIVAO Yusuke	●	6040946
Signal processing apparatus, method, and program	ONO Nobutaka	●	6005443

List of Registered Trademarks

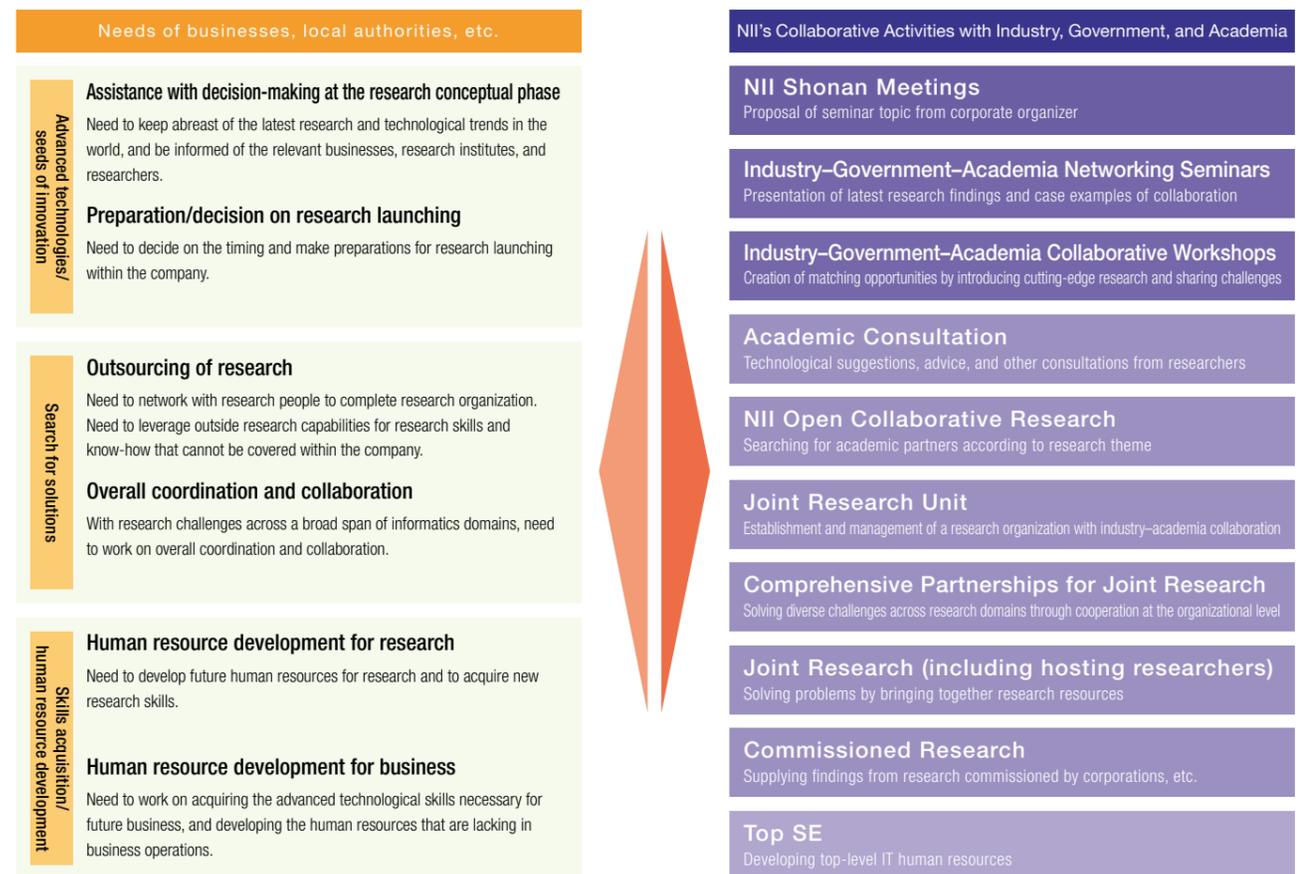
Trademark Mode	Registration No.	Trademark Mode	Registration No.	Trademark Mode	Registration No.	Trademark Mode	Registration No.
NII	4811291	Net Commons	5182361	Picture (Palette)	5498318	Picture (Michael)	5600802
NII	4830960	n c net commons	5152641	Picture (GakuNin)	5498319	meQuanics	5622078
Net Commons	4832775	neXt commons	5191260	Info dog	5538785	Picture (GeoNLP)	5645544
Picture + SINET	4934163	researchmap	5261160	Picture (Info dog)	5538784	SIGVerse *	5649553
NAREGI	4952143	GRACE+ Picture	5275386	Picture (CNii)	5580217	PrivacyVisor *	5653596
Top SE	4943324	GAKUNIN	5341899				
WebELS	4980388						

*SIGVerse (International Registration No. 1203063) and PrivacyVisor (International Registration No. 1208262) are also registered trademarks in Europe, the United States, and China. *QNNcloud is a registered trademark in Europe and China as well.

Collaboration with Industry, Government, and Academia (Advancing Practical R&D and Collaborative Activities)

NII carries out practical R&D in order to address real social issues in the field of informatics. Collaborations between industry, government, and academia are critical to implementing our R&D achievements in the real world. NII engages in industry–government–academia collaborations to strengthen and deepen such collaborations, as well as to help ensure that our R&D meets the needs of businesses and local authorities.

Action Program for Industry–Government–Academia Collaborations



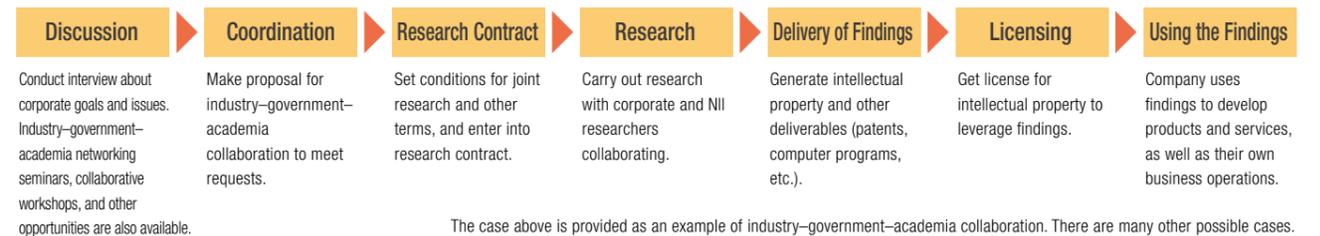
Academic Consultation by Researchers

NII offers consulting services that aim to expand the framework for industry–government–academia collaborations, explore possible collaborations with new partners, and contribute to society at large. Through communications between researchers and business people, our consulting services support startups by providing relevant policy advice from researchers on various issues that are likely to lead to innovations through industry–academia collaboration and benefit society.



Innovation Produced by Knowledge

Model Case of Collaboration with Industry, Government, and Academia

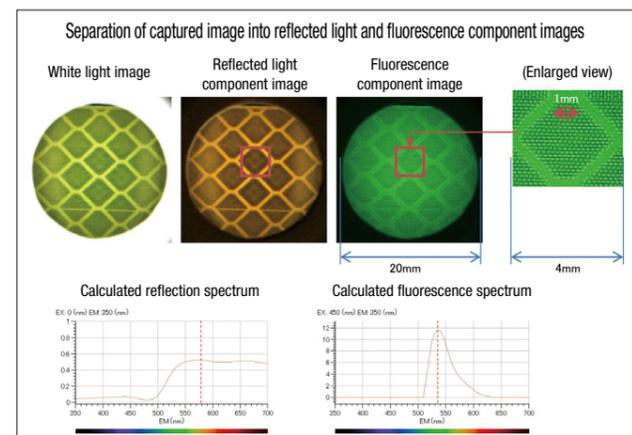


Example Case of Collaboration with Industry, Government, and Academia: NII - Hitachi High-Tech Science Corporation Achieving visualization of separated reflected light image and fluorescence image of objects EEM® View: CMOS Camera Imaging System for Fluorescence Spectrophotometer

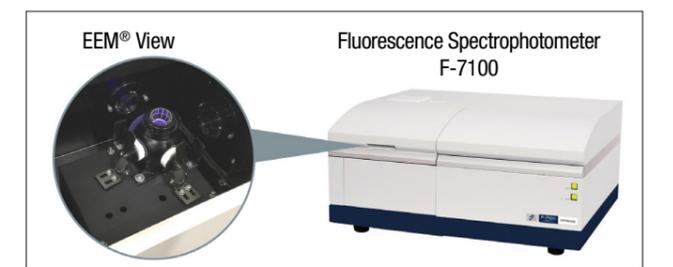
A new technology capable of simultaneously capturing both spectroscopic images and spectral data. The computational algorithm developed by NII Professor SATO, Imari and Associate Professor ZHENG, Yinqiang (Current affiliation: University of Tokyo) of the Digital Content and Media Sciences Research Division has made it possible to separate and visualize the fluorescent component and reflected component of images. By integrating it into Hitachi's fluorescence spectrophotometer, an object's spectral data and the fluorescence/reflected light images taken by the CMOS camera can

be captured at the same time. These captured sample images can then be subdivided into 25 sectors to obtain enlarged images and spectral fluorescence/reflection data for each sector. Whereas conventional fluorescence spectrophotometers are limited to obtaining the average spectral data for the entire sample, this technology allows visualization of the reflection/fluorescence spectra, making it possible to observe parts of the image with fluorescence emissions and obtain spectral data for specific locations, and enabling higher-precision measurements of fluorescent substances.

The fluorescence analysis tool in this device holds promising uses for R&D and quality control in a wide range of fields, not only in electronic and industrial materials for LEDs and display devices—areas in which the need for fine-grained measurement technologies is increasingly urgent—but also in areas such as food inspection, life sciences, and biotechnology.



The image separation algorithm separated the captured image into its reflected light component and fluorescent component. In the images, the reflected component is orange and the fluorescent component is green. These colors correspond to the respective spectral colors in the reflection and fluorescence spectra.



A dedicated fluorescence spectrophotometer measurement system capable of simultaneously capturing both spectroscopic images and spectral data.
*EEM® is a registered trademark of Hitachi High-Tech Science Corporation in Japan.

Research Seeds Collection: NII SEEDs

Since FY2014, NII has been publishing NII SEEDs every year to present our cutting-edge research in informatics that has great potential for industrial applications, as well as to provide an opportunity for joint research and partnerships with the industrial sector and government agencies. The latest issue entitled, "NII SEEDs 2021: Creating Innovation and Future Value through Informatics," showcases the research results of 24 researchers in a special report format classified into six categories: Foundation of Informatics, Information Infrastructure Science, Software Science, Multimedia Information Science, Intelligent Systems Science, and Information Environment Science. In addition, the issue begins with a section called "Researcher file" that features two of our researchers and highlights their personalities, the trajectories of their careers, their thoughts on research work, and much more.



NII SEEDs FY2021 edition
(Contains a list of NII's patents in Japan)

NII SEEDs website (in Japanese)
<https://www.nii.ac.jp/seeds/>

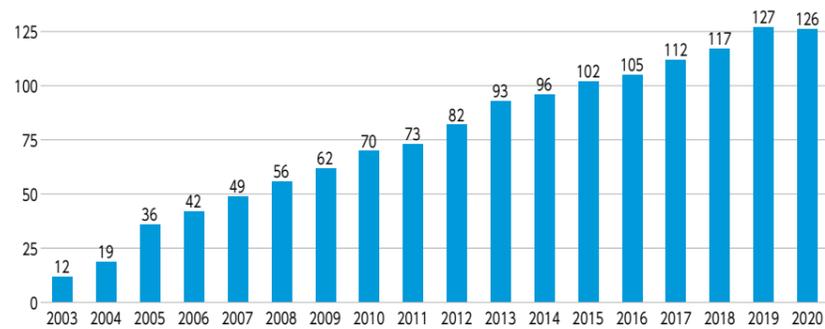
International Exchange

NII set up Global Liaison Office (GLO) to promote international exchange with overseas universities and research institutes. GLO handles various activities including entering into international exchange agreements through Memorandum of Understanding (MOU), running the NII International Internship Program for students from institutes under MOU agreements with NII, and coordinating MOU Grant/Non-MOU Grant to dispatch and invite researchers and students under research exchange grants.

International Exchange Agreements (MOU)

NII enters into international exchange agreements through MOU to systematically and actively promote international exchange with overseas universities and research institutes. As of March 2021, we have agreements with 126 institutions in 34 countries and regions. *See page 25 for the list of institutions.

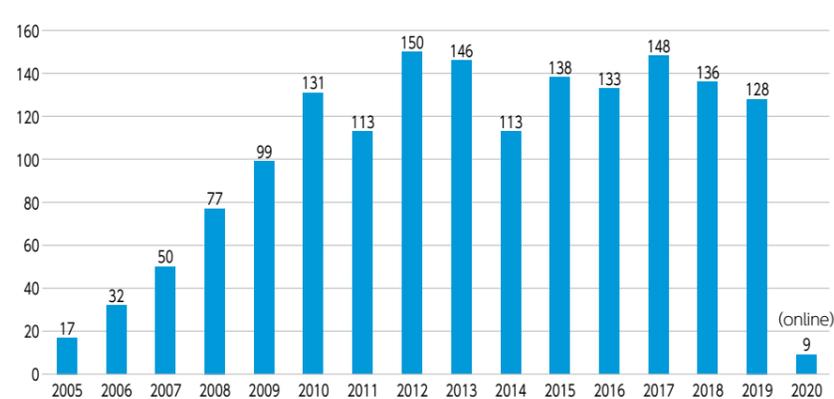
Number of MOU signatory institutes



NII International Internship Program

The NII International Internship Program welcomes students in masters or doctoral courses from institutions having MOU with NII. We accept applications from MOU signatory institutes twice a year on a broad range of nearly 100 research topics proposed each time by NII faculty members. Students work on their research topics under the supervision of their NII academic advisor during the internship period of two to six months (up to 180 days). Living expenses for the duration of the internship are covered and certificates of completion are issued upon completion. Since the start of the program in FY2005, NII has accepted more than 1,600 students and the program has greatly contributed to NII's research activities by promoting exchanges with MOU signatory institutions, presentations at international conferences, and a greater number of international papers, as well as other positive effects.

Number of accepted students to the NII International Internship Program



MOU/Non-MOU Grant

MOU Grant was established in FY2005 and Non-MOU Grant was established the following year as a financial assistance program for research exchange with our partner and non-partner institutions. With the aim of promoting and intensifying research exchange, MOU Grant dispatches and invites researchers and students for research exchanges with institutes under MOU, while Non-MOU Grant accepts foreign researchers for research exchanges with institutes without MOU. Expenses (travel and stay expenses) are covered for NII faculty and students, as well as for overseas researchers.

List of International Exchange Agreements (MOU)

34 countries and regions
MOU for research cooperation: 109 institutes

Country/Region	Name of Institution
People's Republic of China	School of Information Science and Technology, Department of Automation, Tsinghua University
	Institute of Computational Mathematics and Scientific/Engineering Computing, Academy of Mathematics and System Sciences, Chinese Academy of Sciences
	Tongji University
	School of Electronics Engineering and Computer Science, Peking University
	The Hong Kong University of Science and Technology (HKUST)
	The School of Electronic Information and Electrical Engineering of Shanghai Jiao Tong University
	University of Science and Technology of China (USTC)
	Institute of Computing Technology, Chinese Academy of Sciences (ICT-CAS)
	College of Electrical Engineering and Computer Science, National Taiwan University
	National Tsing Hua University, College of Electrical Engineering and Computer Science (NTHU EECS)
Taiwan	Department of Computer Engineering, Chulalongkorn University
Thailand	School of Engineering and Technology, Asian Institute of Technology
	Faculty of Science, Kasetsart University
	International Research Institute, Multimedia Information, Communication, and Applications (MICA)
Socialist Republic of Vietnam	Hanoi University of Science and Technology (HUST)
	Vietnam National University of Ho Chi Minh City (VNU-HCM)
	University of Science (Vietnam National University - Ho Chi Minh City)
	VNU University of Engineering and Technology
Republic of Korea	Department of Computer Science and Engineering, Seoul National University
Republic of Singapore	School of Computing, National University of Singapore (NUS)
India	Institute for Infocomm Research
Commonwealth of Australia	Indraprastha Institute of Information Technology, Delhi
	Commonwealth Scientific and Industrial Research Organisation (CSIRO) (Data61)
	The Faculty of Engineering and Information Technologies, The University of Sydney
The Kingdom of Saudi Arabia	School of Computing & Information Systems, Melbourne School of Engineering, The University of Melbourne
	Royal Melbourne Institute of Technology
	King Abdullah University of Science and Technology (KAUST)
United States of America	College of Engineering and Computer Science, University of Michigan-Dearborn
	College of Engineering, University of Washington, Seattle
	New Jersey Institute of Technology
	International Computer Science Institute
	University of Southern California
	School of Informatics, Computing, and Engineering, Indiana University
Canada	University of Illinois at Urbana-Champaign
	Faculty of Mathematics, University of Waterloo
	Faculty of Science, Department of Computing Science, Alberta Machine Intelligence Institute, University of Alberta (Amii)
	School of Computer Science, McGill University
Brazil	Simon Fraser University
	Polytechnique Montréal
Argentina Republic	York University
	Pontifical Catholic University of Campinas
Republic of Chile	The Faculty of Exact and Natural Sciences of Buenos Aires University
Ireland	The Irish Software Research Centre (Lero)
	Trinity College Dublin
	Dublin City University
French Republic	University of Nantes (Atlantic 2020)
	Institut National de Recherche en Informatique et en Automatique (INRIA)
	Institut National Polytechnique de Grenoble
	Université Grenoble Alpes (Université Joseph Fourier-Grenoble 1, UJF)
	Laboratoire d'Informatique de Paris 6, Sorbonne Université (l'université Pierre et Marie Curie) (LIP6)
	Toulouse INP-ENSEEIH
	National Center for Scientific Research (CNRS)
	Université Toulouse III - Paul Sabatier
	Université Toulouse III - Paul Sabatier
	Claude Bernard University Lyon 1

MOU for development and operational cooperation: 17 institutes

Country/Region	Name of Institution
Asia-Pacific	Asia-Pacific Ring (APR) Collaboration
United States of America	Indiana University
	North American Coordinating Council on Japanese Library Resources
	The New Venture Fund (NWF) on behalf of the Scholarly Publishing & Academic Resources Coalition (SPARC) Center for Open Science (COS)
Republic of Korea	Korea Education & Research Information Service (KERIS)
	Korea Institute of Science and Technology Information (KISTI)
Republic of the Union of Myanmar	Department of Higher Education (DHE)
	Myanmar Rectors' Committee (RC)
	EFL (Electronic Information for Libraries)

(as of March 2021)

Country/Region	Name of Institution
French Republic	Université Paris Sud
	University of Nice Sophia Antipolis
	LIMOS, Université Clermont Auvergne (formerly, The Blaise Pascal University of Clermont-Ferrand)
	The French National Audiovisual Institute (INA)
	Centre de Recherche en Informatique de Lens (CRIL)
	Institut de Recherche en Informatique et Systèmes Aléatoires (IRISA)
United Kingdom of Great Britain and Northern Ireland	Ecole Normale Supérieure de Lyon (ENS Lyon)
	Department of Computer Science, Faculty of Engineering Science, University College London
	Faculty of Science, Technology, Engineering & Mathematics, The Open University
	Department of Computer Science, University of Bristol
	University of Bath
	Department of Computing at Imperial College London
	Department of Computer Science, University of Oxford
	School of Computer Science & Electronic Engineering, University of Essex
	School of Informatics, University of Edinburgh
	Newcastle University
Federal Republic of Germany	University of Kent, Faculty of Sciences, School of Computing
	Department of Theoretical and Applied Linguistics, University of Cambridge
	Department of Computer Science & Technology, University of Cambridge
	The Alan Turing Institute
	Faculty of Applied Computer Science, University of Augsburg
	Institute of Information Systems, German Research Center for Artificial Intelligence (DFKI)
	The Faculty of Applied Science of the University of Freiburg
	RWTH Aachen University (Faculty of Mathematics, Computer Science and Natural Sciences)
	The German Academic Exchange Service (DAAD)
	Saarland University
Republic of Austria	Ludwig-Maximilians-Universität München
	Berlin Institute of Technology (TU Berlin)
	Technische Universität Braunschweig (TU Braunschweig)
	Technische Universität München (TUM)
	Georg-August-Universität Göttingen
	Department of Computer and Information Science at the University of Konstanz (ISGUK)
Italian Republic	Bochum University of Applied Sciences, Department of Electrical Engineering and Computer Science
	The Faculty of Science at the University of Potsdam
Swiss Confederation	Vienna University of Technology
	Dipartimento di Informatica, Università degli Studi di Torino
Republic of Finland	Politecnico di Milano, Dipartimento di Elettronica, Informazione e Bioingegneria
	Università degli Studi di Ferrara (UNIFE)
The Kingdom of Sweden	Dipartimento di Informatica - Scienza e Ingegneria (DISI), Università di Bologna
	Institute of Electrical Engineering in Ecole Polytechnique Fédérale de Lausanne
Czech Republic	University of Zurich
	Aalto University
The Kingdom of Spain	School of Computer Science and Communications (CSC), KTH Royal Institute of Technology
	Faculty of Electrical Engineering, Czech Technical University in Prague
Hellenic Republic	The Institute of Physiology of the Czech Academy of Sciences
	Universitat Politècnica de València (UPV)
Netherlands	Universidad Politécnica de Madrid (UPM)
	Facultat d'Informàtica de Barcelona, Universitat Politècnica de Catalunya (UPC)
Portuguese Republic	Athena Research & Innovation Center
	Faculty of Electrical Engineering, Mathematics and Computer Sciences of Delft University of Technology (TU Delft)
Arab Republic of Egypt	Instituto de Engenharia de Sistemas e Computadores, Investigação e Desenvolvimento em Lisboa (INESC-ID)
	INESC Technology and Science (INESC TEC)
	University of Minho
	Egypt-Japan University of Science and Technology (E-JUST)

Country/Region	Name of Institution
Federal Republic of Germany	Hochschulbibliothekszentrum des Landes Nordrhein-Westfalen
	German National Library of Science and Technology (TIB)
	German National Library of Medicine (ZB MED)
European Union (EU)	Gigabit European Academic Network (GÉANT)
Africa	European Organization for Nuclear Research (CERN)
Asia-Pacific and Europe	West and Central African Research and Education Network (WACREN)
	Asiapacific-Europe Ring (AER) Collaboration

International Exchange

NII Shonan Meeting

<https://shonan.nii.ac.jp>

NII launched the NII Shonan Meeting in February 2011. The NII Shonan Meeting constitutes the first seminar series in Asia in the style of the Dagstuhl Seminars, which brings together top-class researchers from around the world for intensive discussions on issues in the field of informatics with the goal of solving difficult problems. The meetings are jointly hosted by NII and Kanagawa Prefecture under a partnership agreement.

The venue, Shonan Village Center, is easily accessible from Narita Airport and Haneda Airport, and is located in an environment blessed by nature where participants can focus on their research work. More than 150 seminars have been held so far. In August 2014, we also launched NII Shonan School, which is intended primarily for students and young researchers.

*Dagstuhl Seminar: A renowned seminar series in the field of informatics held almost every week in Dagstuhl, Germany. It is famous for its training camp style format where participants stay for about a week to hold intensive discussions on a specific topic.



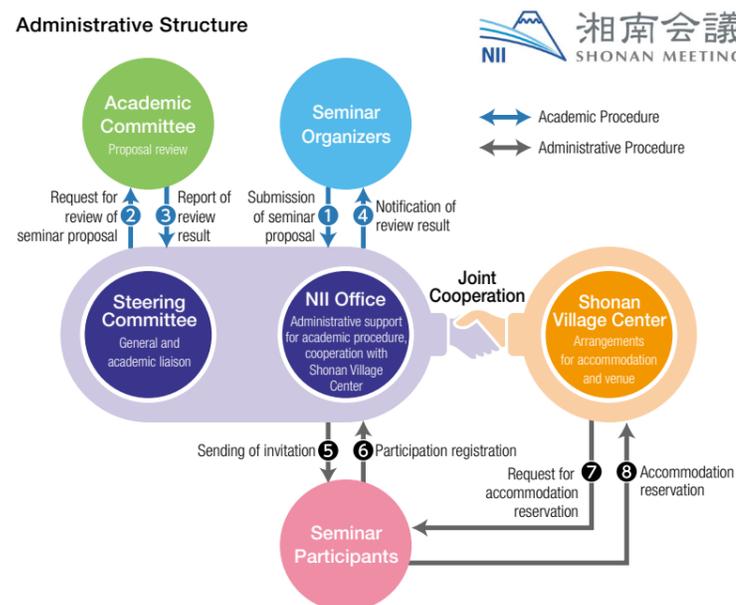
Shonan Village Center



Support Setup

The Office of NII Shonan Meeting and Shonan Village Center staff manage various activities on behalf of seminar organizers, including sending invitations, providing information on accommodations, and preparing the venue on seminar days. The program also includes events such as historical walks through Kamakura to cultivate personal exchanges and friendships among participants.

Administrative Structure



NII Shonan Meeting Memorial Lectures

The NII Shonan Meeting Memorial Lectures are held annually and co-hosted by NII and Kanagawa Prefecture. NII researchers give open lectures on the latest research topics in the field of informatics.



NII Shonan Meeting Memorial Lecture

Call for Seminar Proposals

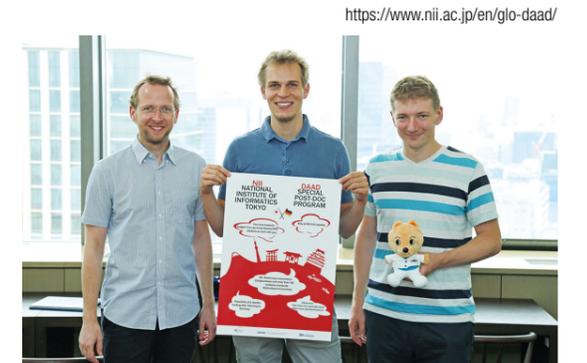
We accept seminar proposals for the NII Shonan Meeting throughout the year. The deadlines for submission are twice a year, June 15 and December 15. Following the review of the proposal by the Academic Committee at NII, seminar organizers will be notified of the result.

Contact: Office of NII Shonan Meeting, shonan@nii.ac.jp

Agreement with the German Academic Exchange Service (DAAD)

NII has a special agreement with the German Academic Exchange Service (DAAD) that allows German postdoctoral researchers to carry out research projects under the supervision of NII faculty members.

Under this agreement, postdocs can stay at NII for a minimum of three months (six months is recommended) and up to a maximum of two years with the support of DAAD. During their stay, they will carry out their own programs and receive research advice from the faculty at NII. The postdocs can also enlist the help of Master's and Ph.D. students and engineers on conducting projects. Since NII is an inter-university research institute, they can visit NII's partner universities and research institutes in Japan to build their network in Japan.



<https://www.nii.ac.jp/en/glo-daad/>

Japanese-French Laboratory for Informatics (JFLI)

The Japanese-French Laboratory for Informatics (JFLI) was founded in 2008 as a hub for informatics research exchange between France and Japan by five institutions, namely the National Center for Scientific Research (CNRS) in France, Sorbonne University (University of Paris VI), The University of Tokyo (Graduate School of Information Science and Technology), Keio University, and NII. It was turned into a Joint International Unit (JMI) of CNRS in 2012, and has since been more active in conducting research exchange. JFLI carries out collaborative research with a special emphasis on the important and challenging areas of informatics. The main research topics are (1) next-generation networks; (2) high-performance computing; (3) software, programming models, and formal methods; (4) virtual reality and multimedia; and (5) quantum computing. The institutions have all engaged in collaborative research, including Japanese institutions accepting researchers and graduate students from French research institutes. Workshops for enhancing collaborative research and research presentations that serve as venues for graduate internship students to present their research are also held regularly. The JFLI Seminar is another one of its regular activities. Networks of researchers have recently been forming as a result of such activities conducted through JFLI. In March 2016, a JFLI-wide workshop was held at NII that invited outside researchers who have been involved with JFLI. JFLI also organizes joint workshops with universities and other non-member institutions. There are now plans to collaborate with other UMIs of CNRS across the Asian region with similar research interests. Going forward, JFLI will continue working to promote informatics research through research collaboration between the two countries and in partnership with universities in Japan.



<https://jfli.cnrs.fr/>

Minister of Higher Education, Research and Innovation of France VIDAL, Frédérique (left) and Director-General KITSUREGAWA, Masaru



Active research exchange at JFLI

Department of Informatics, School of Multidisciplinary Sciences, The Graduate University for Advanced Studies, SOKENDAI

Establishment of Graduate School

In April 2002, National Institute of Informatics joined up with The Graduate University for Advanced Studies, SOKENDAI to launch the Department of Informatics with a three-year Ph.D. course, and saw its first students graduate in March 2005. A five-year Ph.D. course was launched in AY2006. SOKENDAI was founded as the first graduate university in Japan with the aim of fostering original, world-class academic research that transcends the boundaries of traditional disciplines and pioneering advanced fields of study that create new lines of scientific inquiry.

Content and Structure

The Department of Informatics aims to develop young IT researchers and engineers who will take the lead at the international level in the 21st century. Students will be able to earn a Doctor of Philosophy in Informatics degree (or a Doctor of Philosophy in Science degree, depending on the course content). The Department offers education and research guidance in the following six fields: (1) foundations of informatics, (2) information infrastructure science, (3) software science, (4) multimedia information science, (5) intelligent systems science, and (6) information environment science. Around 70 subjects are available as special subjects of the department and common specialized subjects of the school.

Features of the Department

The Department of Informatics actively welcomes students from overseas and is a place filled with lively cross-cultural communication between students. There are also many working students, accounting for around 20% of the student body.

Number of students in the Department of Informatics (as of April 2021) *() indicates number of international students

Five-year Ph.D. course	Three-year Ph.D. course	Total
54 (30)	43 (23)	97 (53)



SOKENDAI (Hayama Campus)



Lecture at the Department of Informatics

[Message from the Dean of the Department of Informatics]



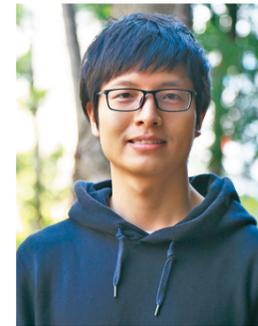
SUGIMOTO, Akihiro

(Professor, Digital Content and Media Sciences Research Division, National Institute of Informatics)

The Department of Informatics encompasses six fields: foundations of informatics, information infrastructure science, software science, multimedia information science, intelligent systems science, and information environment science. These fields are comprehensive and cover a wide range of academic studies, including not only conventional computer science and information engineering, but also artificial intelligence, mathematics, and data science, which are core study areas in a data-driven world, as well as human informatics and social informatics, which address human and social issues. The Department conducts research and education at various phases—basic, applied, and practical—with the goal of educating researchers while at the same time educating highly specialized professionals and grooming leaders who will produce great achievements in the field of informatics.

National Institute of Informatics provides research supervision in a form that matches the ambition, purpose, and research plan of each student, using a coaching system on a nearly one-to-one basis, and running a degree-teaching program conducted by its world-class researchers. Moreover, we have set up a sub-advisor system, in which several faculty members conducting research in different fields, or from different angles in the same field, act as sub-advisors to give advice on the content and direction of research from a broad range of perspectives. Using the dual-degree system, it is also possible to receive doctoral research guidance at overseas research and educational institutions for a period of time. We have put in place a teaching program that provides plenty of time for students with a bachelor's degree to work on their own research topics in the five-year Ph.D. course, while students with a master's degree can concentrate on working on their ongoing research topics in the three-year Ph.D. course. Students in the Department of Informatics are both students of SOKENDAI and members of National Institute of Informatics. They can therefore study in an environment of international collaboration on a daily basis, join various research projects, and gain training experience as international researchers through exchange programs with partner universities and research institutes overseas. Around half of our Japanese students are working students who enrolled in the course to overhaul what they have worked on so far from a research standpoint, as well as to learn the latest technologies, while keeping their current positions at companies and other organizations. Another key feature of the Department is the high percentage of international students. Many lectures are in English, and many laboratories also hold seminars in English. For young people aspiring for international success, it offers a rare environment for cross-cultural exchange among students. Furthermore, students can expand their social circle considerably and build rich human networks through collaborations with other core institutions and departments of SOKENDAI.

Research by Current Students

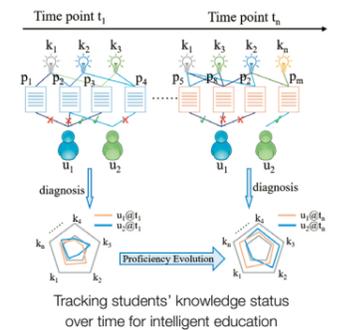


GAN, Wenbin

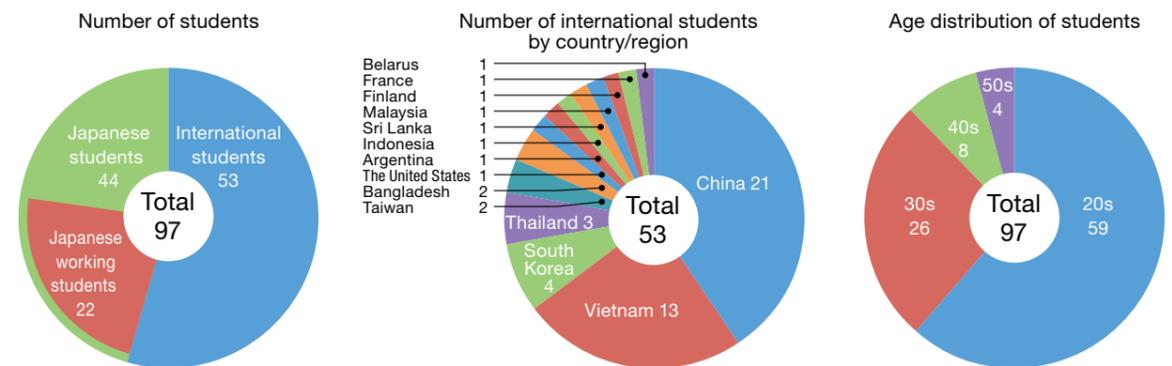
Enrolled in April 2019 to the three-year Ph.D. course, Department of Informatics, School of Multidisciplinary Sciences, SOKENDAI
Main Supervisor: Associate Professor SUN, Yuan

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 an adaptive service.

My research involves creating new methodologies to assess and trace students' knowledge states based on their past performance in solving exercises. 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.



Student Data (as of April 2021)



Career paths of students after course completion

(over the past three years) *() indicates number of international students

Year of completion	University/Research institution	Private sector	Undetermined	Total
AY2020	10 (7)	6 (3)	2 (2)	18 (12)
AY2019	5 (3)	7 (4)	2 (2)	14 (9)
AY2018	5 (5)	5 (2)	1 (1)	11 (8)



Graduation and Outstanding Student Award Ceremony (September 2019)

Curriculum

The Department of Informatics provides research and education conducted by world-class researchers within the state-of-the-art environment and international atmosphere of NII.

The Department covers a broad range of interdisciplinary fields, from fundamental disciplines such as mathematics to the basics of computer architecture and networks, and extending to software and media engineering, artificial intelligence, information sociology, and research informatics. We have run a flexible educational system since the Department was first established, through classes and research guidance in small groups in order to meet each student's needs. Cutting-edge research and education are provided every day, with the aim of producing professionals capable of working at the forefront of the informatics field. The academic year consists of two semesters: the first running from April to September and the second semester running from October to March.

To complete the course, students are required to earn the necessary credits, carry out their research under proper supervision, and pass a review of their doctoral dissertation summarizing their research findings. The minimum number of credits required is 10 units for the three-year doctoral course and 40 units for the five-year doctoral course. Program duration is flexible, and may be shortened for students who have shown excellent research achievements. If a student enrolled in the integrated program withdraws before graduation, they may be awarded a master's degree as long as they meet certain requirements.

1. Special Subjects of the Department of Informatics

Foundations of Informatics	Logic in Computer Science (TATSUTA, Makoto); Theory of Numerical Methods (TBD); Algorithms (UNO, Takeaki); Discrete Mathematics (KAWARABAYASHI, Ken-ichi); Mathematical Logic (TATSUTA, Makoto)
	Quantum Information Systems (NEMOTO, Kae); Quantum Computation (MATSUMOTO, Keiji); Computational Neuroscience (TBD); Sublinear Algorithms (YOSHIDA, Yuichi)
	Control Theory and Optimization (KISHIDA, Masako); Numerical Analysis (TBD); Graph Algorithms (TBD); Algorithmic Market Design (YOKOI, Yu)
	Computational Complexity Theory (HIRAHARA, Shuichi); Computational Game Theory (IGARASHI, Ayumi); Combinatorial Optimization for Machine Learning (FUJII, Kaito)
Information Infrastructure Science	Computer System Design (YONEDA, Tomohiro; GOSHIMA, Masahiro; ISHIKAWA, Yutaka); Information and Communication Systems (JI, Yusheng; ABE, Shunji; FUKUDA, Kensuke; KANEKO, Megumi)
Software Science	Mathematical Structures in Programming (TBD); Distributed Systems (SATO, Ichiro); Data Engineering (TAKASU, Atsuhiko); Software Engineering (ISHIKAWA, Fuyuki); Signal Processors (HASHIZUME, Hiromichi)
	Probabilistic Models in Informatics (KITAMOTO, Asanobu); Mathematical Structures in Formal Methods (HASUO, Ichiro)
	Database Theory (KATO, Hiroyuki); Programming Languages and Theory (TSUSHIMA, Kanae); Formal Methods for Cyber-Physical Systems (HASUO, Ichiro)
	Software Verification (SEKIYAMA, Taro); Embedded Real-Time Systems (AOKI, Shunsuke)
Multimedia Information Science	Digital Media Infrastructure (ECHIZEN, Isao; SUGIMOTO, Akihiro; KATAYAMA, Norio; ZHENG, Yinqiang (University of Tokyo); TAKAYAMA, Kenshi); Fundamentals of Media Processing (YAMAGISHI, Junichi; KODAMA, Kazuya; IKEHATA, Satoshi; MO, Hiroshi; SATOH, Shin'ichi)
	Applications of Multimedia Processing (YAMAGISHI, Junichi; SUGIMOTO, Akihiro; SATO, Imari; AIZAWA, Akiko; ZHENG, Yinqiang (University of Tokyo); ANDO, Ryoichi); Interactive Media (ARAI, Noriko; AIHARA, Kenro; GOTODA, Hironobu; YU, Yi)
Intelligent Systems Science	Logical Foundations for Artificial Intelligence (INOUE, Katsumi); Knowledge Sharing System (TAKEDA, Hideaki); Reasoning Science (SATO, Ken); Human-Agent Interaction (YAMADA, Seiji)
	Machine Learning (ICHISE, Ryutarō); Natural Language Processing (AIZAWA, Akiko; SUGAWARA, Saku); Robot Informatics (INAMURA, Tetsunari); Deep Learning (PRENDINGER, Helmut)
	Cluster Analysis (HOULE, Michael E); Communication Environments (BONO, Mayumi); Computational Social Science (MIZUNO, Takayuki)
	Data Mining (SUGIYAMA, Mahito); Cognitive Robotics (TBD)
Information Environment Science	Digital Publications (OYAMA, Keizo); Information Retrieval (KANDO, Noriko); ICT-Enabled Business (OKADA, Hitoshi); Introduction to Statistical Methods in Bibliometrics (SUN, Yuan); Methodology of Scientometrics (NISHIZAWA, Masaki)
Common Subjects (Faculty in Charge of the Department of Informatics)	Research in Informatics for Ph.D. Thesis IA, IB - VA, VB
	Seminar on Basic Knowledge in Informatics IA, IB - IIA, IIB
	Research in Informatics for Master Thesis IA, IB - IIA, IIB

2. Common Specialized Subjects of the School of Multidisciplinary Sciences

Introduction to Mathematical Logic (TATSUTA, Makoto); Introduction to Algorithms (UNO, Takeaki); Quantum Information and Computing (NEMOTO, Kae; MATSUMOTO, Keiji)
High-Performance Computing (AIDA, Kento; ISHIKAWA, Yutaka; KOIBUCHI, Michihiro; TAKEFUSA, Atsuko); Information Sharing System Architecture (JURUSHIDANI, Shigeo; TAKAKURA, Hiroki; KURIMOTO, Takashi)
Introduction to Software Science I (All Professors in Software Science); Introduction to Software Science II (All Professors in Software Science); Introduction to Multimedia Information Science (All Professors in Multimedia Information Science; ZHENG, Yinqiang (University of Tokyo))
Introduction to Intelligent Systems Science I (INOUE, Katsumi; YAMADA, Seiji; AIZAWA, Akiko; INAMURA, Tetsunari; ICHISE, Ryutarō; HOULE, Michael E)
Introduction to Intelligent Systems Science II (SATO, Ken; TAKEDA, Hideaki; PRENDINGER, Helmut; SUGIYAMA, Mahito; BONO, Mayumi; MIZUNO, Takayuki; SUGAWARA, Saku); Introduction to Information Environment Science (All Professors in Information Environment Science)
Scientific Presentation (HOULE, Michael E; KANEKO, Megumi; IGARASHI, Ayumi; WU, Stephen (Institute of Statistical Mathematics); BRUNO, F. Lourenço (Institute of Statistical Mathematics); JONES, Caryn (Visiting Lecturer))
Scientific Writing (HOULE, Michael E; KANEKO, Megumi; IGARASHI, Ayumi; WU, Stephen (Institute of Statistical Mathematics); BRUNO, F. Lourenço (Institute of Statistical Mathematics); JONES, Caryn (Visiting Lecturer)); Introduction to Information Security Infrastructure (ECHIZEN, Isao; OKADA, Hitoshi; TAKAKURA, Hiroki)
Applied Linear Algebra (GOTODA, Hironobu; SATOH, Shin'ichi; KISHIDA, Masako); Introduction to Big Data Science (Professors Related to Big Data); Practical Data Science (YAMAJI, Kazutsuna)

Partnership with Graduate Schools

NII actively cooperates on graduate school education with The University of Tokyo, Tokyo Institute of Technology, Waseda University, Japan Advanced Institute of Science and Technology, Kyushu Institute of Technology, The University of Electro-Communications, and Tokyo University of Science. In partnership with these institutions, we give lectures and accept graduate students for research supervision.

Partner Graduate Schools

University	Graduate School	Note
The University of Tokyo	Graduate School of Information Science and Technology	Since AY2001
Tokyo Institute of Technology	Graduate School of Information Science and Engineering	Since AY2002
	Interdisciplinary Graduate School of Science and Engineering	Since AY2003
	School of Engineering (undergraduate)	Since AY2016
	School of Engineering (graduate school)	
Waseda University	Graduate School of Fundamental Science and Engineering	Since AY2005
	Graduate School of Creative Science and Engineering	
	Graduate School of Advanced Science and Engineering	
Japan Advanced Institute of Science and Technology	Graduate School of Advanced Science and Technology	Since AY2008
Kyushu Institute of Technology	Graduate School of Computer Science and Systems Engineering	Since AY2010
	Faculty of Computer Science and Systems Engineering	
The University of Electro-Communications	Graduate School of Information Systems	Since AY2012
	Graduate School of Informatics and Engineering	
Tokyo University of Science	Graduate School of Science	Since AY2015

Research Students for Special Collaboration

As an inter-university research institute, NII accepts graduate students from other universities in Japan and overseas as research students for special collaboration (exchange graduate students). Research students for special collaboration are supervised by NII faculty members of the National Institute of Informatics according to their research topics.

University Affiliations of Research Students for Special Collaboration

(AY2020)

Ochanomizu University	École polytechnique
Chiba University	Federal University of São Carlos
University of Tokyo	Peking University
Tokyo University of Science	University of Edinburgh
Tottori University	University of Konstanz
Chinese Academy of Sciences	University of Wuppertal
Claude Bernard University Lyon 1	Zhejiang University

Number of Students Accepted through Both Schemes:

Partnership with Graduate Schools and Research Students for Special Collaboration (AY2020)

Master's course	Doctoral course	Total
45	33	78

Science Information NETWORK (SINET) Available Nationwide at Ultra-High Speed with Low Latency

<https://www.sinet.ad.jp/en/>

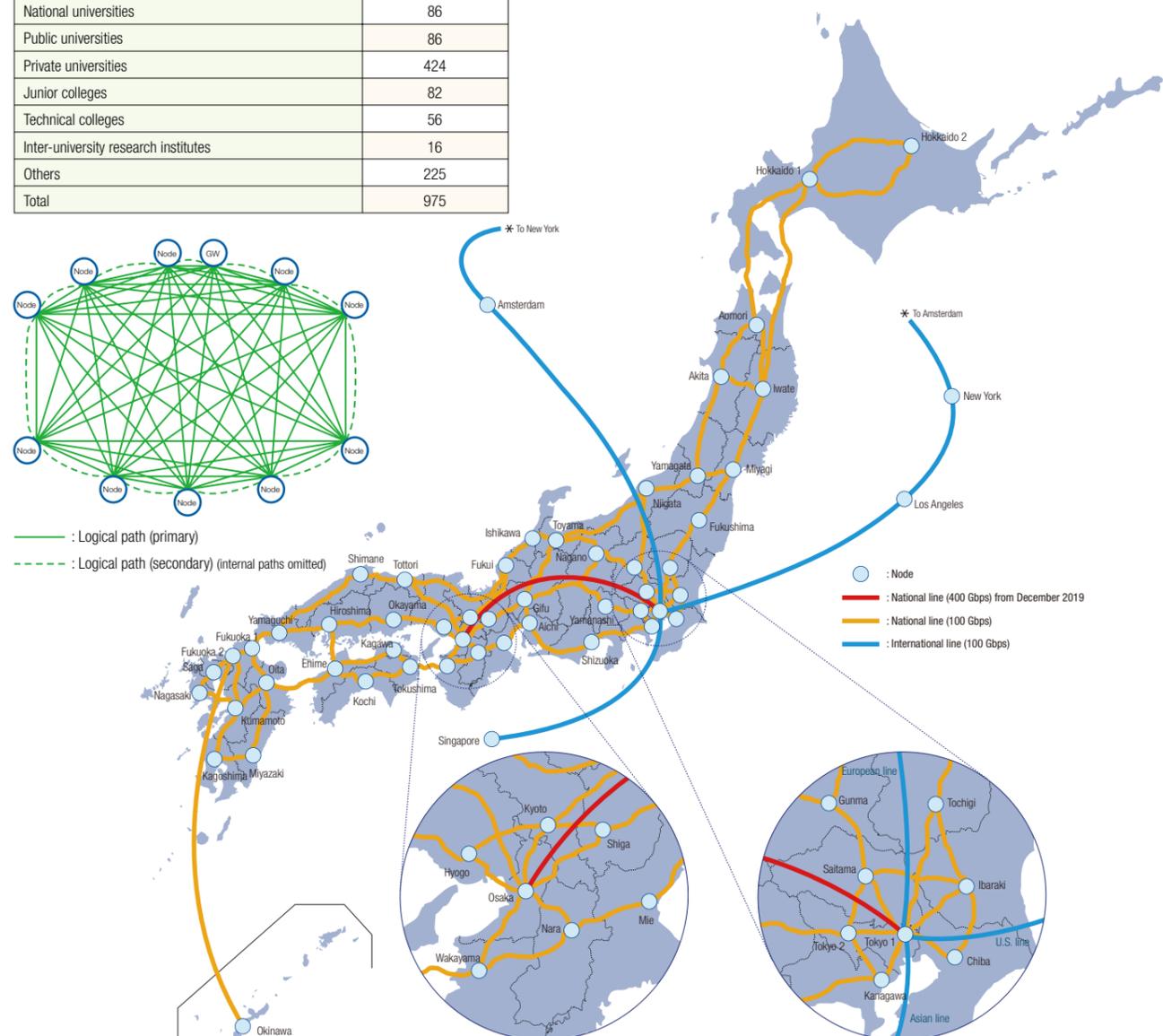
100G Full-mesh Connectivity Opens Up New Possibilities

The Science Information NETWORK (SINET) is an information and communications network built and operated as an academic information infrastructure for universities and research institutions throughout Japan. With nodes (network connection points) across Japan, the advanced network is provided to universities and research institutes in order to help support community-building among the numerous people involved in research and education, and to encourage wide distribution of scientific information. SINET is also interconnected with many research networks overseas, including Internet2 in the U.S. and GÉANT in Europe, to facilitate the circulation of research information between countries that is vital for advanced international research projects.

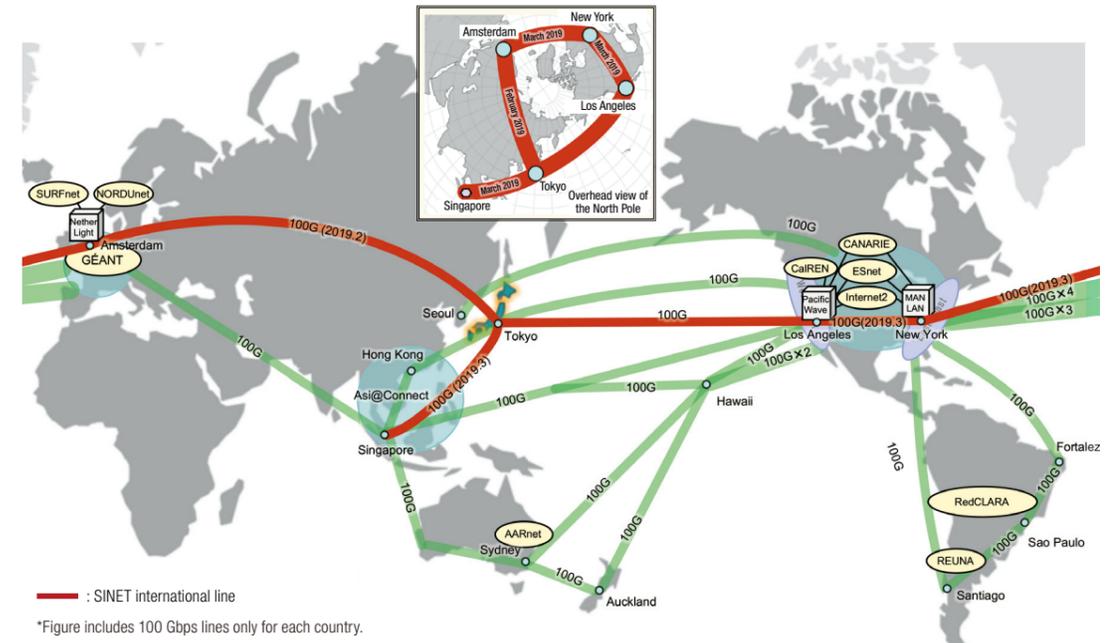
SINET5 is an upgrade of the previous version of the network, SINET4. Full-scale operations of SINET5 started in April 2016. SINET5 provides high-level academic information platforms to more than 900 universities and institutions by organically connecting and coordinating cloud, security, and academic content infrastructures on a 100 Gbps nationwide network. In December 2018, we launched the pilot test of a core function directly connecting mobile networks and SINET. The service enables users to flexibly use the computing resources of universities and cloud resources as needed for data collection and analysis using mobile networks. We also began operations of an international 100 Gbps ultra-high speed ring network circling the globe, Japan–U.S.–Europe–Japan, in March 2019. As a national research and education network (NREN), this is the world's first international line circling the globe to be built as a single network. At the same time, we also upgraded the line between Japan and Singapore to 100 Gbps. To meet increasing traffic demand within Japan, we implemented a 400 Gbps line directly connecting Tokyo and Osaka in December 2019, which will enable stable, uninterrupted operations of scientific research projects. We believe these efforts will help to further strengthen international cooperation and Japan's international competitiveness. We also hope that these will speed up the advanced integration of cyberspace (virtual space) and physical space (real space), and ultimately help achieve Society 5.0, Japan's vision of the ideal society in the future.

Number of member institutions in SINET (as of March 31, 2021)

National universities	86
Public universities	86
Private universities	424
Junior colleges	82
Technical colleges	56
Inter-university research institutes	16
Others	225
Total	975



Interconnection with Overseas Research Networks



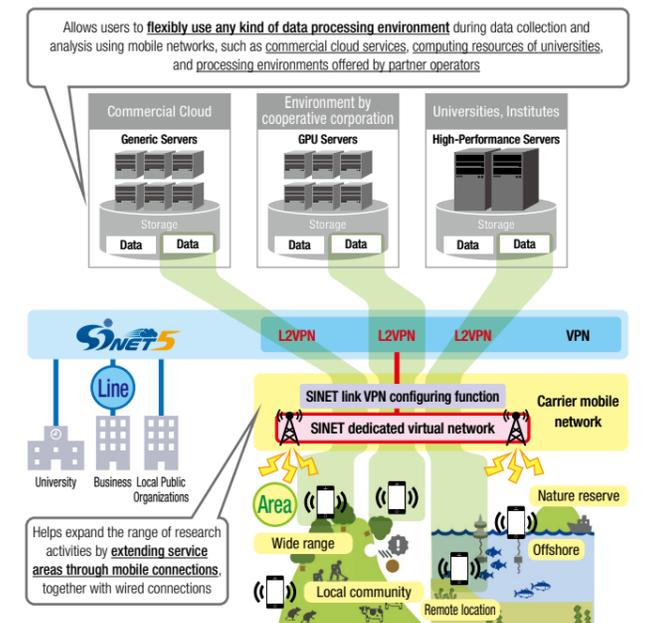
SINET5 Services

We provide new services through joint consideration and development, based on requests from universities and institutes. SINET5 offers 100GE, 40GE, and other ultra-high speed network interfaces. To create a secure and flexible research environment at universities and research institutes, we are expanding our network services to better serve our users; this effort includes university LAN virtualization, L2 on demand, and wide-area data collection infrastructure. We also provide the world's most advanced high-speed file transfer software for users needing high-capacity data transfer.

Service	Notes
L3 Service	Internet connection (IPv4 & IPv6) Full Route Provision IP multicast (+QoS) QoS per application L3VPN(+QoS)
L2 Service	L2VPN/VPLS(+QoS) University LAN Virtualization L2 on demand (Basic) L2 on demand (International collaboration: NSI) L2 on demand (Cloud collaboration: REST)
L1 Service	Leased wavelength line
Wide-Area Data Collection Infrastructure	Secure mobile connection Pilot test started from December 2018
Redundancy of Access Line	Multihoming Link aggregation Redundant trunk group service
Stabilization of Network Operations	DDoS mitigation Security measure function
Next-Generation Network Functions	NFV service In trial phase
Enhanced Transfer Performance	Performance measurement High-speed file transfer Achieved world's fastest at 416 Gbps between Japan and the U.S.

Wide-Area Data Collection Infrastructure

In December 2018, we began pilot tests of a new service, the SINET Wide Area Data Collection Infrastructure. It offers a one-stop data collection and data processing service from mobile devices for use in research on the environment, ecology, and IoT, among others, bringing us one step closer to the realization of Society 5.0. The service allows users to collect research data from a wide range of areas that were previously unreachable by wired networks, using mobile networks provided by private mobile carriers. In conjunction with a secure network service, namely, L2VPN, research data can be collected safely. Users can connect to various data processing environments and create a one-stop extensive research environment.



Concepts and Features of SINET5

<https://www.sinet.ad.jp/en/>

Five Major Concepts of SINET5

(1) Innovative Connectivity

Uses leading-edge technologies that minimize communication lags. The latest transmission technologies made it possible to create a full-mesh topology that minimizes transmission delays between all node connections.

(2) Ultra-High Speed

Delivers a high-speed 100 Gbps nationwide network. SINET5's state-of-the-art digital coherent technology created an overall stable 100 Gbps nationwide network.

(3) Robust and Reliable

Provides a highly robust and reliable network without interruptions or downtime. SINET5 adopts a multilayered advanced network architecture (physical layer, MPLS-TP network layer, IP/MPLS network layer), with redundancies configured at each layer, as well as bottleneck avoidance and bypassing features, which are all linked together to create a highly robust and reliable network.

(4) Global Reach

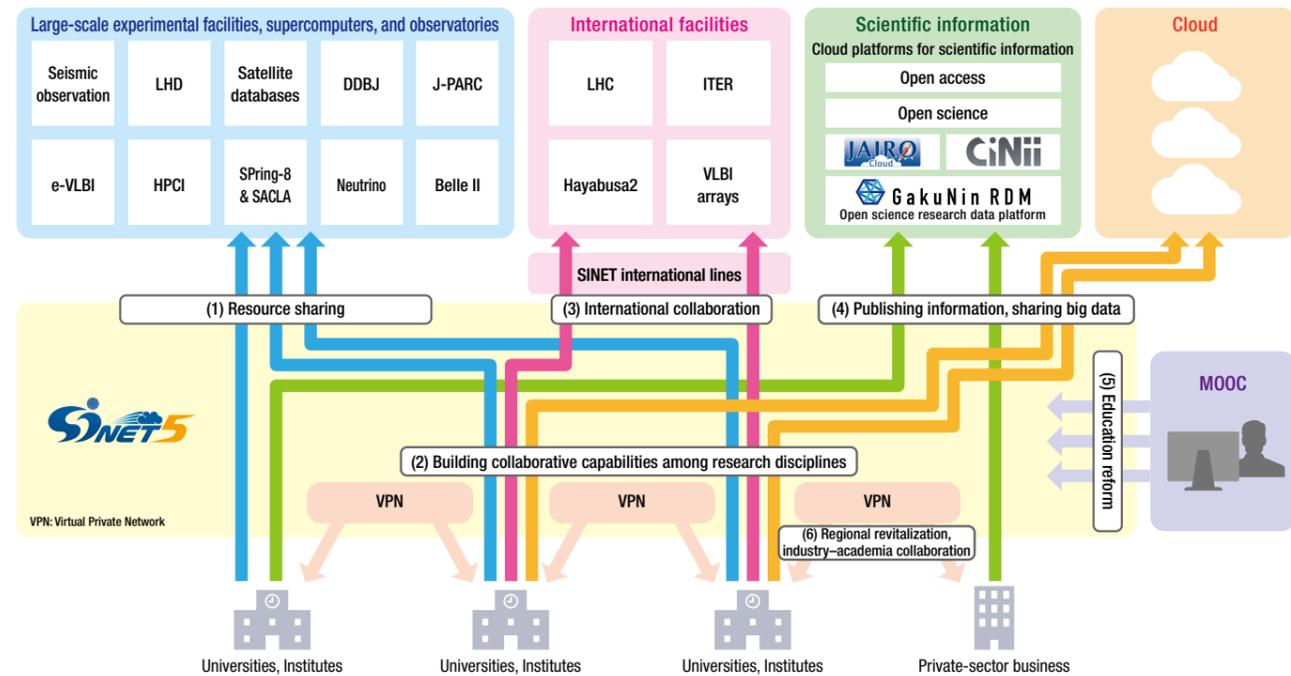
Offers high-speed international lines directly connected to the U.S., Europe, and Asia. Low latency is achieved by building a direct line to Europe, not going through the U.S. SINET5 strengthens support for international joint research projects by upgrading to 100 Gbps bandwidth in all directions to the U.S., Europe, and Asia, in order to create a ring of connectivity between Japan, the U.S., and Europe.

(5) Multifunctionality

Promotes a variety of developments in academic information infrastructure, such as security, use of cloud systems, and academic content.

Features of SINET5

SINET was built and operated as a platform for (1) resource sharing of large testing facilities; (2) building the collaborative capabilities among research disciplines; (3) international collaboration with countries worldwide; (4) publishing academic information and sharing big data; (5) improving the quality of university education; and (6) knowledge-intensive centers of regional revitalization, local universities, and collaboration between industry and academia.

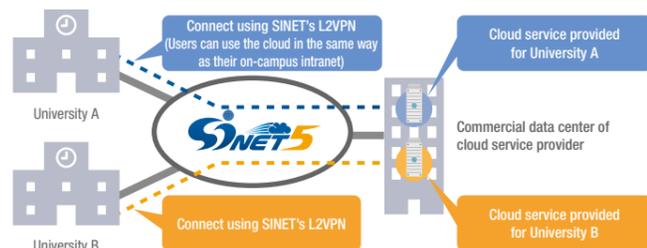


SINET Cloud Connection Service

https://www.sinet.ad.jp/connect_service/service/cloud_connection

The service allows member universities and research institutes to access secure and fast cloud environments by directly connecting SINET and commercial clouds using L2VPN.

Note that SINET does not offer cloud services. This service provides an environment that directly connects SINET to commercial clouds for the convenience of cloud users in member institutions.



GakuNin Cloud: Support for Cloud Adoption and Use

<https://cloud.gakunin.jp/>

NII provides three services under the GakuNin Cloud brand to support the adoption and use of clouds in universities and research institutes. We do this with the aim of developing advanced academic information platforms using clouds.

GakuNin Cloud Adoption Support Service

The GakuNin Cloud Adoption Support Service collects, distributes, and shares information on the criteria for selecting cloud services, as well as on their adoption and use, for universities and research institutes. We have developed and published a checklist of items that need to be confirmed before universities and research institutes adopt cloud services. We have also added the implementation status of cloud service providers to the checklist based on responses from providers. The responses are verified by NII and made available to institutions considering to adopt those services.

When developing specifications for cloud procurement, the verified checklist makes it possible to compare several cloud services with the same criteria and thereby select cloud services which meet the needs of the institution.

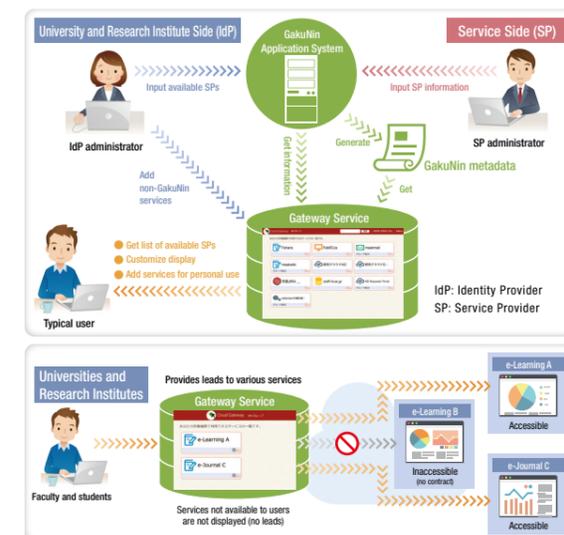
In addition, NII conducts individual consultations on cloud adoption, hosts seminars on cloud services for universities and research institutes, and provides documents such as cloud startup guides and cloud use cases.



GakuNin Cloud Gateway Service

The GakuNin Cloud Gateway Service provides a portal for one-stop access to various cloud services required for conducting research and education, as well as to electronic journals and other online services.

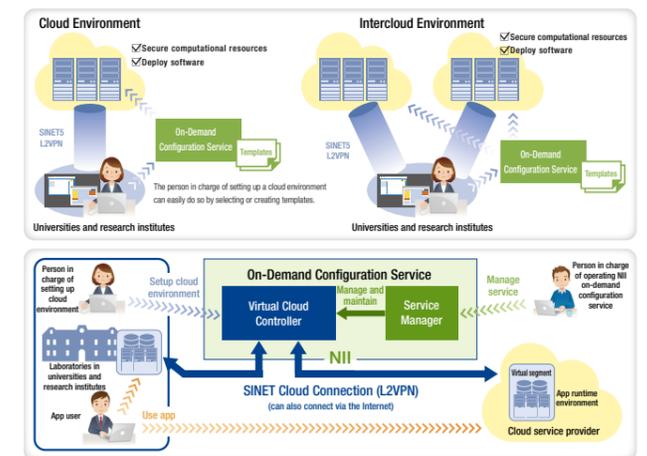
Users (faculty and students) at universities and research institutes can see the various services available at their institution by accessing the portal site via the authentication platform operated by their institution. They can then quickly and easily use these services. Moreover, IdP administrators at universities and research institutes can customize the list of services displayed to users, and the users themselves can add services, providing a high degree of flexibility and usability.



GakuNin Cloud On-Demand Configuration Service

The GakuNin Cloud On-Demand Configuration Service provides support for setting up complex applications environment over clouds.

Users of this service can install and set up an application environment on cloud resources relatively easily using prepared templates. The service is also applicable to the SINET5 Cloud Connection Service. This makes it possible to setup a secure on-demand intercloud environment consisting of computers at universities and research institutes and multiple cloud environments connected to SINET5, for use in research, education, and IT system operations.



SINET Cloud Connection: Provides cloud connection to member institutions by directly connecting SINET and commercial clouds. A SINET service allows high-performance, safe, and low-priced use of commercial cloud services.

Building an Authentication Infrastructure

GakuNin: Academic Access Management Federation in Japan



The Academic Access Management Federation in Japan, GakuNin, is a framework for utilizing the authentication platform of universities not only for on-campus services but also for collaboration with other universities and commercial services. GakuNin enables safe and secure use and provision of academic services on the Internet through identification of individuals and institutions. With Single Sign-On, users can seamlessly and automatically login to multiple on- and off-campus services with a single login. Meanwhile, for universities, creating an authentication platform compatible with GakuNin makes it possible to reduce personnel cost for ID management and raise the level of security measures.

Data on Participants (as of the end of March 2021)

Number of organizations (IdP: Identity Providers)	257
Number of service providers (SP: Service Providers)	Total 190

[Features]

- Users only need one ID (integrated authentication)
- Input password only once (single sign-on)
- Accessible anywhere on- and off-campus (remote access)
- Requires web browser only (software not required)
- Also supports client certificate authentication and/or multifactor authentication (centralized security level management)

GakuNin strives to maintain reliability through annual assessments of IdP operations. GakuNin also offers Level of Assurance 1 (LoA1) authentication service as specified in the trust framework of the U.S. Federal Government's Federal Identity, Credential, and Access Management (FICAM). Universities that have been LoA1-accredited can use U.S. government services, including the National Institutes of Health database.

The Committee for Academic Authentication makes plans, draws up proposals, and manages GakuNin. Under this committee, four working groups have been established: (1) the Operation Working Group, which considers matters related to operations; (2) the Trust Working Group, which studies matters related to trust in GakuNin; (3) the Library Service Working Group, which considers matters regarding GakuNin's library services; and (4) Next-generation Identity Federation Working Group, which studies matters toward realizing new trust framework for developing and evolving academic authentication.

Issuing Digital Certificates: UPKI Digital Certificate Issuance Service



NII launched the UPKI Digital Certificate Issuance Service in January 2015 as a service for issuing digital certificates to universities and research institutes. In addition to the server certificates issued so far, NII now also issues client certificates and code signing certificates.

We continue to issue highly secure server certificates that conform to the unified international standards of the WebTrust for Certification Authorities (WTCA).

The use of these server certificates enhances web security in that they certify the authenticity of the web server provider (domain name and organization name), which makes it easier to distinguish authentic sites from phishing ones. We also issue client certificates to individuals of member institutions, which can be used for authentication and signing emails, as well as for multifactor authentication and preventing identity theft.

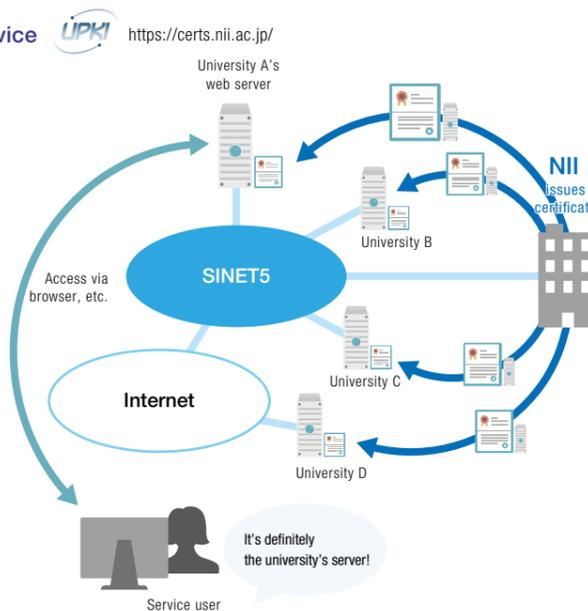
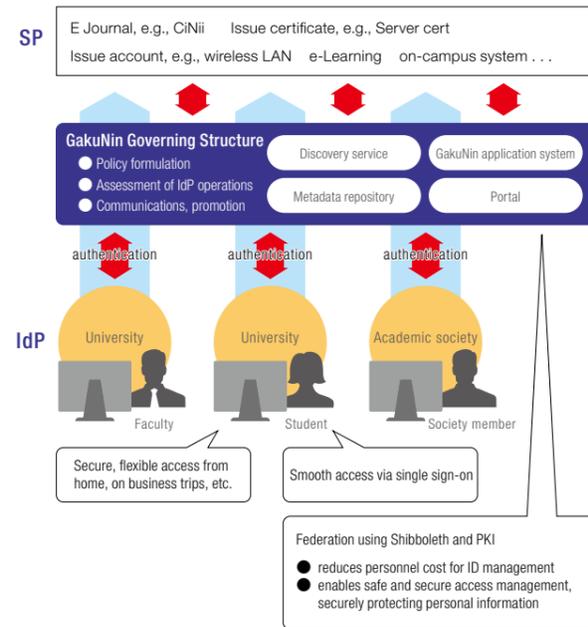
Additionally, by signing software, code signing certificates verify the identity of the developer and ensure that the code has not been tampered with. This helps users determine whether to trust and use the software.

The UPKI Digital Certificate Issuance Service aims to improve the security of universities and research institutes as a whole by providing these certificates for their use.

Institutions using UPKI Digital Certificate Issuance Service

(as of the end of March 2021)

Number of institutions	365
Number of domains	489



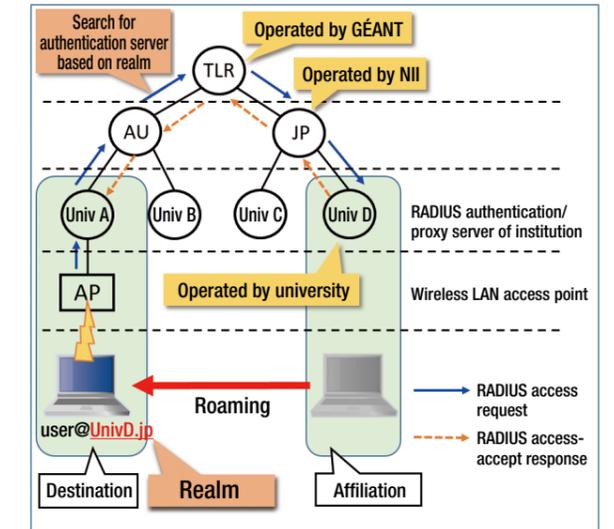
eduroam: World-wide Academic Wireless LAN Roaming Platform



eduroam is an academic wireless LAN roaming platform developed by GÉANT (formerly TERENA) in Europe, enabling shared access of on-campus Wi-Fi across universities and other research and educational institutions. Introduced in Japan in 2006 as part of NII's University Public Key Infrastructure (UPKI) project under the name "eduroam JP", NII operates, provides support for, and develops the technology of the platform. eduroam is based on the industry-standard IEEE 802.1X, meaning that it is able to provide a safe and convenient wireless LAN environment.

eduroam JP participants (as of the end of March 2021)

Number of participating institutions in Japan	305
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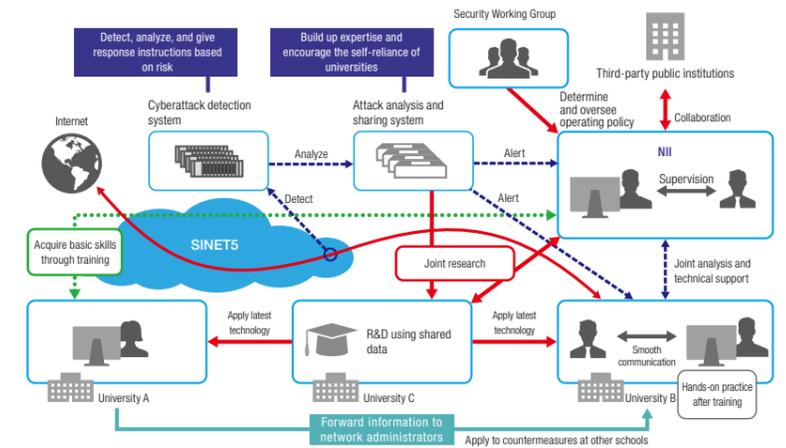


Supporting Information Security Framework through Inter-University Collaboration

https://www.nii.ac.jp/service/nii-socs/

NII established the Center for Cybersecurity Research and Development in 2016 to support the creation of a framework that enables national universities and other institutions to quickly respond to incidents and accidents due to cyberattacks, while the NII Security Operation Collaboration Services (NII-SOCS) began operations in 2017.

We develop cybersecurity experts through inter-university collaboration and at the same time apply our research findings as appropriate on detecting attacks and improving defense capabilities. Our aim is to improve the quality of cybersecurity infrastructure at national universities and other institutions and to carry out R&D that will provide an environment that promotes cybersecurity research, as well as a safe and secure educational and research environment for all academic and research fields.



Organization for Science Network Operations and Coordination

The operations of the Science Information NETwork are carried out through the collaboration and cooperation of information technology centers at universities and research institutes and four R&D centers at NII, under the supervision of a joint organization of universities and research institutes and NII called the Organization for Science Network Operations and Coordination.



Open Science

<https://rcos.nii.ac.jp/en/>

Open Science is emerging as a new way of conducting research that promotes open and sharing, not only of papers, but also of research data and software over the Internet. Together with universities and research institutes nationwide, NII contributes to the development of Open Science in Japan by providing three platforms for managing, publishing, and searching various types of files generated in the course of research.*

Research Data Management Platform



A platform for managing and sharing research data and materials generated during the research project among researchers and their supporters. GakuNin RDM enables effective file management among collaborators by linking with existing storage and research tools. It also has a time-stamping function for research trail tracking and providing research integrity. GakuNin RDM is equipped with a customizing function, so that researchers and institutions can utilize it as a research data management system.

Publishing Platform



A platform for researchers and their supporters to publish and communicate their research outputs, such as research papers and data. The researchers can easily add identifiers and metadata of their research outputs by linking with this platform and GakuNin RDM and post them on the repository of their affiliated institution in formats suitable for research dissemination. The platform is designed to be flexible and expandable and apply as an institutional repository (JAIRO Cloud) or as a subject repository.

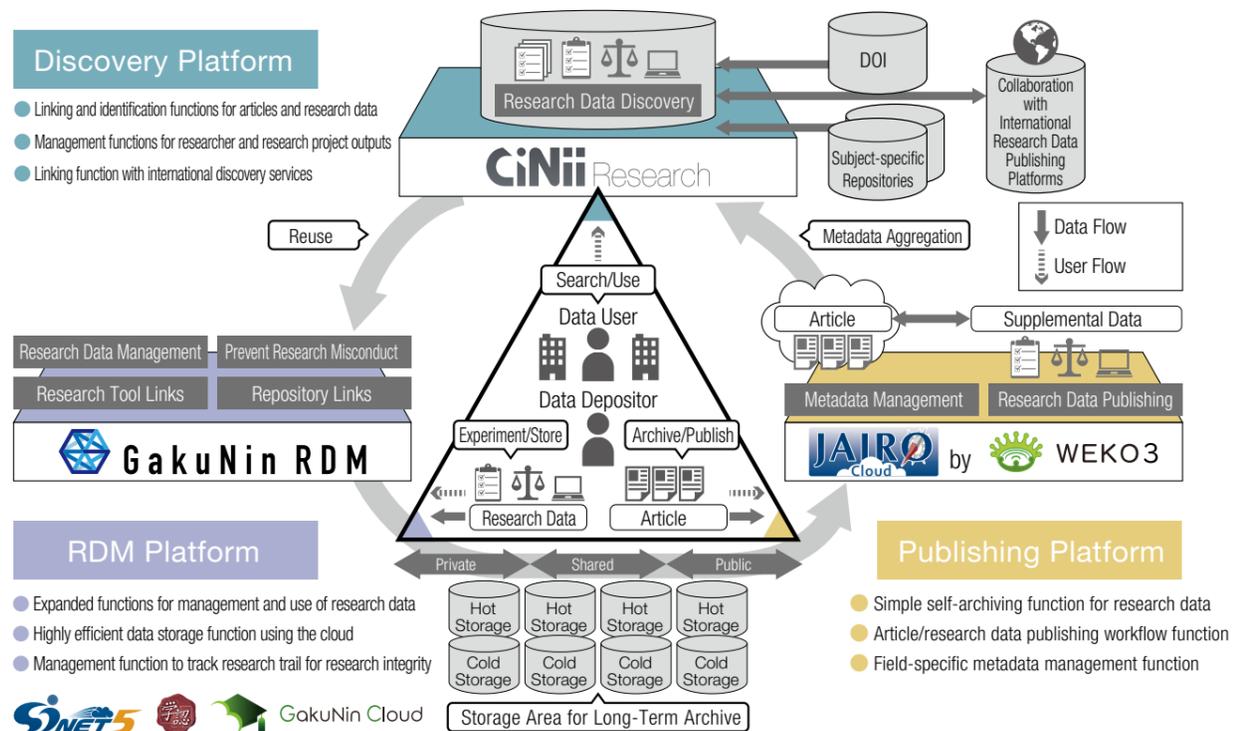
Discovery Platform



A platform aggregates information from the WEKO3 and other institutional databases and provides a comprehensive search for scholarly resources. Research data are closely related to scholarly articles, bibliographies, and other literature, as well as with the researchers and research projects that produced these academic resources. This discovery platform's core is a large-scale scholarly knowledge graph that interactively links all this information together. CiNii Research helps with making discoveries by providing the ability to navigate through these complex relationships intuitively.

*These three platforms will go into full-scale operation in 2021.

Research Data Cloud for Open Science	
Aim	To develop a common platform for managing, publishing, and searching the cutting-edge research data, and to promote open science in various fields, in close collaboration with academic communities.



Support for Construction and Linkage of Institutional Repositories (JAIRO Cloud)

<https://www.nii.ac.jp/irp/en/>

NII supports the construction and linkage of institutional repositories that publicly disseminate the results of education and research conducted by universities and other institutions. As well as these activities, we promote open access, with the aim of helping establish the next generation of academic content platforms. NII has provided support for content expansion, system linkage and community building at academic institutions in Japan, and has built and operated institutional repositories for over 810 institutions.

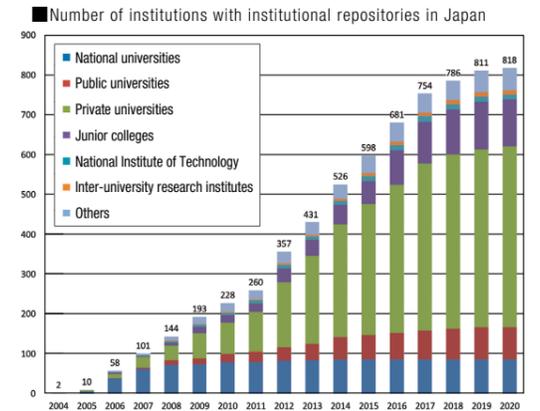
JAIRO Cloud: Shared Repository Service

NII provides an environment for a shared repository system as a cloud service, based on the NII-developed institutional repository software WEKO (<http://weko.at.nii.ac.jp/>), for institutions that have difficulty constructing and operating their own repositories.



Usage data (as of the end of March 2021)

Number of institutions using the service	642
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Integrated Search of Academic Information in Institutional Repositories in Japan

IRDB: Institutional Repositories Database

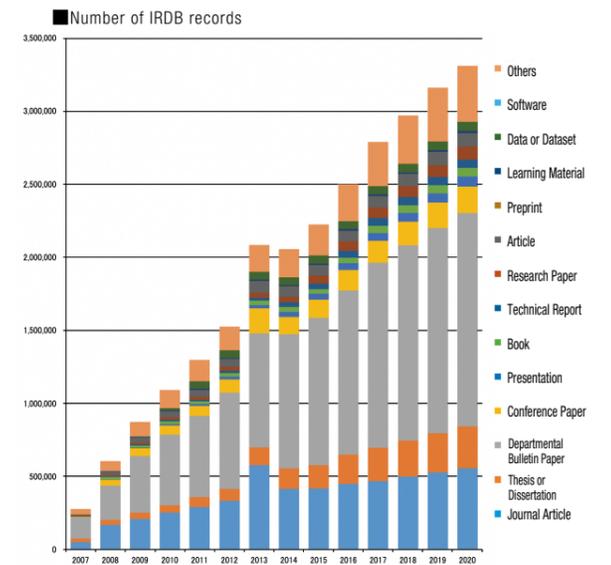
<https://irdb.nii.ac.jp/en>

Enables integrated searching of education and research results (journal articles, theses or dissertations, departmental bulletin papers, research papers, learning materials, etc.) at universities and other institutions that are stored in institutional repositories in Japan.

Full texts are available to users through this system as well as access via CiNii. This service took over from JAIRO, an institutional repository portal, which ended operations in March 2019.

Data on coverage (as of the end of March 2021)

Number of institutional repositories	748
Contents	3.31 million items



* Figures before FY2018 are JAIRO statistics
* Categories for the number of contents are based on the juni2 schema (NII Type) until FY2018, and on the JPCOAR schema from FY2019

Japan Consortium for Open Access Repository

<https://jpcoar.repo.nii.ac.jp/>

JPCOAR: Japan Consortium for Open Access Repository

JPCOAR is a community of institutions with repositories where universities and other research institutions in Japan can work more effectively on their efforts to widely disseminate research results and enhance the significance of building and operating institutional repositories. The consortium is also working on improving scholarly communication, which includes open science, as well as on joint operation of the institutional repository system platform (JAIRO Cloud).

NII supports these activities as well as JPCOAR by providing assistance such as physical support for collaboration with university libraries.



JPCOAR general assembly

Publishing and Communicating Academic Information CiNii

NII collects and structures the results of education and research produced at universities and research institutions, and provides access to them through a user-friendly interface.

CiNii <https://ci.nii.ac.jp/en>

CiNii is a service enabling exhaustive searches of academic information from academic articles, books, journals, and doctoral dissertations, among others. NII is working to expand the pool of data available and improve hit rates in text by linking various types of database services other than those from NII. CiNii also makes full use of intersystem links to university libraries and other facilities by providing search APIs (application programming interfaces) such as OpenSearch. The service also provides a display exclusively for smartphones for a better experience searching.

CiNii Articles: Searching for Research Papers in Japan

<https://ci.nii.ac.jp/en>

Contains information on over 20 million Japanese academic articles published in academic society journals and research bulletins, and articles included in the Japanese Periodicals Index Database of the National Diet Library, among others.

Data on coverage (as of the end of March 2021)

Number of articles on which information is included
22.52 million



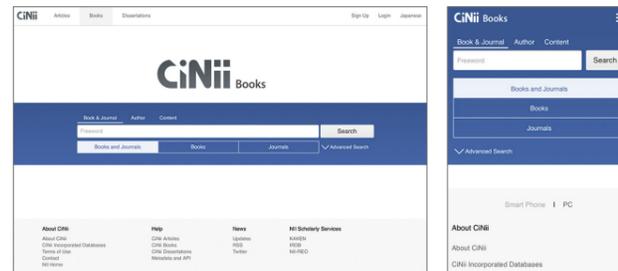
CiNii Books: Searching for Books in University Libraries

<https://ci.nii.ac.jp/books/en>

Enables search of information on books and journals held by university libraries in Japan. Contains book and author information on about 12 million titles held by university libraries nationwide, which were stored through the Catalog Information Service (NACSIS-CAT) operated by NII.

Data on coverage (as of the end of March 2021)

Number of bibliographic records	Number of holding records	Number of participating libraries
12.38 million	146.53 million	1,336



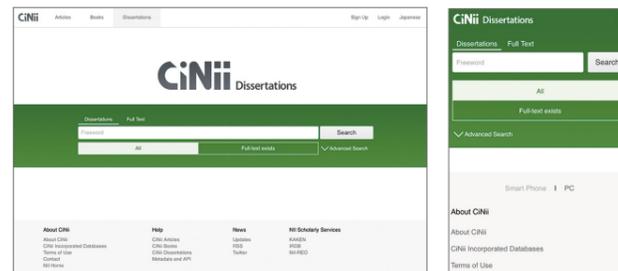
CiNii Dissertations: Searching for Doctoral Dissertations in Japan

<https://ci.nii.ac.jp/d/en>

Enables comprehensive centralized searching of doctoral dissertations in Japan. In addition to dissertation texts digitized by the National Diet Library, enables searching and viewing of dissertation texts publicly available in institutional repositories of universities and research institutes.

Data on coverage (as of the end of March 2021)

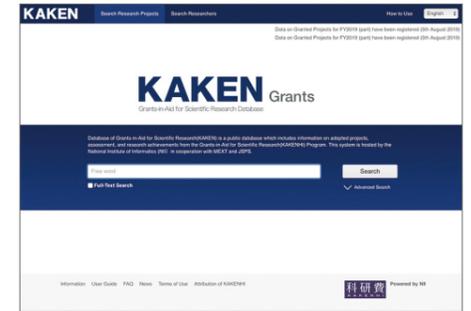
Number of doctoral dissertation records	Number of full texts from dissertation records
670,000	Approximately 280,000



Database of Grants-in-Aid for Scientific Research KAKEN

KAKEN: Database of Grants-in-Aid for Scientific Research <https://kaken.nii.ac.jp/en/>

This database enables users to browse adopted projects, as well as reports and summaries of research conducted through funds from the Grants-in-Aid for Scientific Research implemented by the Ministry of Education, Culture, Sports, Science and Technology and the Japan Society for the Promotion of Science. It provides access to the latest research in a wide range of fields in Japan. The system developed by KAKEN is also used in the JST project database (<https://projectdb.jst.go.jp/>), which contains research projects funded by the Japan Science and Technology Agency (JST).



Data on coverage (as of the end of March 2021)

Number of adopted projects
940,000

Catalog Information Service



<https://www.nii.ac.jp/CAT-ILL/en/>

The Catalog Information Service consists of the online cataloging system (NACSIS-CAT) and the interlibrary loan system (NACSIS-ILL).

NACSIS-CAT: Online Cataloging System

NACSIS-CAT is a system for creating a unified and comprehensive database designed to instantly provide information on the academic literature (books and journals) archived at university libraries and similar institutions throughout Japan. To form the database efficiently, the cataloging system has the capability to refer to standard cataloging data (MARC), and university libraries and other institutions nationwide sharing the work of inputting records online.

Registration and usage data

(as of the end of March 2021, * indicates figure for one year, FY2020.)

Number of institutions participating in NACSIS-CAT	Cumulative number of registered book records	Number of institutions participating in NACSIS-ILL	Number of NACSIS-ILL copies*	Number of NACSIS-ILL loans*
1,336	141.91 million	1,107	388,000	65,000

NACSIS-ILL: Interlibrary Loan System

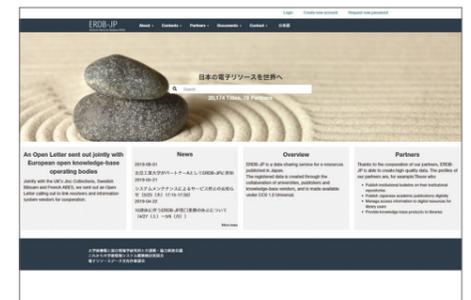
NACSIS-ILL is a system that makes use of the unified and comprehensive catalog database created by the NACSIS-CAT cataloging system to support the exchange of books and journal articles between libraries, thereby facilitating the provision of academic literature to researchers at universities and institutions. NACSIS-ILL also supports interlibrary loan services with university libraries overseas by linking to ILL systems such as KERIS in South Korea, and promotes more efficient library operations through ILL document copying and other services.

Database Sharing Service for Electronic Resources

ERDB-JP: Electronic Resources Database-JAPAN <https://erdb.jp.nii.ac.jp/en>

ERDB-JP is a service that builds and shares knowledge bases (databases) of electronic resources, such as e-journals and e-books, published in Japan. ERDB-JP is operated by NII and the E-resources Data Sharing Working Group, which is made up of staff responsible for managing e-resources at universities. Content metadata are collected and updated in collaboration with partner institutions encompassing universities, publishers, and knowledge base vendors. The collected content metadata are made available under CCO license. They can be exported and used to create lists of e-resource titles for use in OPAC and discovery services provided by universities and other institutions.

The application for ERDB-JP can now be carried out at the same time as the application for JAIRO Cloud.



Number of participating institutions

*Partner A: Can modify all contents in ERDB-JP; Partner B: Can modify own institution's contents only.

(as of the end of March 2021)

	National universities	Public universities	Private universities	Inter-university research institutes	Publishing companies	Others	Total
Partner A	38	5	22	4	3	17	89
Partner B	9	1	21	1	0	9	41
Total	47	6	43	5	3	26	130

Data registrations

(as of the end of March 2021)

Number of registrations	Number of new registrations (FY2020)
21,064	481

Digital Archives

https://reo.nii.ac.jp/index_en.html

NII is engaged in the following activities to store and provide digital academic information on a permanent basis.

NII-REO: NII Repository of Electronic Journals and Online Publications

Back issues of online journals outside Japan (approximately 4.12 million records) and electronic collections in the field of humanities and social sciences (approximately 660,000 records) are stored on NII servers and provided to universities in Japan.

Electronic resources archived in NII-REO are maintained in collaboration with the Japan Alliance of University Library Consortia for E-Resources (JUSTICE).

Archived contents (as of the end of March 2021)

Online journal archives	Years covered	Coverage
Springer Online Journal Archive	1832-1999	Journal titles: Approx. 1,100; Number of records: Approx. 2 million
Springer Lecture Note in Computer Science	1973-1999	Titles: 1,501
Oxford Journal Archive Collection	1849-2003	Journal titles: 311; Number of records: Approx. 640,000
Kluwer Online	1997-2005	Journal titles: Approx. 800; Number of records: Approx. 350,000
IEEE Computer Society Digital Library (CSDL)	1988-2011	Journal titles: 30; Number of records: Approx. 350,000
Taylor & Francis Online Journals Classic Archives (science and engineering collection in three fields)	1798-1996	Journal titles: 124; Number of records: Approx. 220,000
Humanities and social sciences electronic collection	Years covered	Coverage
Nineteenth / Twentieth Century House of Commons Parliamentary Papers (19c HCPP & 20c HCPP)	1801-2004	Number of records: Approx. 186,000
Eighteenth Century House of Commons Parliamentary Papers (18c HCPP)	1660-1834	Number of records: Approx. 58,000
The Making of the Modern World:Goldsmiths'-Kress Library of Economic Literature (MOMW)	1450-1850	Number of records: books, 61,000; periodicals, 445
The Making of the Modern World, Part II (MOMW II)	1851-1914	Number of records: Approx. 5,000
Eighteenth Century Collections Online	1701-1800	Number of records: Approx. 180,000
Early English Books Online	1475-1700	Number of records: Approx. 130,000
America's Historical Imprints Series I:Evans	1639-1800	Number of records: Approx. 36,000 (scheduled for registration from 2021)
The Making of the Modern World Part III (MOMW III)	1890-1945	Number of records: Approx. 5,000 (scheduled for registration from 2021)

Promoting Scholarly Communication

<https://www.nii.ac.jp/sparc/en/>

SPARC Japan

Since FY2003, SPARC Japan has been working together with academic societies and university libraries in Japan, in collaboration with SPARC (USA) and SPARC Europe, to promote the digitization and internationalization of academic journals published by academic societies and other organizations in Japan, to help improve international standards for scholarly communication, and at the same time to promote the wider dissemination of the achievements of academic, scientific, and technological research in Japan.

In particular, the SPARC Japan Seminars address the latest issues in scholarly

communication and function as a forum for stakeholders on academic information. The coalition moved under the Academic Information Distribution Promotion Committee from FY2019, and is engaged in assessing the trends and actual conditions in scholarly communication in Japan and overseas, considering and coordinating strategies for publishing and use of academic information, and carrying out advocacy work in collaboration with stakeholders mainly from the academic community, with the ultimate goal of promoting open access and open science.

Education and Training Services

<https://contents.nii.ac.jp/hrd>

We offer education and training services such as those below to develop human resources in universities and other institutions who work on academic information infrastructures in Japan.

- Training courses (NACSIS-CAT/ILL self-learning)
- Specialized training courses (bibliography creation for catalog systems, information processing technology seminars)
- Comprehensive training (NII on-the-job training, comprehensive IT training for university librarians), etc.



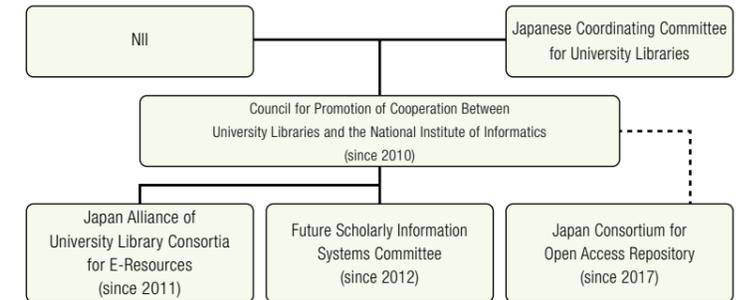
Collaboration with University Libraries

<https://contents.nii.ac.jp/cpc>

Council for Promotion of Cooperation Between University Libraries and the National Institute of Informatics

NII entered into an agreement with the Japanese Coordinating Committee for University Libraries to promote services in collaboration with university libraries. The Council for Promotion of Cooperation Between University Libraries and the National Institute of Informatics was established under this agreement. The Council, together with the Japan Alliance of University Library Consortia for E-Resources and the Future Scholarly Information Systems Committee established under it, carries out collaborative and cooperative services related to digital materials and scholarly communication.

The Council has also partnered with the Japan Consortium for Open Access Repository for services related to institutional repositories.



Japan Alliance of University Library Consortia for E-Resources

<https://contents.nii.ac.jp/en/justice>

JUSTICE: Japan Alliance of University Library Consortia for E-Resources

One of the world's largest consortia of over 500 participating national, public, and private university libraries, with the aim of implementing a range of activities that provide stable uninterrupted access to academic information from online journals and other resources.

NII established the JUSTICE Secretariat in the Library Liaison Cooperation Office to support the activities carried out by JUSTICE, with a full-time staff on loan from university libraries.



Future Scholarly Information Systems Committee

<https://contents.nii.ac.jp/korekara>

The Committee was established with the aim of further promoting activities related to the building, management, sharing, and provision of platforms for scholarly information resources. The Committee is composed of university library staff recommended by national, public, and private university library associations and councils, experts, and NII staff. In addition to identifying the various issues that are relevant to the future of scholarly information systems, the Committee also reviews future visions of systems and their operating communities, as well as plans to achieve these visions.

NII participates as a committee member and provides support for its activities by taking up the secretariat role for the Committee.

Working Group for Examination System Models

This working group performs two tasks: (1) examination of new library system networks that enable integrated discovery environments, as well as sustainable operating systems; and (2) examination of issues in joint procurement and operations of systems.

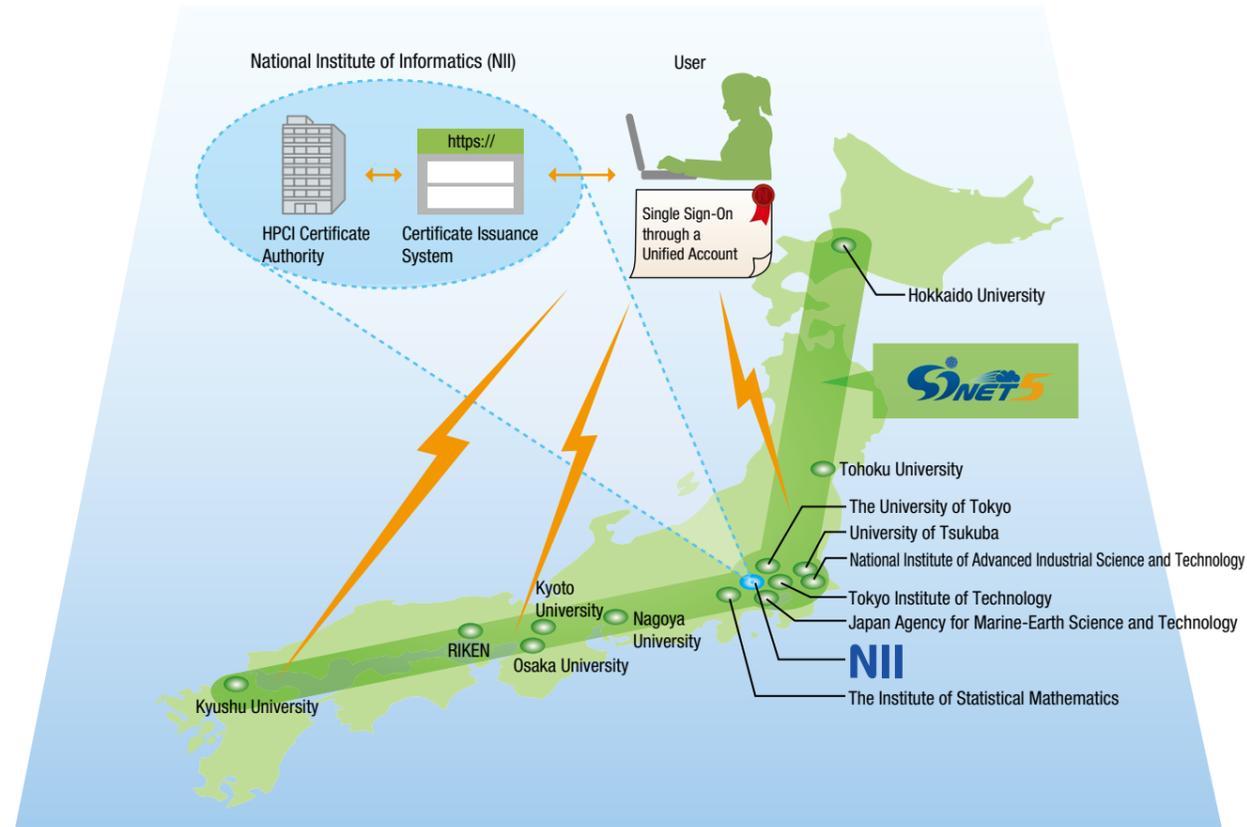
Working Group for Examination System Workflows

This working group performs four tasks: (1) examination of integrated discovery environments, (2) examination of data sharing of digital information resources, (3) examination of advanced metadata distribution, and (4) ERDB-JP operations work. The working group consists of university library staff and others in charge of contracts, management, and provision of electronic resources, or of cataloging work.

Operating and Maintaining the Authentication Infrastructure for the High Performance Computing Infrastructure (HPCI)

HPCI connects supercomputers and storage systems installed at universities and research institutes across Japan, with the supercomputer Fugaku installed in Kobe at its core. This creates a revolutionary shared computing infrastructure that meets the diverse needs of a wide range of users, including the industrial sector. The second phase of the project began in FY2017. HPCI has an authentication system that allows users to gain access to any computing resource by using a unified login account, and offers users a platform that is easy to use. In collaboration with supercomputer Fugaku, as well as universities and research institutes nationwide, NII continues its work started in the first phase of the project, operating and maintaining the authentication system that forms the core of the unified account authentication, which includes a certification authority and certificate issuance system. The authentication system ensures communication and data

security through a highly secure framework that uses digital certificates for HPCI users, and also provides a single sign-on system that enables users to seamlessly use the supercomputers and storage resources in the HPCI. Moreover, NII plays a central role in the survey and research of rapidly advancing authentication infrastructure technologies and international usage trends. We carry out R&D on next-generation authentication platforms while considering the utilization of existing technologies and systems in addition to new technologies, with the aim of both improving user convenience and boosting the efficiency of its operations and management. The Science Information NETwork (SINET) takes over the responsibility of providing the essential high-speed network infrastructure for linking supercomputers in remote areas and sharing massive amounts of test data and calculation results.



NII Library: Contributing to Informatics Research and Education

As a facility for informatics research and education, the NII Library provides online journals, as well as books, journals, and other resources, in the field of informatics. Moreover, the Library is under a mutual library use agreement with the neighboring Meiji University Library, in order to provide access to references for graduate students of SOKENDAI.

Number of books and journal titles

(as of the end of March 2021)

Reference type	Books	Print journals	Journals (number of titles)
Japanese	15,405	9,734	130
Foreign	9,522	8,313	7
Total	24,927	18,047	137

Facilities and equipment

Available service	Reading room	Stack room
Area	140 m ²	151 m ²
Seats	10	—
Others	Automated book lending/returning machine Copier	

Major online journals and databases

Service	Publisher
ACM Digital Library	Association for Computing Machinery
APS-ALL Package	American Physical Society
IEEE/IET Electronic Library	IEEE/IET
IOP	IOP Publishing
OUP	Oxford University Press
Nature	Springer Nature
Science	American Association for the Advancement of Science
ScienceDirect	Elsevier B.V.
Scopus	Elsevier B.V.
Springer eBook	Springer Nature
SpringerLink	Springer Nature
Web of Science	Clarivate Analytics
Wiley Online Library	John Wiley & Sons, Inc.
IEICE	Institute of Electronics, Information and Communication Engineers
IPSJ Digital Library	Information Processing Society of Japan



Reading room



Reading room

Symposium on DX at Educational Institutions—Cyber-Symposium on Online Education and Digital Transformation at Universities and Other Institutions

<https://www.nii.ac.jp/event/other/decs/>

Taking into consideration the situation with the COVID-19 pandemic, in late March 2020, NII began holding a series of events titled “Symposium on DX at Educational Institutions—Cyber-Symposium on Online Education and Digital Transformation at Universities and Other Institutions” at a weekly to biweekly pace. The purpose of these events was to share as much information as possible about distance education at universities and other institutions. (Please note the initially planned title of these events was “Cyber-Symposium for Information Sharing on Remote Teaching Efforts at Universities since April.”) The lectures given at these events covered a wide range of regularly occurring, pressing issues related to remote learning at universities and other institutions, as well as to digital transformation of education. This included discussions on precedents of distance education and exchange of information, interpretation of Copyright Law and recent amendments, actual relevant cases at overseas universities, methods of practice at medical and engineering schools, online support for students, and hybrid lessons that included face-to-face teaching. In total, 29 sessions were held in the first year and approximately 37,000

people, mainly from universities and other higher education institutions, took part. Overall, more than 260 lectures were given during this period and the uploaded video recordings viewed more than 206,300 times. This symposium series has made a visible contribution to the sharing of information, demonstrating how universities and other institutions have responded to the COVID-19 pandemic and facilitated digital transformation in their classes.



Public Communications

Communicating NII's Research and Services to Society at Large

NII holds open houses and public lectures at the institute, conducts special classes for high school and technical college students, creates exhibits for exhibitions, issues printed publications, and carries out other activities, in order to share the latest informatics-related research findings widely with society at large and deepen understanding of its projects and services.

We also strive to provide timely information through digital media such as our websites, email newsletters, and social media (Twitter, Facebook).

NII Open House

NII holds an annual Open House to open NII to the public and present the results of its various research projects to a broad audience that includes the general public, researchers, and graduate school applicants. In FY2020, the event was held online for the first time, featuring live-streaming of the keynote lecture and discussions, as well as virtual poster sessions. At the Computer Science Park, participating children could experience an interactive virtual workshop.



The keynote lecture was livestreamed during the June 2020 Open House.

Public Lectures NII holds free lectures for the general public from time to time.

National Institute of Informatics Public Lectures:

At the Forefront of Informatics

<https://www.nii.ac.jp/event/shimin/>

In these free lectures, researchers at NII discuss various subjects at the forefront of the field of informatics for the general public. In FY2020, videos of four lectures were streamed on-demand. Videos, presentation materials, and Q&As of past lectures are available on the NII Japanese website.



The first video-on-demand to be streamed was Associate Professor ICHISE Ryutaro's lecture: "What is Artificial Intelligence?" (February 25, 2021)

Karuizawa Saturday Salon

<https://www.nii.ac.jp/event/karuizawa/>

Lectures on informatics and many other fields are held at the International Seminar House for Advanced Studies in Karuizawa, Nagano Prefecture several times a year for local residents. (The events were all canceled in FY2020.) A portion of the contents of past lectures has been published in six volumes of the Collection of Lectures from the Karuizawa Saturday Salon: Harmony of Intelligence and Art (Karuizawa Doyo Konwakai Koenshu: Chi to Bi no Hamoni), and is also available on the NII Japanese website.

Exhibitions

NII participates in various exhibitions to introduce its research findings, operations, and services. In FY2020, we took part in the Inter-University Research Institute Symposium, which was held online for the first time, with live-streaming of the research discussions on the first day and an online exhibition on the second.



Q&A session joined by researchers from the Research Organization of Information and Systems

Special Classes at High Schools and Technical Colleges

NII researchers visit high schools and technical colleges to present the latest research findings in simple terms. The aim is to bring informatics closer to the students, who will be responsible for our future, and foster their interest in informatics. (The events were canceled in FY2020.)

Publications

NII Series (Japanese)

A new commercially available publication (Maruzen Library) that introduces and explains the contents of NII's research to the general public in an easy-to-understand way using familiar topics. The latest issue, *Learning Compass: The Analytics of Learning*, was released in January 2020.



The public information magazine, *NII Today*, is issued four times a year.

Public Information Magazines

- *NII Today* (Japanese/English) <https://www.nii.ac.jp/en/about/publications/today/>
- Annual Report of the National Institute of Informatics
- Overview of National Institute of Informatics (Japanese/English)
- NII SEEDs
- Summary of National Institute of Informatics (Japanese/English)
- Getting to Know NII (Info Dog "Bit-kun")

News Releases

(FY2020)

Release date	Title
April 1, 2020	CISCO and the National Institute of Informatics will jointly support distance education by universities, junior colleges and technical colleges; CISCO will provide its Webex special support program for higher education institutions for free for 180 days.
April 6	NII Director-General KITSUREGAWA, Masaru is awarded the Japan Academy Prize for pioneering research in the theory and application of large-scale high-performance database systems.
April 7	Tohoku University Professor SONE, Hideaki; Tohoku University Specially Appointed Associate Professor KANAYA, Yoshinari; Hosei University Professor UEDA, Hiroshi; Chukyo University Professor HASEGAWA, Akiumi and Kobe Gakuin University Professor OGAWA, Masaru jointly receive Commendation by the Minister of Education, Culture, Sports, Science and Technology and the Science and Technology Award (enhancement of understanding category) for promoting and raising public awareness of information security regulations and teaching materials for higher education institutions.
April 7	OHMUKAI, Ikki, visiting associate professor at NII and the University of Tokyo Graduate School of Humanities and Sociology, receives the FY2020 Commendation by the Minister of Education, Culture, Sports, Science and Technology and the Science and Technology Award (development category) for his achievements in the development of the academic information service infrastructure CiNii.
April 7	NII Associate Professor KISHIDA, Masako receives the Young Scientists' Prize in the FY2020 Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology for new interpretation of the structured singular value and research on its application to systems science.
April 24	NTT BizLink and NII start providing a secure remote videoconference service for staff at universities, research institutes, and medical institutions nationwide.
April 30	The public-private sector collaborative program to develop "Experts in Information Science" is launched, in which young researchers engaged in cutting-edge research in the field of informatics directly guide selected high school and other students through joint research projects to foster them into becoming elite researchers in their 20s.
May 28	This year's NII Open House 2020 will be held online. Keidanren (Japan Business Federation) Chairman NAKANISHI, Hiroaki will deliver a keynote speech on June 12, with an online discussion space to be set up with NII researchers. SATOH, Shin'ichi, Head, NII Research Center for Medical Bigdata, will give a keynote speech on June 13, when the Computer Science Park Playground will also be held to help participants learn programming thinking through play.
June 10	Additional contents for the June 12-13 online NII Open House 2020: On June 12, Keidanren Chairman (Hitachi chairman) NAKANISHI, Hiroaki; LINE Corp. CEO IDEZAWA, Takeshi; and TANAKA, Yorimasa, program director for the Cabinet Office Director General for Science, Technology and Innovation Policy (Yamato Holdings executive officer in charge of IT), will hold discussions with NII Director-General KITSUREGAWA, Masaru; the first-day session will also feature a special session of the ongoing cyber symposium series to discuss "the new normal of distance education." On June 13, four speakers will give lectures on responses to COVID-19 based on natural language processing, big data, CT and AI; remote reporting of the Computer Science Park event will also be possible.
July 13	Development of a method to achieve both the accuracy of choice presented by decision-making support systems and computation speed, paving the way for high-speed computation in quality verification of industrial products, autonomous driving, strategies for market investment, and more.
September 28	A platform for AI analysis of CT images of novel coronavirus disease (COVID-19) pneumonia is developed, in which CT images collected from hospitals nationwide are selected by artificial intelligence and turned into high-quality AI research-purpose datasets.
October 5	The "COVID-19 Data Portal Japan" is launched: Quick access to the research data of the novel coronavirus disease is made available.
October 17	NII with other institutions have discovered that time crystals can be used to simulate complex quantum networks, raising possibilities of new simulations that run on quantum computers.
November 6	"CiNii Research Pre-version" is released, introducing a preliminary version of an integrated search system for a wide range of research resources including research data.
November 12	A new circuit compression method is developed, which will bring smaller and faster quantum computers one step closer; the new technology is expected to accelerate development of large-scale quantum computing.
November 25	A two-day online event (December 3-4), commemorating the 20th anniversary of NII's founding, to discuss expectations for digital technology and NII is announced.
December 11	The "Cyber Auditorium" service is launched to help educational institutions from elementary schools to universities and research institutes hold education and research events online.
December 15	NII begins providing property information data, supplied by a real estate information network comprising more than 58,000 outlets nationwide, for academic research purposes.
January 22, 2021	New variations are added to LINE Stamps of NII official character, "Johoken Bit-kun"; in the new third edition, 16 different stamps selected through online voting are available.
January 29	NII provides digital equipment for remote education and programming education to support digital transformation at diverse venues of education from elementary schools to universities and research institutes.
February 15	Full operation of the research data management platform "GakuNin RDM" commences to support management/sharing of research data among academic institutions nationwide.
February 19	A joint industry-government-academia team, comprising NII members, receives the highest level of praise for its disaster scene description from aerial images and indexing tasks aimed at disaster-related image recognition at the TREC Video Retrieval Evaluation (TRECVID) conference hosted by the U.S. Institute of Standards and Technology.
March 9	A data-driven social creation platform mdx is introduced, jointly operated by nine universities and two research institutes to promote industry-government-academia collaboration, social implementation, and research in data utilization.
March 23	NII starts to supply data on the survey of complaints related to COVID-19 as a dataset for research purposes.

Digital Media (Japanese except Website)

Website (English)

<https://www.nii.ac.jp/en/>

Visit the website for details of events and publications.

YouTube channel

<https://www.youtube.com/user/jyouhougaku>

Watch videos of lectures and research presentations.

Email newsletter

<https://www.nii.ac.jp/mail/>

Twitter

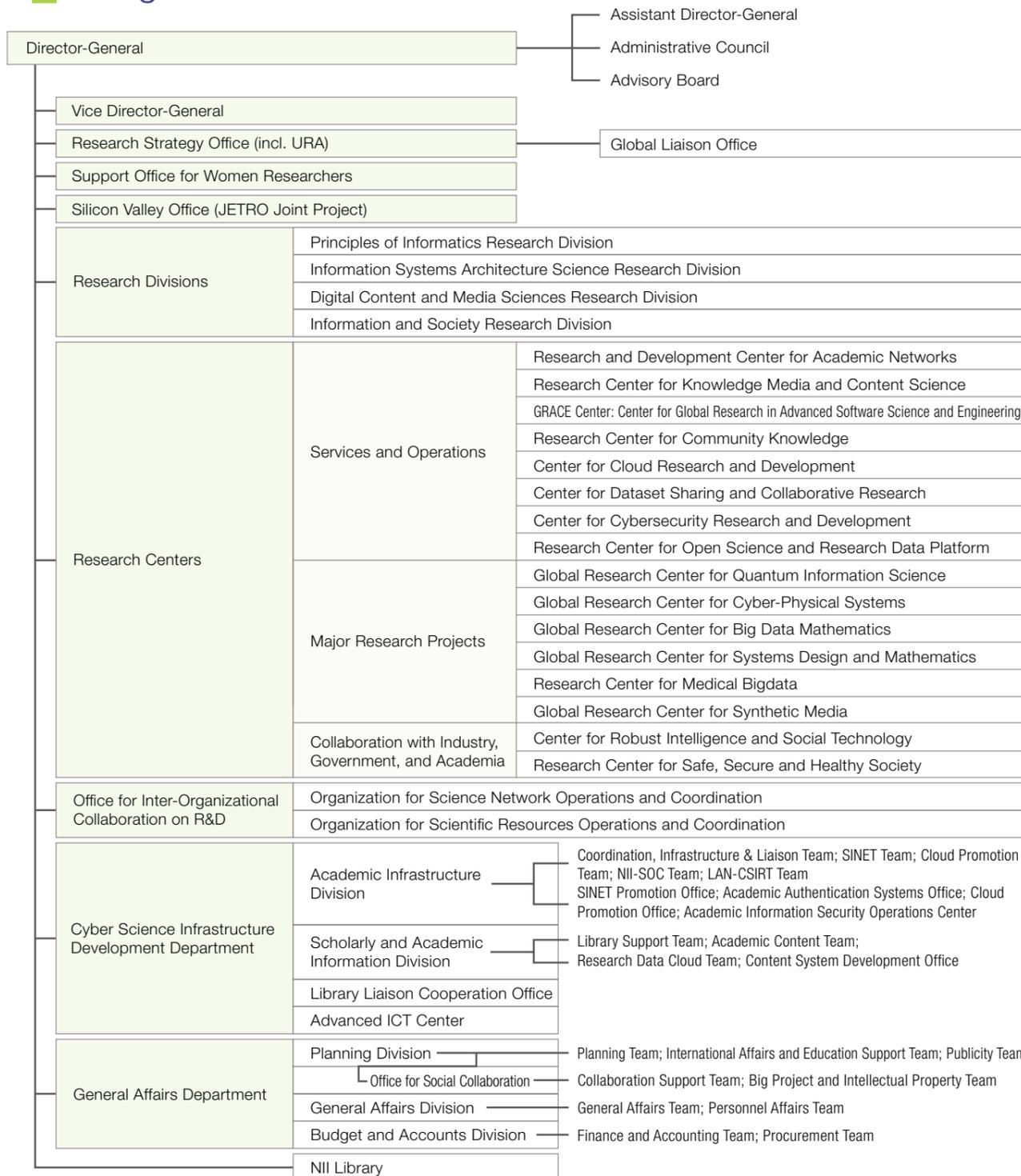
Official NII account (@jouhouken) <https://twitter.com/jouhouken>

Johoken Bit-kun https://twitter.com/NII_Bit

Facebook

<https://www.facebook.com/jouhouken>

Organization



Silicon Valley Office (JETRO Joint Project)

In May 2017, NII and the Japan External Trade Organization (JETRO) jointly established an office in Silicon Valley. This new office carries out studies and identifies international needs that will lead to the use and commercialization of NII's research findings in North America, particularly the West Coast. Using the resulting information gathered, it is also expected to conduct initiatives that will bring and develop NII's research achievements overseas. The office also manages joint research contracts between NII and overseas corporations, universities, research groups, and other organizations, as well as providing administrative support to international conferences and exhibitions held in neighboring areas.



Executives

Director-General	KITSUREGAWA, Masaru	Vice Director-General	URUSHIDANI, Shigeo	Vice Director-General	OYAMA, Keizo
Acting Director-General/ Vice Director-General	SHINOZAKI, Motoshi	Vice Director-General	YONEDA, Tomohiro	Vice Director-General	ADACHI, Jun
Vice Director-General	AIZAWA, Akiko	Chief Cyber Science Infrastructure Director	YASUURA, Hiroto		
Assistant Director-General	TAKASU, Atsuhiko				
Executive Director of Research	FURUI, Sadaoki				
Director, Principles of Informatics Research Division		UNO, Takeaki	Director, Information Systems Architecture Science Research Division		JI, Yusheng
Director, Digital Content and Media Sciences Research Division		SATO, Imari	Director, Information and Society Research Division		ECHIZEN, Isao
GLO Acting Director	PLANAS, Emmanuel				

Cyber Science Infrastructure Development Department

General Manager	AIDA, Kento	Deputy General Manager	TAKEYA, Kimie
◇Academic Infrastructure Division Manager	SATO, Suguru	◇Scholarly and Academic Information Division Manager	YOSHIDA, Yukinae
◇Advanced ICT Center Head	ABE, Shunji	◇Library Liaison Cooperation Office Head	HIRATA, Yoshiro

General Affairs Department

General Manager	NISHIJIMA, Manabu	◇General Affairs Division Manager	SUGAWARA, Akira	◇Budget and Accounts Division Manager	SATO, Yoshiro
◇Planning Division Manager	GOHARA, Masayoshi				

NII Library

Head SUN, Yuan

Staff Numbers

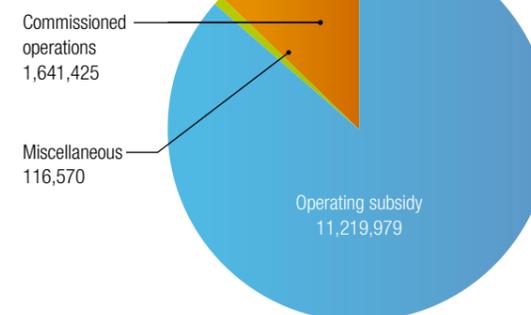
(as of May 2021)

Category	Director-General	Vice Director-General	Assistant Director-General	Professor	Associate Professor	Lecturer	Assistant Professor	Subtotal	Administrative Staff	Total
Full-time staff	1	5	1	28	27		16	78	64	142
Project professor, etc.		1		13	18		12	44		44
Special term/fix-term/short-term staff										307

Budget

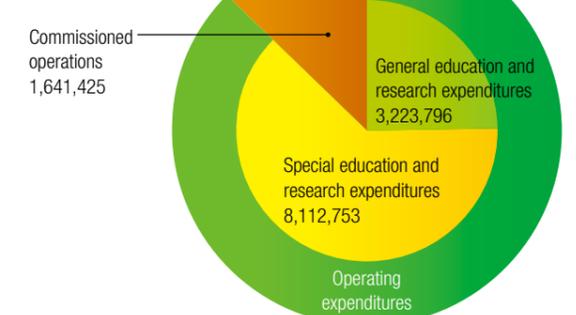
Income

12,977,974 (unit: thousand yen)



Expenditure

12,977,974 (unit: thousand yen)



Administrative Council

Conducts deliberations on important matters concerning the management and operation of NII, such as the selection of candidates for the post of Director-General and for research and academic staff, and joint research planning, as well as matters concerning NII in the medium-term targets and plans of the Research Organization of Information and Systems (ROIS).

Advisory Board

Composed of Japanese and overseas experts external to NII who possess deep and extensive knowledge of academic information. The Board responds to inquiries from the Director-General regarding issues involving research on informatics, as well as development and maintenance of infrastructure for communicating scholarly information.

Professors Emeriti

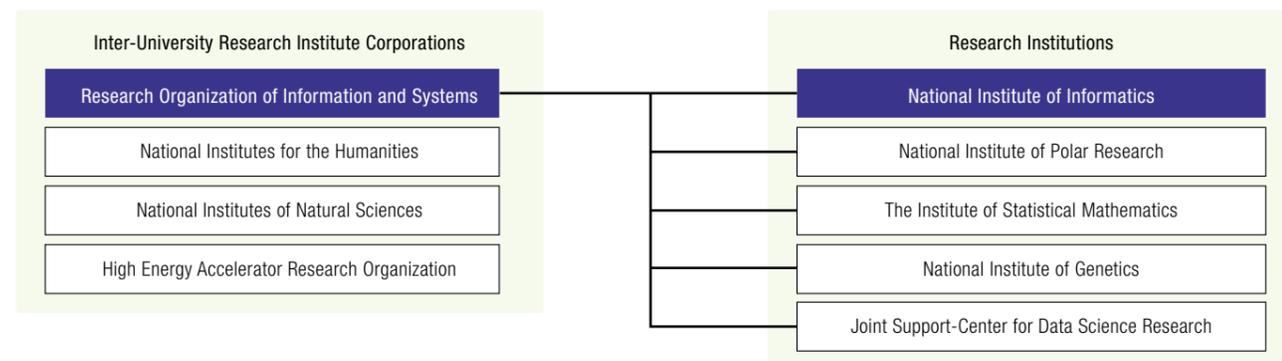
National Institute of Informatics (NII)

Name	Award date
SAWA, Takamitsu	April 1, 2002
NAITO, Eisuke	July 2, 2002
HATORI, Mitsutoshi	November 19, 2004
ONO, Kinji	November 19, 2004
YAMAMOTO, Takeo	April 1, 2005
SUEMATSU, Yasuharu	April 1, 2005
UENO, Haruki	April 1, 2007
MARUYAMA, Katsumi	April 1, 2010
NEGISHI, Masamitsu	April 1, 2010
MIURA, Kenichi	April 1, 2011

Name	Award date
ASANO, Shoichiro	April 1, 2013
KOYAMA, Teruo	April 1, 2015
MIYAZAWA, Akira	April 1, 2015
YAMADA, Shigeki	April 1, 2015
YAMAMOTO, Yoshihisa	April 1, 2015
SONEHARA, Noboru	April 1, 2017
ADACHI, Jun	April 1, 2018
HONIDEN, Shinichi	April 1, 2018
NAKAJIMA, Shin	April 1, 2021
HAYAMI, Ken	April 1, 2021

Inter-University Research Institute Corporations

NII is one of the institutions operating under the auspices of the Research Organization of Information and Systems (ROIS). Inter-university research institute corporations are "research institutes for shared use among all universities" in different research fields. Unique to Japan, these research institutes offer state-of-the-art large-scale equipment that is difficult to install and maintain individually at the university level, as well as access to vast quantities of academic data, other valuable resources, and analytical techniques for the use of researchers across Japan, free of charge, in order to promote original collaborative research that exceeds the purview of individual universities. ROIS aims to carry out holistic studies across different disciplines by framing important issues of the 21st century related to complex phenomena, such as life, the Earth, the natural environment, and human society, from the perspective of information and systems.



History

Month/year	Event
October 1973	Ministry of Education, Science, Sports and Culture proposes an "Improved Circulation System for Academic Information" in the Third Report (Basic Policies for the Promotion of Scholarship) of the Science Council.
May 1976	Research Center for Library and Information Science (RCLIS) is established at the University of Tokyo.
November 1978	"A New Plan for Academic Information Systems" is presented to the Science Council by the Minister of Education, Science, Sports and Culture. The Science Council issues a response in January 1980.
April 1983	Center for Bibliographic Information is established at the University of Tokyo, with the reorganization of the Research Center for Information and Library Science.
December 1984	The NACSIS-CAT catalog information service is launched.
April 1986	National Center for Science Information Systems (NACSIS) is established, with the reorganization of the Center for Bibliographic Information, the University of Tokyo.
April 1987	The Science Information NETWORK (SINET) is launched.
April	The NACSIS-IR information search service is launched.
April 1988	Email service is launched.
January 1989	International connection between SINET and US (National Science Foundation: NSF)
January 1990	International connection between SINET and the UK (British Library: BL)
April 1992	The Inter-Library Loan (ILL) System is launched.
April	The Internet backbone (SINET) is launched.
November 1993	Start of mutual access to databases through gateways with the Japan Information Center of Science and Technology (JICST)
April 1994	Start of ILL service with the British Library Document Supply Centre (BLDSC)
November	Chiba Annex (Inage-ku, Chiba City) is built.
October 1995	International connection between SINET and Thailand
April 1996	Start of ILL service with the National Diet Library
March 1997	International Seminar House for Advanced Studies, Inose Lodge (Karuzawa, Nagano Prefecture) is established.
April	Electronic Library Service is launched.
December	An Advisory Panel on a Core Institution for Scientific Research in the Information Field is established by the Ministry of Education, Science, Sports and Culture.
January 1998	A proposal entitled "Promoting Computer Science Research" is published by the Science Council of Japan, calling for the establishment of a core institution for inter-university research in informatics.
March	Advisory Panel on a Core Institution for Scientific Research in the Information Field issues its report.
April	Coordination Office is established for the Core Institution for Scientific Research in the Information Field; committee is formed in May.
March 1999	Coordinating Committee of the Core Institution for Scientific Research in the Information Field issues its report.
April	Preparatory Office is established for the Core Institution for Scientific Research in the Information Field; committee is formed in May.
July	Preparatory Committee of the Core Institution for Scientific Research in the Information Field issues its interim report.
February 2000	Operations move to the National Center of Sciences (Hitotsubashi, Chiyoda-ku, Tokyo).
March	Preparatory Committee of the Core Institution for Scientific Research in the Information Field issues its final report.
April	National Institute of Informatics (NII) is established, with the reorganization of NACSIS and assumption of its functions.
January 2002	SuperSINET is launched.
April	Ph.D. Program in Informatics is established in the Department of Informatics, Graduate University for Advanced Studies.
April	GeNii (NII Academic Contents Portal) is released.
April	Japan-U.S. document delivery service is launched.
June	Intersystem linkage of catalogs with RLG in the U.S. is launched.
September	Research Planning and Promotion Strategy Office is founded.
October	International Course is established within Ph.D. Program in Informatics.
October	Start of joint construction of meta-databases
January 2003	Global Liaison Office is formed.
April	Initiation of Project to Improve Infrastructure for International Circulation of Scholarly Information
April 2004	NII begins a new chapter as a member of the new Inter-University Research Institute Corporation/Research Organization of Information and Systems.
April 2005	Official service of GeNii (the NII Scholarly and Academic Information Navigator) is launched.
June 2007	Science Information NETWORK3 (SINET3) is launched.
April 2009	NII Scholarly and Academic Information Navigator (CINii) and the KAKEN database of Grants-in-Aid for Scientific Research are revamped. Japanese Institutional Repositories Online (JAIRO) is officially launched.
February 2011	First NII Shonan Meeting takes place.
April	Science Information NETWORK4 (SINET4) is launched.
April	Library Liaison Office is established.
November	CINii Books is launched.
April 2012	Japanese Institutional Repositories Online Cloud (JAIRO-Cloud) is launched.
October 2015	CINii Dissertations is launched.
April 2016	Science Information NETWORK4 (SINET5) is launched.
December 2018	Operation of Wide-area Data Collection Infrastructure (Mobile SINET) is launched.
March 2019	World's first round-the-globe ultra-high-speed 100 Gbps academic communications network is built.
December	NII begins operating 400 Gbps Tokyo-Osaka link of SINET5.
October 2020	Kashiwa Annex is established in Kashiwa City, Chiba Pref.

Facilities and Locations

National Center of Sciences (Chiyoda-ku, Tokyo)

<https://www.nii.ac.jp/en/>

The National Center of Sciences was built as a center for research in informatics and other fields, academic exchange, dissemination of scientific information, and social collaboration, with the aim of expanding and strengthening Japan's academic research infrastructure. Construction was completed in December 1999.

The high-rise wing is primarily occupied by three institutions: NII, Hitotsubashi University Chiyoda Campus, and the National Institution for Academic Degrees and Quality Enhancement of Higher Education. The Center aims to provide an advanced base for intellectual creativity through the comprehensive interaction of the various academic capacities of each institution.

Conference facilities such as Hitotsubashi Hall are located in the low-rise wing. These facilities accommodate a wide variety of events such as international and academic conferences, lectures, and meetings organized by national universities and other institutions.

National Institute of Informatics

National Center of Sciences Bldg.

2-1-2 Hitotsubashi, Chiyoda-ku, Tokyo, 101-8430 Japan

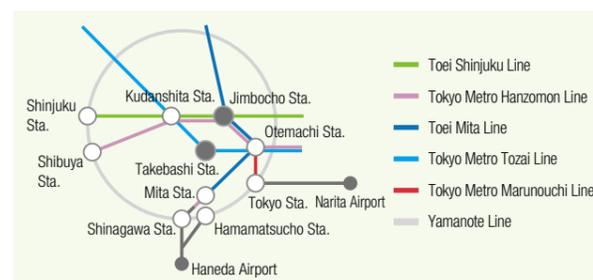
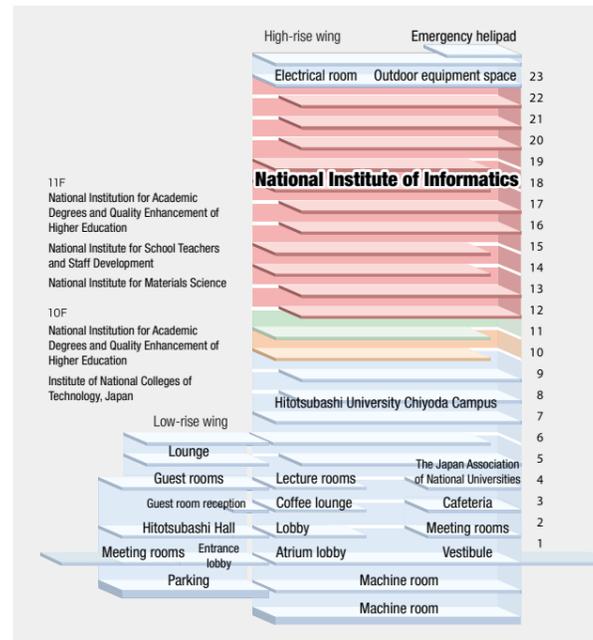
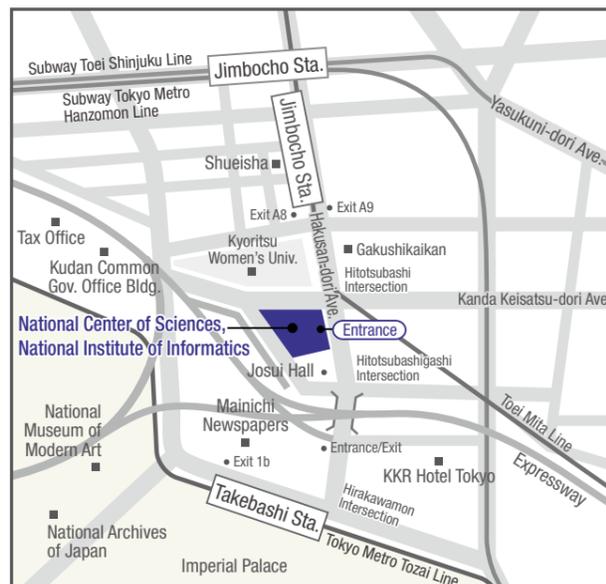
Tel: +81-3-4212-2000 (exchange)

■ Site area: 6,842 m² (occupied by NII: 3,036 m²)

■ Floor space: 40,585 m² (occupied by NII: 18,145 m²)



National Center of Sciences



Kashiwa Annex (Kashiwa City, Chiba Prefecture)

The Annex was completed in October 2020 on the University of Tokyo's Kashiwa II Campus as a facility to house equipment for various academic information services provided by NII, including the Science Information NETWORK (SINET), and to serve as a center for NII's research and development.

The facility is to be used for seeking further improvement in research results by establishing it as part of the University of Tokyo's research complex for joint studies and collaborations.

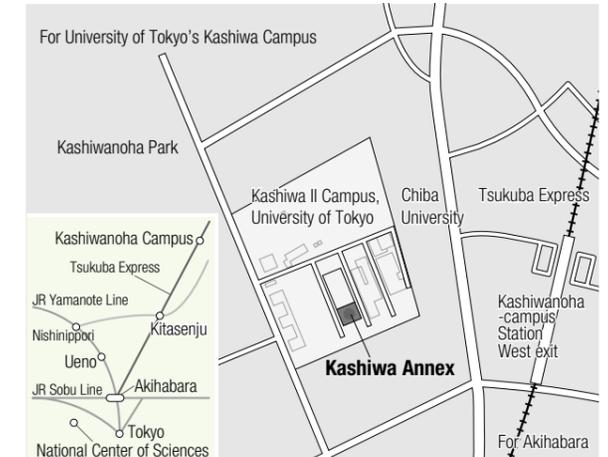


Exterior of Kashiwa Annex

Kashiwa Annex

6-2-3 Kashiwanoha, Kashiwa City, Chiba, 277-0882 Japan
Tel: +81-4-7135-1640 (switchboard)
Of the building's total floor space of 10,672 m², NII occupies 3,886 m² for its exclusive use

Guide Map



International Seminar House for Advanced Studies (Karuzawa, Nagano Prefecture)

<https://www.nii.ac.jp/access/karuzawa/>

Inose Lodge

The International Seminar House for Advanced Studies (Inose Lodge) was completed in May 1997 on land donated by Dr. INOSE, Hiroshi, the first Director-General of NII. His wish was to create an ideal place for interdisciplinary and international studies and discussions.

Uses

1. Domestic and international academic conferences, seminars, etc.
2. Public lectures, social gatherings, etc.
3. Research and training of NII researchers and staff



Exterior of Seminar House

International Seminar House for Advanced Studies Inose Lodge

1052-471 Okan Minamihara, Nagakura, Karuzawa-machi, Kitasaku-gun, Nagano, 389-0111 Japan
Tel. +81-267-41-1083; Fax +81-267-41-1075

■ Site area: 3,339 m² ■ Floor space: 667 m²

Guide Map

