2019 Overview

NII

**Inter-University Research Institute Corporation /
Research Organization of Information and Systems**

National Institute of Informatics

Contact List

Content	Contacts	Contact Information
Kakenhi (P.18). Collaborative Research Promotion (P.20)/ Industry-Government-Academia Collaboration (P.22)/ Academic Guidance by Researchers (P.23)	Planning Division, Office for Social Collaboration, Collaboration Support Team	kaken@nii.ac.jp
Intellectual Property (P.21)	Planning Division, Office for Social Collaboration, Big Project and Intellectual Property Team	chizai_web@nii.ac.jp
TopSE (P.23)	GRACE Center	general@topse.jp
International Exchange (MOU) (P.24)/ (NII International Internship Program) (P.25)	Planning Division, International Affairs and Education Support Team	international@nii.ac.jp
International Exchange (NII Shonan Meeting) (P.26)	NII Shonan Meeting Administrative Office	shonan@nii.ac.jp
International Exchange (DAAD/JFLI) (P.27)	Planning Division, International Affairs and Education Support Team	international@nii.ac.jp
Graduate Education (P.28)	Planning Division, International Affairs and Education Support Team	daigakuin@nii.ac.jp
Science Information Network (P.32)	Academic Infrastructure Division, SINET Promotion Office	support@sinet.ad.jp
Supporting the Introduction of Cloud Computing (P.35)	Academic Infrastructure Division, Cloud Promotion Office	cld-office-support@nii.ac.jp
Authentication Infrastructure (P.36)	Academic Infrastructure Division, Academic Authentication Systems Office	gakunin-office@nii.ac.jp
Support of Inter-University Collaboration-based Information Security Framework (P.37)	Academic Infrastructure Division, NII-SOC Team	soc-office@nii.ac.jp
CiNii (P.38)	Scholarly and Academic Information Division, CiNii Desk	ciniiadm@nii.ac.jp
Institutional Repositories (P.39)	Scholarly and Academic Information Division, Institutional Repository Desk	ir@nii.ac.jp
Catalog Information Service (NACSIS-CAT/ILL) (P.40)	Scholarly and Academic Information Division, CAT/ILL Desk	catadm@nii.ac.jp
SPARC Japan (P.41)	Scholarly and Academic Information Division, SPARC Desk	sparc@nii.ac.jp
Education and Training Service (P.41)	Scholarly and Academic Information Division, Education and Training Desk	edu@nii.ac.jp
Open Science (P.43)	Research Center for Open Science and Data Platform	rcos-office@nii.ac.jp
NII Library (P.45)	Scholarly and Academic Information Division, Library Desk	library@nii.ac.jp
Public Relations (P.46)	Planning Division, Publicity Team	kouhou@nii.ac.jp / 03-4212-2146
News Releases/Media Relations (P.47)	Planning Division, Publicity Team/ Media Relations Desk	media@nii.ac.jp / 03-4212-2164
Facilities/Location (P.52)	General Affairs Division, General Affairs Team	soumu@nii.ac.jp

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

National Center of Sciences Bldg.
2-1-2 Hitotsubashi, Chiyoda-ku, Tokyo 101-8430
TEL: +81-3-4212-2000
https://www.nii.ac.jp/en/

Contents

Top Message

Masaru Kitsuregawa

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

As Japan's only general academic research institution focusing on informatics, the National Institute of Informatics (NII) is advancing a full spectrum of research with a long-term view in mind, ranging from basic research to practical hands-on research aimed at solving societal problems. At the same time, as an inter-university research institute, we are working to develop and provide a state-of-the-art academic-information infrastructure, as well as academic content and services that are critical to the research and educational activities of the academic community as a whole.

As we engage in activities that embrace both research and business, one of the most revolutionary innovations that NII has introduced is the Science Information Network (SINET), a network that links universities and research institutes from all over Japan and has contributed to Japan's academic community ever since its inception. SINET5, which we began providing in 2016, achieves a speed of 100 gigabits per second (Gbps). Our accomplishments in creating a network that connects every single one of Japan's prefectural and city governments at a speed of 100 Gbps, forming one of the most powerful networks anywhere in the world, carry deep significance for Japan's academic community. Currently, we have 910 universities, academic research institutions, and other facilities connected to SINET (as of the end of March 2019), making the network a vital infrastructure for Japan's academic community.

In fiscal 2018, we added even more robust functions to SINET5. In December 2018, we began verification and testing of a new service called Wide Area Data Collection Infrastructure, which will provide a direct link to mobile communication environments. This project is an effort to directly link the Virtual Private Network (VPN) service provided by SINET5 with closed mobile communication environments. When this is accomplished, it will be possible to directly connect vital research data from wide areas that could only be connected with wired networks up until now, as well as crucial research data from remote areas such as seaborne vessels, and to compile and store the data safely. When Society 5.0 is available, it will not only serve as a critical infrastructure but will also lead the way to creating new fields of research that will link the Internet of Things and other aspects of the real world with the cyber world.

In addition, in March 2019, we constructed a series of 100 Gbps links that run in a loop from Japan (Tokyo) to the west coast of the United States (Los Angeles), from there to the east coast of the United States (New York), then to Europe (Amsterdam), and then back to Japan (Tokyo). At the same time, we boosted the speed of our link between Japan and Asia (Singapore) to 100 Gbps as well. By augmenting these international connections, we are taking integrated research among the United States, Europe, and Asia to deeper levels, and at the same time are further strengthening Japan's international cooperation and international competitiveness.

At our Research Center for Medical Big Data, established in fiscal 2017 with support from the Japan Agency for Medical Research and Development (AMED), we have built a cloud infrastructure for big data from medical images together with medical societies. Through these and other efforts, we are supporting the development of image recognition artificial intelligence (AI)

technology that will provide support in medical care. We envision that medical images will steadily expand to larger volumes in the future, and it goes without saying that SINET5 will play a vital role in compiling those data.

The trend toward open science has been picking up speed, and the focus has come around, in particular, to the handling of research data. The Cabinet Office, the Ministry of Education, Culture, Sports, Science and Technology, and the Science Council of Japan have been moving forward with studies, and NII has determined that the time is right to shift from the study stage to the realization of outcomes. To that end, we are promoting links with international entities and building a test bed, and we have already begun conducting verification testing with a number of research institutions. Given the diversity of academic fields, we are still defining our pathway, but with the world now having a firm foothold in the Age of Data, we are striving to put our systems architecture in place as soon as possible.

With networks becoming more pervasive and making deeper inroads, obviously security is the foremost issue that we face. At NII, we have been engaged in a project since fiscal 2017 to build the infrastructure for an information security system grounded in university connections, and the efficacy of this system has become increasingly visible. Because attacks are occurring incessantly, measures to contain and prevent them need to be taken quickly, and we are joining hands with universities in finding ways to improve the security of our networks and data.

NII is also engaging in joint efforts with industry and academia. In 2016, with support from Sumitomo Mitsui Asset Management Company, Limited, we established a Research Center for Financial Smart Data, and in fiscal 2018, we jointly established a Research Center for Robust Intelligence and Social Technology with LINE Corporation. As we continue to promote our connections with industry and academic institutions, we look forward to working with industry to conduct research and promote development of diverse solutions tailored to the new stage of AI at which we find ourselves.

Along with projects such as SINET, NII also carries out practical, hands-on research that we hope to actually implement in society, with the aim of contributing to basic research in informatics and to the growth and development of society, making us a unique organization from a global standpoint. Naturally, the "by IT" component is important, but we also want to build a robust, flexible research system that maintains a balance between the "by IT" side and basic research in IT itself, as the "of IT" component.

In fiscal 2017, with Associate Professor Ichiro Hasuo heading the ERATO project for the Japan Science and Technology Agency (JST), we established our Global Research Center for Systems Design and Mathematics, and through the Center, NII has been conducting basic research in software to support the ERATO project. In the future, we intend to continue making basic research a focal point of our endeavors.

We are moving back to the basics, and redoubling our efforts under a banner of "Think Together, Create Together".

We would be very happy if you would take the time to learn about NII's research and business endeavors, and to give us your valuable feedback and opinions. We look forward to your ongoing interest and support.

April 2019

Weaving Information into Knowledge

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

The National Institute of Informatics (NII) is Japan's only general academic research institution informatics to cutting-edge themes such as artificial intelligence, Big Data, the Internet of Things (IoT), as well as practical studies aimed at resolving current social problems. NII is building and operating including the SINET5 (Science Information NETwork 5), while expanding and cultivating services such state-of-the-art technology by providing mutual feedback on the expertise gained through operations large, while also administering vital collaborative ties to private enterprise in addition to our Informatics also is committed to providing graduate education that promotes creative, world-class

devoted to creating future value in the new discipline of informatics. From the basic methodology of and information security, NII pushes forward with fundamental research valued from a long-term view essential research and education information infrastructures for Japan's academic community, as the provision of academic content and service platforms. We are also offering services that utilize as well as from research. NII uses these activities in its efforts to train talent and contribute to society at connections with foreign/domestic universities and research institutions. The National Institute of scientific research with the aim of pioneering the development of leading-edge disciplines.
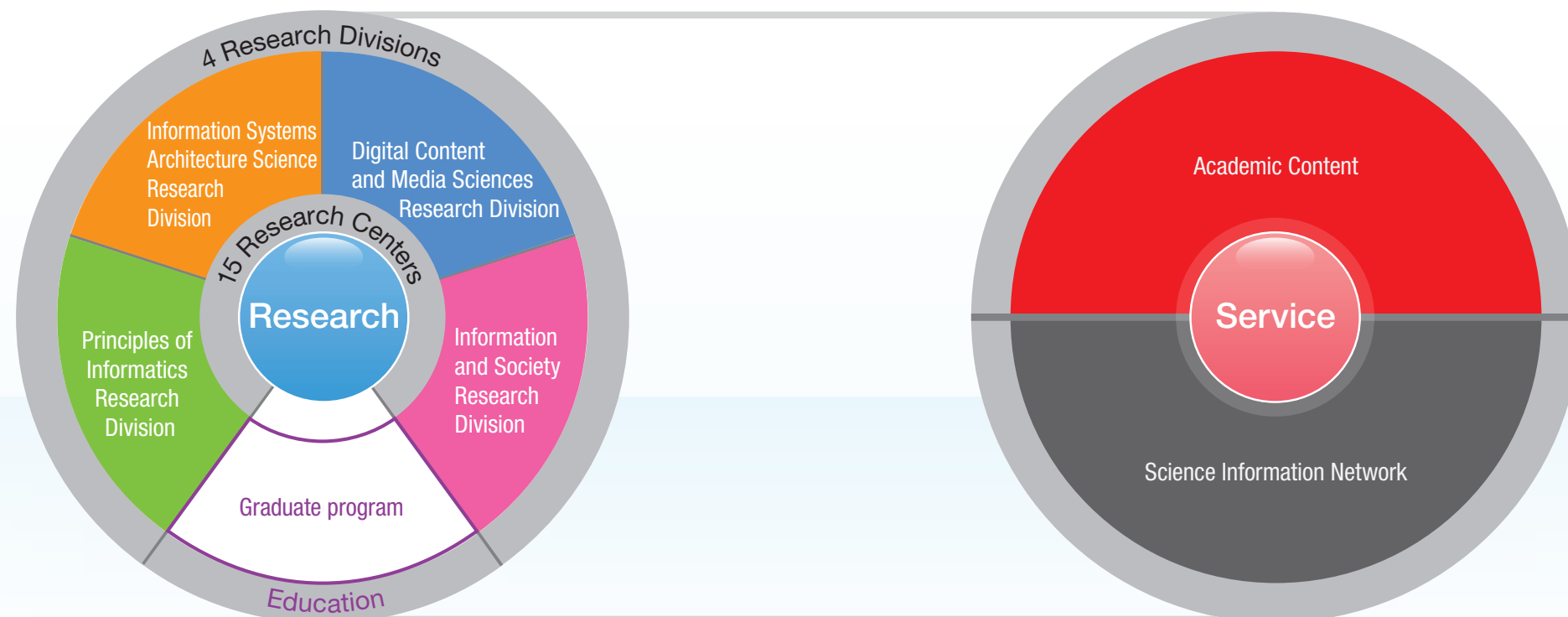
Integrated Research from Basic Methodology to State of the Art

"Informatics" combines not only computer science and information engineering but also the humanities, social studies, and the life sciences. This new academic domain involves every aspect of society. NII has established four basic Research Divisions and 15 Research Centers charged with systematically accomplishing specific tasks. From the basic methodology of informatics to state-of-the-art artificial intelligence, Big Data, the Internet of Things (IoT), and information security, NII advances the integration of research. Researchers on the front lines of their fields teach graduate programs using state-of-the-art equipment in an international atmosphere.
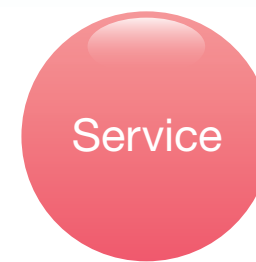
Services to Support Research Infrastructure and Education

NII coordinates with academic institutions and the research community to construct and operate the Science Information NETwork (SINET). It utilizes this ultra high-speed, high reliability and high performance SINET5 network to develop and provide an academic authentication infrastructure, cloud infrastructure and an academic content infrastructure, and promote open science. In this way, it contributes to technical research and education activities. Through a security system framework grounded on inter-university collaboration, NII also helps build systems which enable national universities and other academic institutes to respond rapidly to incidents.

Fostering New Leaders of an Advanced Information Society

Graduate education at National Institute of Informatics involves (1) participation in courses at SOKENDAI (The Graduate University for Advanced Studies), (2) cooperation with other graduate schools, or (3) acceptance of special joint research fellows.
SOKENDAI is the first graduate university in Japan established to push original, world-class scholarly research beyond the borders of conventional disciplines and to open up new paths of scientific inquiry. National Institute of Informatics offers 3-year and 5-year Ph.D. course within SOKENDAI, in which it constitutes the Department of Informatics. There are six research fields within the Department of Informatics. So, students can receive lectures and research guidance based on the field of expertise they are pursuing.

Collaboration with Industry, Government, and Academia

While engaged in pragmatic research and development aimed at resolving social problems, NII promotes collaboration with industrial, governmental, and academic entities to find ways of implementing the fruits of research.
NII's Joint Research Division operates specialized laboratories in cooperation with industry to actively promote collaboration between industry, government and academia. This can take the form of things like comprehensive partnerships and open collaborative research as well. NII also aims to spawn chances to collaborate and utilize the results of research (licensing). To this end, it holds seminars that introduce cutting-edge research seeds and address the needs of both industry and society. It also offers technical consulting by our faculty members and cultivates human resources in the IT sector.

International Exchange

At NII, the Global Liaison Office (GLO) was established to systematically promote international research exchange activities with foreign universities and research institutes. Its main roles are such as conclusion of international Memorandum of Understanding (MoU), enforcement of MOU Grant (Research Exchange Grant Program), and NII International Internship Program. NII also holds "Shonan Meetings", where the world's top-class researchers get together to have intensive discussions on the field of informatics by staying in a training-camp-style. NII is actively accepting researchers through German Academic Exchange Service (DAAD) and Japanese-French Laboratory for Informatics (JFLI) as well.

Research Divisions

NII advances research in the wide-ranging discipline of informatics through four core research divisions, which are the Principles of Informatics Research Division, the Information Systems Architecture Science Research Division, the Digital Content and Media Sciences Research Division and the Information and Society Research Division. Each conducts research ranging from basic to apply in its particular area.

Principles of Informatics Research Division
Senior Researcher: Takeaki Uno

We explore new principles and theories relevant to informatics, including algorithms and complexity theory, artificial intelligence, robotics, and quantum computing, and conduct research aimed at opening up new fields of study and developing new technologies that will support society in the future.

Fields of Research

Algorithms, artificial intelligence, machine learning, deep learning, big-data analysis, data mining, mathematical modeling, numerical analysis, computing science, Web informatics, neuroscience, quantum information, and leading-edge research with potential to discover new principles and theories at the frontiers of these areas or to create new applications.

Information Systems Architecture Science Research Division
Senior Researcher: Yusheng Ji

Conducts research on software and hardware architecture ranging from establishing innovative technologies to implementing practical systems, with the aim of improving the performance, quality, and sophistication of the computers and networks that form the basic components of IT.

Fields of Research

Post Internet, cyber-security Infrastructure, software/hardware architecture, distributed cloud computing, programming languages, system performance and log analysis infrastructure, dependable systems, Internet of Things (IoT), and network/cloud visualization research.

Digital Content and Media Sciences Research Division
Senior Researcher: Atsuhiro Takasu

Conducts research on the analysis and creation of content and media, including code media and pattern media, basic technology for storing, retrieving, and organizing content, and the analysis of social media and interaction focusing on people and information.

Fields of Research

R&D related to natural language processing, computer vision, image processing, acoustical information processing, computer graphics, databases, human interaction, Web mining, social media, community analysis, media clone generation/recognition, machine learning, deep learning applications, etc.

Information and Society Research Division
Senior Researcher: Shin Nakajima

Conducts interdisciplinary research combining Information and systems technology with human and social sciences for logical decision making based on scientific data in a "cyber-physical Integrated society", where the information world is integrated and linked with the real world.

Fields of Research

R&D related to protection and use of privacy information, next-generation anonymization, data governance, next-generation IR infrastructure theory, data policy theory, data use personnel development theory, digital communities, IT healthcare, data reliability evaluation, crowd sourcing, digital education, and open innovation platforms, and research in humanities and social sciences related to these topics.

Research Centers

To respond quickly to important social issues, NII has removed boundaries in our research system and established 15 research centers, building a system that enables researchers that have different specialties to focus research in specific fields with collaboration across fields.

Services and Operations

Research and Development Center for Academic Networks
https://www.nii.ac.jp/en/research/centers/network/

This center develops and delivers new services and functions to enhance the capabilities and efficiency of the Science Information Network (SINET): a crucial backbone network for more than 900 universities and research institutes in Japan.
Director: Shigeo Urushidani, NII Deputy Director General/ Professor, Information Systems Architecture Science Research Division

Center for Global Research in Advanced Software Science and Engineering
http://grace-center.jp/?lang=en

This center is dedicated to the integration of research, implementation, and education aimed at developing twenty-first-century software infrastructure, through collaboration with both Japanese and international research institutions, as well as through industry-academia collaborations. It also aims to cultivate world-class researchers and technologists to serve as a nucleus for next-generation efforts in this field.
Director: Shinichi Honiden, NII Project Professor

Center for Cloud Research and Development
https://www.nii.ac.jp/en/research/centers/ccrd/

This center promotes research and education utilizing IT by promoting R&D in collaboration with universities and other research facilities, aimed at providing state-of-the-art academic information infrastructure utilizing cloud technologies on the Science Information Network (SINET).
Director: Kento Aida, Professor, Information Systems Architecture Science Research Division

Center for Cybersecurity Research and Development
https://www.nii.ac.jp/en/research/centers/cybersecurity/

Through R&D that leverages knowledge acquired from the creation and operation of academic information infrastructure, this center helps to ensure the security and operational efficiency of university research environments in cyberspace and to cultivate human resources in collaboration with universities.
Director: Hiroki Takakura, Professor, Information Systems Architecture Science Research Division

Research Center for Knowledge Media and Content Science

This center pursues advanced research on the analysis and extraction of knowledge from academic papers and other academic content, as well as empirical R&D for promoting the distribution of academic knowledge.
Director: Akiko Aizawa, Professor, Digital Content and Media Sciences Research Division

Research Center for Community Knowledge

This center conducts practical R&D promoting next-generation information sharing, including activities focusing and analyzing processes that form shared knowledge between people and other people or machines, and that disseminate research results,
Director: Noriko Arai, Professor, Information and Society Research Division

Center for Dataset Sharing and Collaborative Research
https://www.nii.ac.jp/en/research/centers/dsc/

This center develops useful datasets for informatics research and makes them available to researchers. In addition, it conducts R&D on the creation of datasets and on systems for their utilization, and promotes joint usage and research in informatics.
Director. Keizo Oyama, Professor, Digital Content and Media Sciences Research Division

Research Center for Open Science and Data Platform
https://rcos.nii.ac.jp/en/

This center conducts R&D on an infrastructure which allows researchers to manage, publish and search research data. The R&D is conducted in collaboration with universities and research centers in Japan and serves the paradigm shift to Open Science in Japan.
Director: Kazutsuna Yamaji, Professor, Digital Content and Media Sciences Research Division

Big Research Projects

Global Research Center for Quantum Information Science
https://qis1.ex.nii.ac.jp/qi/

As an international hub for advanced research on quantum information science and technology, this center promotes quantum information science and explores the potential of quantum information technologies. Also educates international personnel who will lead medium-to-long-term research focused on specific goals.
Director: Kae Nemoto, Professor, Principles of Informatics Research Division

Global Research Center for Cyber-Physical Systems

In collaboration with industry, government, and academia, this center researches and develops social cyber-physical systems (CPS) aimed at creating new value and addressing social issues by linking the real world with cyberspace.
Director: Atsuhiro Takasu, Professor, Digital Content and Media Sciences Research Division

Global Research Center for Big Data Mathematics
https://bigdata.nii.ac.jp/wp/english/

Research base for the JST ERATO Kawarabayashi Large Graph Project. This world-class hub for research on big data mathematics, with a central focus on developing high-speed algorithms, conducts advanced research and professional development.
Director: Ken-ichi Kawarabayashi, NII Deputy Director General/Professor, Principles of Informatics Research Division

Global Research Center for Systems Design and Mathematics

JST ERATO HASUO Metamathematics for Systems Design Project Research Base. This research base aims to support manufacturing from specification measures to the design, manufacture and maintenance of industrial products by incorporating knowledge of formal methods from software engineering.
Director: Ichiro Hasuo, Associate Professor, Information Systems Architecture Science Research Division

Research Center for Medical Bigdata

This research center is furthering the construction of cloud platforms for big data of medical imaging that utilizes the SINET5 Science Information Network built and operated by NII, as well as the development of Artificial Intelligence (AI) that helps doctors in diagnoses by analyzing the large volume of medical images which are collected from medical academic societies.
Director: Shin'ichi Satoh, Professor, Digital Content and Media Sciences Research Division

Industry-Academia Collaborations

Research Center for Financial Smart Data
https://rcfsd.github.io/en/

This center pursues the development of technology for financial information analysis by turning big data into "smart data", and through statistical analysis and modeling of economic and social phenomena, to enable more precise predictions of the future, natural language processing, and machine learning.
Director: Masaru Kitsuregawa, NII Director General

Center for Robust Intelligence and Social Technology
https://www.nii.ac.jp/en/research/centers/cris/

This center researches and develops infrastructure for information technologies that address social problems, such as disaster prevention, education, and disadvantaged support, by placing emphasis on robust intelligence and social technologies with an intellectual prowess developed in unwavering response to ever-changing real world issues.
Director: Masaru Kitsuregawa, NII Director General

Principles of Informatics Research Division

<Mathematical Informatics>

Assistant Professor:
Yoichi Iwata
Ph.D. (Information Science and Technology)
Specialties: Exact algorithms; Parameterized complexity; Algorithms using real-world input structures
Research themes: Algorithms for computations using computers. There are limits to optimization, but theoretical worst cases are considered. Developing and analyzing algorithms that work effectively for special cases appearing in real applications.

Professor:
Takeaki Uno
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:
Ken-ichi Kawarabayashi
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 real society.

Associate Professor:
Masako Kishida
Ph.D.
Specialties: General control theory and related topics
Research themes: Mathematical methods for control and optimization, focusing on uncertainty. Recently also particular interest in building a new theory of networked control, for performing control through networks, and developing mathematical approaches to solving various problems.

Assistant Professor:
Ryota Kobayashi
Ph.D. (Science)
Specialties: Data mining; Computational neuroscience; Machine learning
Research themes: Big Data analysis, examining information processing mechanisms mainly in the brain, nerve cells and nerve circuits, to study the underlying rules. Explaining the overall rules governing phenomena in the economy and society.

Professor:
Ken Hayami
Ph.D. (Engineering)
Specialties: Numerical analysis and numerical linear algebra (Development and analysis of iterative methods for large systems of linear equations and least squares problems), Numerical solution of inverse problems
Research themes: Development of the Cluster Gauss-Newton method to find multiple solutions to nonlinear least squares problems and its practical application in parameter estimations of pharmacokinetic models, and the development of the inner-iteration preconditioning for least squares problems and its application to the primal-dual interior point method for linear programming problems

Assistant Professor:
Shuichi Hirahara
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:
Yu Yokoi
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. Designing efficient algorithms for avoiding improper participation and producing fair matching,

Associate Professor:
Yuichi Yoshida
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.

<Mathematical Logic>

Professor:
Makoto Tatsuta
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:
Kae Nemoto
Ph.D. (Science)
Specialties: Quantum information and computation; Quantum optics; Theoretical physics
Research themes: Creation and explanation of new quantum realms using hybrids of various elements, properties and methods, such as diamond NV centers and superconducting devices, with the goal of realizing various quantum technologies anticipated to overcome fundamental limitations.

Associate Professor:
Keiji Matsumoto
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:
Ryutaro Ichise
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. Developing revolutionary technology to integrate differing types of data, and for data mining and knowledge discovery.

Associate Professor:
Tetsunari Inamura
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.
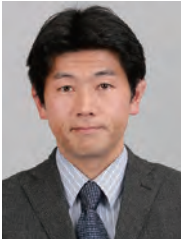
Professor:
Katsumi Inoue
Ph.D. (Engineering)
Specialties: Artificial intelligence platforms; Knowledge representation and inference: Induction and abduction: Relational learning; Logic programming; Constraint programming
Research themes: Artificial intelligence approaching a theory of intelligence. Building a theory for inference and learning, developing efficient algorithms and implementing them with computers to contribute to advancement of science and understanding in society.

Professor:
Ken Satoh
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:
Mahito Sugiyama
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:
Hideaki Takeda
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:
Shingo Murata
Ph.D. (Engineering)
Specialties: Cognitive robotics; Deep learning; human-robot interaction; Computational psychiatry
Research themes: Research aims to theoretically understand the constructive approach to calculation methods that succeed in human-like cognitive functions by integrating perspectives, such as cognitive neuroscience, robotics, and machine learning, to realize cognitive robots able to cooperate with others (human or robot).

Information Systems Architecture Science Research Division

<Network Architecture>

Associate Professor:
Shunji Abe
Ph.D. (Engineering)

Specialties: Performance analysis and quality control methods through communication traffic measurement; IP network communication performance improvement; Network architecture
Research themes: Developing methods for controlling communication volume to realize efficient and secure communication networks and evaluating 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:
Kensuke Fukuda
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 to a 1/f law. Searching for possible overall control of the Internet by understanding this mechanism.

Associate Professor:
Megumi Kaneko
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, while 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.

Associate Professor:
Takashi Kurimoto
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 and high-speed network services in cooperation with SINET.

<Information Network>

Professor:
Shigeo Urushidani
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. Developing original NII functionality in collaboration with system vendors. Developing various services such as the world's first L1 on-demand service.

Professor:
Yusheng Ji
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 last, high-quality, and sustainable wireless access services supporting the demands of future mobile communications traffic.

<Computer Architecture>

Professor:
Hiroki Takakura
Ph.D. (Engineering)

Specialties: Cyber security; High-reliability networks; Anomaly detection
Research themes: Security measures to protect confidential information from cyber attacks, 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:
Kento Aida
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:
Michihiro Koibuchi
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 loss of data. Liquid submersion cooling technologies for computers. One dream is to design the world's first supercomputer network.

Professor:
Masahiro Goshima
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 in the past ten years, clock speeds have remained relatively stable, but effective speeds have increased by a factor of ten. Ongoing research to extend this trend for another ten or twenty years.

Associate Professor:
Atsuko Takefusa
Ph.D. (Science)

Specialties: Parallel and distributed processing; Cloud infrastructure technologies; Intercloud technologies
Research themes: Building a new information platform that will seamlessly integrate the Cloud, SINET and on-demand academic networks internationally. Enabling creation of new applications using safe, broadband networks and the Cloud.

Professor:
Hiromichi Hashizume
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.

<Software Infrastructure>

Assistant Professor:
Hiroyuki Kato
Ph.D. (Engineering)

Specialties: Optimization for casual queries to database; Fundamental Issues on 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 adequately. Advancing research on the query language. XQuery, to improve usability.

Assistant Professor.
Taro Sekiyama
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.

Assistant Professor:
Kanae Tsushima
Ph.D. (Science)

Specialties: Programming languages; Functional programming; Program debugging; Development support
Research themes: Difficulty in writing correct programs when unsafe programs are rejected as type errors. Debugging methods for correcting type errors, enabling inexperienced programmers to write safe programs easily.

Associate Professor:
Ichiro Hasuo
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.

<Software Engineering>

Associate Professor:
Fuyuki Ishikawa
Ph.D. (Information Science and Technology)

Specialties: Software engineering; Formal methods; testing; Autonomous and smart systems; Cyber-physical system; Machine learning engineering
Research themes: The catch phrase for research is "Smart Systems and Smart Dependability Assurance." In anticipation of leading-edge application systems, the research works in technologies that include verification, extrapolation, optimization, automatic test generation and self adaption by utilizing a wide range of models with various requirements, specifications and designs.

Associate Professor:
Nobukazu Yoshioka
Ph.D. (Information Science)

Specialties: Security software engineering; Privacy engineering; Software engineering
Research themes: Methods for deciding security requirements and design using security patterns for building secure software systems. Also, mechanisms for building software that takes user privacy into consideration.

Professor:
Tomohiro Yoneda
Ph.D. (Engineering)

Specialties: Asynchronous circuit technology and dependable VLSI platform technologies
Research themes: Asynchronous circuit technology, which solves 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.

Research
Graduate Program
Service
Organization/Other

Digital Content and Media Sciences Research Division

<Foundations of Content Management>

Associate Professor:
Norio Katayama
Ph.D. (Engineering)
Specialties: Data management technology for video corpus analysis
Research themes: High-speed, efficient 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.

Assistant Professor:
Yusuke Komiyama
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:
Atsuhiro Takasu
Ph.D. (Engineering)
Specialties: Text and sensor data mining; Structural pattern matching; Cyber-physical data base systems
Research themes: Building a society in which useful information can be extracted from large data sets to accumulate information and knowledge for humankind. Mechanisms to integrate, manage and analyze large-scale data sets to achieve this.

Associate Professor:
Asanobu Kitamoto
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 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:
Kazuya Kodama
Ph.D. (Engineering)
Specialties: A study on 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:
Imari Sato
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:
Akihiko Takano
Ph.D. (Science)
Specialties: Informatics of association; Algebra of programming
Research themes: Supporting search for highly reliable information on the "想/IMAGINE" platform, an intelligent digital information space utilizing suggestion functionality. At the same time, building an information service that will be public intellectual property to expand ways of thinking and promote deeper thought.

Professor:
Kazutsuna Yamaji
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.

<Text and Language Media>

Professor:
Akiko Aizawa
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 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:
Shin'ichi Satoh
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, establishing search technologies for objects and events portrayed in video. Participating in overseas R&D projects and refining technologies.

Professor:
Akihiro Sugimoto
Ph.D. (Engineering)
Specialties: Sensing and understanding human activities in daily life; Real-time 3D environment recovery using RGBD 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". In particular, reexamining problems in computer vision from a mathematical and engineering perspective to build a visual mathematics.

Assistant Professor:
Kenshi Takayama
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:
Keizo Oyama
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:
Teruhito Kanazawa
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.

Professor:
Junichi Yamagishi
Ph.D. (Engineering)
Specialties: Speech information processing; Speech-based human machine interaction; Speech-based assistive technology
Research themes: Development of speech synthesis that is smart speaking selectively and responsively according to the desires and state of the user. Broad expansion into fields such as medicine, social welfare and the arts. Proposing new ideas and returning useful technologies to society.

Associate Professor:
Yinqiang Zheng
Ph.D. (Engineering)
Specialties: 3D reconstruction, Photometric computer vision, Hyperspectral imaging
Research themes: In computer vision, 3D reconstruction for recovering shape from 2D images and technologies focusing on color in images. Enabling better shoe fitting in online shopping by reconstructing foot shape in 3D. Creating new businesses in this way.

Assistant Professor:
Hiroshi Mo
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.

<Pattern Media>

Assistant Professor:
Ryoichi Ando
Ph.D. (Design Engineering)
Specialties: Computer graphics; Physical simulations; Computational fluid dynamics
Research themes: Developing new computation methods for numerical fluid dynamos 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:
Satoshi Ikehata
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.

Digital Content and Media Sciences Research Division

<Human and Knowledge Media>

Associate Professor:
Kenro Aihara
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:
Frederic Andres
Ph.D./HDR

Specialties: MindFlow; Opinion mining; Agricultural management based on collective intelligence; Image learning ontology; Social project management platforms
Research themes: A distributed semantic service and social project platform for collective intelligence applications. Providing image learning ontology and stress ontology management services, which are core research technologies.

Associate Professor:
Ikki Ohmukai
Ph.D. (Informatics)
Moved to The University of Tokyo in September 2019

Specialties: Construction and use of semantic Web and Linked Open Data; Data sharing in academic information distribution
Research themes: The spread of the semantic Web and Linked Open Data as technological infrastructure for Open Data and Open Science and development of various support tools. Also closely involved in development and operation of CiNii, the academic information service provided by NII.

Professor:
Helmut Prendinger
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; Multi-modal 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 avoidance algorithms and deep learning.

Professor:
Seiji Yamada
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:
Yi Yu
Ph.D. (Information Science)

Specialties: Multi-media data mining and recommendations using multi-modal analysis with images, video and music
Research themes: Aiming to create search/recommendation algorithms and intelligent systems that appropriately support the everyday lives of people.

Information and Society　Research Division

<Information Use>

Professor:
Noriko Arai
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:
Kouichirou Ueki
M.A. (Science)

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:
Noriko Kando
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.

Professor:
Shin Nakajima
Ph.D.

Specialties: Software dependability; Formal methods; Automatic verification
Research themes: Formal methods for developing highly reliable software utilizing mathematics. With the arrival of the IoT age and with software permeating social infrastructure, the ability to ensure reliability, based on uncertainty, is essential for safety in society.

Associate Professor:
Mayumi Bono
Ph.D.

Specialties: Understanding multimodal interaction; Understanding conversational structures in multi-party interaction
Research themes: Creating a data set 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.
Takayuki Mizuno
Ph.D. (Science)

Specialties: Statistical analysis, modeling, prediction, and control of socioeconomic phenomena based on big data; Econophysics
Research themes: Analysis of Big Data using methods from physics and using econophysics to explain phenomena in economics and society. Aim to derive a universal equation for "booms" from this perspective. There is also potential to predict future bubble crashes and prices slumps and to control booms.

Associate Professor:
Masaki Nishizawa
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.
Miho Funamori
M.A. (Science)

Specialties: Multi-faceted university IR systems; Open science; Research data management
Research themes: An IR framework and analysis methods to support university management, and development of models. Consideration of the nature of scholarship in the digital age, including Open Science, and contribution to transition in Japan's academic institutions.

Assistant Professor:
Masako Furukawa
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.

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

Specialties: Critical growth factors of e-commerce and e-money; University Information Security Policy Portal (UISPP)
Research themes: Block chain 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.

<Science Information>

Associate Professor:
Hironobu Gotoda
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:
Yuan Sun
M.A. (Education)

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

<Information Public Policy>

Professor:
Isao Echizen
Ph.D. (Engineering)

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

Professor.
Ichiro Satoh
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.

Research
Graduate Program
Service
Organization/Other

Large-scale Project Involvement

AMED ICT Infrastructure Establishment and Implementation of Artificial intelligence for Clinical and Medical Research

Japan Agency for Medical Research and Development (AMED) Research Project; This project promotes research to establish ICT infrastructures, including clinical and medical research with emphasis such as leading-edge information and communication technologies relevant to clinical and medical research; to provide evidence necessary for clinical development of medical technologies originating In Japan, which leads to the improvements of the medical quality in Japan and the heightening of accessibility (equalization) to receive general medical treatment throughout the country.

New Support for Medical Care Using IT

NII Research Supervisor. Shin'ichi Satoh, Professor, Digital Content and Media Sciences Research Division/Director, Research Center for Medical Bigdata

In cooperation with medical academic associations supposed by Japan Agency for Medical Research and Development (AMED), this research center is furthering the construction of cloud platforms for big data of medical imaging that utilizes the SINET5 (1) Science Information Network built and operated by NII as well as the development of artificial intelligence (AI) that helps doctors in diagnoses by analyzing the large volume of medical images which are collected from medical academic societies. NII established the Research Center for Medical Bigdata in November 2017 to research and develop these fields with this center at the core.

Construction of a Big Data Cloud Platform for Medical Imaging

Data is collected from hospitals and other medical institutions and anonymized by each medical society and then the data is transferred to the servers of the medical societies to facilitate a big data cloud platform for medical imaging from the medical society servers. The big data platform leverages the features of SINET5, which connects every prefecture throughout Japan at ultrahigh-speed lines of 100 Gbps, as well as the enhanced Virtual Private Network (VPN) provided by SINET5 to transfer medical imaging information that demands confidentially over a safe network environment (Figure). By taking advantage of a cloud system, researchers from the medical field nationwide can easily use big data for medical imaging to promote research that leverages a large volume of data unavailable up until now.

Development of AI Medical Imaging Analysts Technology

We are conducting a large-scale project to develop medical imaging analysis technology that uses deep learning and image recognition which are core AI technologies, by gathering medical images from more than 100,000 cases from around Japan through each medial society. Therefore, a joint research and development system with researchers in the field of informatics as well as NII is stepping up to the challenge of resolving these problems by putting in place each research theme. Together with experts who have engineering and informatics viewpoints, doctors active as on-site medical professionals, engineers as well as other related parties, the configuration of a bilateral coordination system that goes beyond medical fields is also an important theme.

One purpose of medical imaging analysis technology is to find slight inconsistencies between areas suspected of a lesion and normal areas in images. We then hope to prevent oversights and contribute to the efficiency of tasks in medical sites by supporting doctors in imaging diagnostics and examination fields.

(1) SINET5: The Science Information NETwork, built and operated by NII. Since its official launch in April 2016, SINET5 has connected all regions of Japan via an ultra-high-speed network offering data rates of 100 Gbps, as well as faster Japan-U.S. channels also offering 100 Gbps and new channels connecting Japan and Europe. More than 900 universities and research institutions across Japan, including all 86 of Japan national universities, are members of the network.
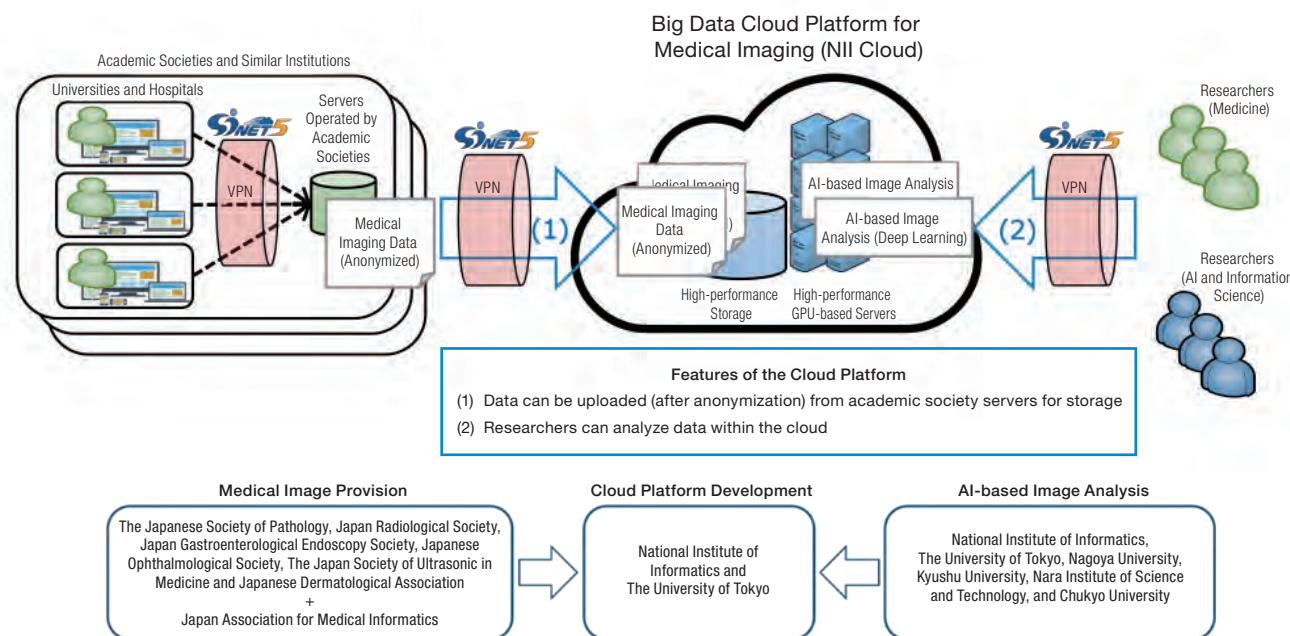
Figure: Overview of cloud platform. Medical institutions, universities, and other organizations use the cloud platform via a high-performance virtual private network (VPN) provided by the Science Information Network, SINET5.

JST ERATO

ERATO stands for the Exploratory Research for Advanced Technology project spearheaded by the Japan Science and Technology Agency (JST). Under the guidance of distinguished leaders, this project aims to create seeds of revolutionary technologies based on new scientific knowledge while driving the innovation of scientific technologies able to revolutionize society and the economy by promoting basic exploratory research filled with creativity.

HASUO Metamathematics for Systems Design Project

Research Director: Ichiro Hasuo, Associate Professor, Information Systems Architecture Science Research Division/Director, Global Research Center for Systems Design and Mathematics

In the manufacturing industry today, progress is being made towards fundamentally changing the way manufacturing processes—from design to production—are carried out by Introducing automation and software support based on advanced information processing technologies. In light of this, the HASUO Metamathematics for Systems Design Project aims to introduce results from the field of software science into traditional manufacturing technologies and build software tools for supporting various aspects of manufactured product development—from specification development to design, implementation, and maintenance. NII established the Global Research Center for Systems Design and Mathematics in November 2017 as a research base.

Leveraging Formal Methods in Manufacturing

Specifically, by incorporating mathematically based system design techniques used in software science known as "formal methods", the project will explore methodologies for software support covering quality assurance and efficiency in "cyber-physical systems", such as cars and other manufactured products. Up until now, formal methods have dealt with "discrete elements" involving calculation by computer, but In order to apply formal methods to physical information systems, they must be extended to encompass "continuous elements" of physical systems such as continuous dynamics, probability, and time (Figure 1). This project's unique approach to this theoretically difficult problem is to analyze mathematically the extension processes themselves and acquire universal knowledge by constructing higher-order (meta-level) theories that will allow various formal methods to be extended simultaneously (Figure 2).
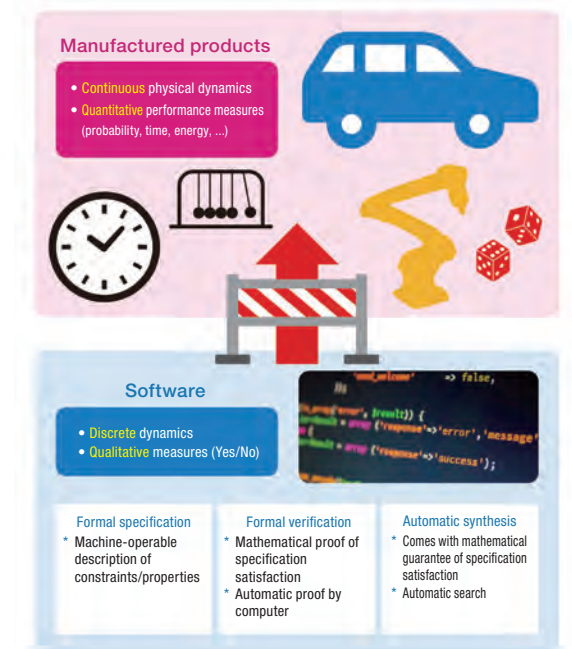
Figure 1: Extending formal methods: From software to physical information systems

This meta level approach is a very theoretical one that employs various abstract mathematical techniques, such as logic and category theory. At the same time, a hallmark of this project is its focus on applying these theoretical research results to real problems faced by industry.

Application for On-site Manufacturing Needs

The project includes two approaches to application. The first is to support real-world product design processes using formal methods in collaboration with domestic and foreign companies. Rather than trying to reform entire design processes, this will involve specific, practical efforts, such as reducing the time required for a certain test from three days to half a day. This will be made possible by formulation based on a theoretical approach and a flexible response to problems. The use of theoretical results will facilitate matching with specific industry needs. The second approach to application is to investigate the role of formal methods in pioneering software-based product design processes. Here, in collaboration with researchers developing the autonomous driving system Autonomoose at the University of Waterloo in Canada, the project conducts groundbreaking research on industry application of formal methods using Autonomoose as a testbed.

Figure 2: Unique methodology: Metatheoretical transfer

Large-scale Project Involvement

JST CREST

Core Research for Evolutionary Science and Technology (CREST). This program promotes original basic research to a high, international standard, toward achieving certain national strategic goals, and team-based research oriented to producing excellent results that will contribute greatly to scientific and technical innovation in the future.

[Big Data] Advanced Core Technologies for Big Data Integration

Research Supervisor. Masaru Kitsuregawa, NII Director General

As ICT permeates society, the amount and diversity of data in various fields is increasing exponentially. To realize integrated analysis of big data spanning these fields, and to create, enhance and systematize next-generation infrastructure technologies, two NII researchers are representing work on their respective research issues under guidance from Research Supervisor and NII Director General Masaru Kitsuregawa.

Data Particlization for Next Generation Data Mining

Research Director: Takeaki Uno, Professor,
Principles of Informatics Research Division

With the arrival of the Big Data age, it has become possible to use various data from the physical and social sciences, economics and other fields. Analyzing diverse and noise-filled data to find meaning and hidden properties can lead to new scientific discoveries, more detailed understanding of social structures, and development of new products and customer services. What is important here is to extract the part of the data related to the meaning or property of interest. Data mining is the technology for finding this part of the data, but it is difficult to find the appropriate structures at an appropriate computational cost. In this project, we have defined this partial data using a structure called a cluster, and developed a technology called data polishing, which can extract meaning from the data relatively easily. Innovative technologies that are faster and more accurate than before will enable various types of big-data applications. We have already applied these technologies to matchmaking data used in many enterprises, including Internet advertising, newspaper articles, purchase data and intestinal bacteria data, and produced a range of knowledge.

Identifying granules through data polishing

Match making | On-line sates | Advertising | Administration
Medicine | Finance | Tourism | Manufacturing | Education
Health | Economics | Books | Conversation

Application-Centric Overlay Cloud Utilizing Inter-Cloud

Research Director: Kento Aida, Professor, Information systems
Architecture Science Research Division

As the performance of supercomputers, clouds and the networks that connect them has increased, the Inter-cloud, which connects multiple clouds through high-speed networks, is being built, making it possible to use them for large-scale data processing. However, with current technology, users must configure computers and networks individually to build a computing platform for processing data, and this creates significant technical and time barriers. The objective of this research is to develop infrastructure technology for quickly and automatically building large scale data processing platforms optimized for each application utilizing multiple clouds connected by networks. The results of this research will enable high-performance, easy processing of large scale data using clouds. We intend to collaborate with researchers in the fields of genome analysis and fluid acoustic analysis to develop applications in these fields, and also to build and operate infrastructure together with researchers in information infrastructure centers in universities and other institutions. This research is being done in collaboration with research groups at Hokkaido University, the National Institute of Genetics, the Tokyo Institute of Technology, and Kyushu University.
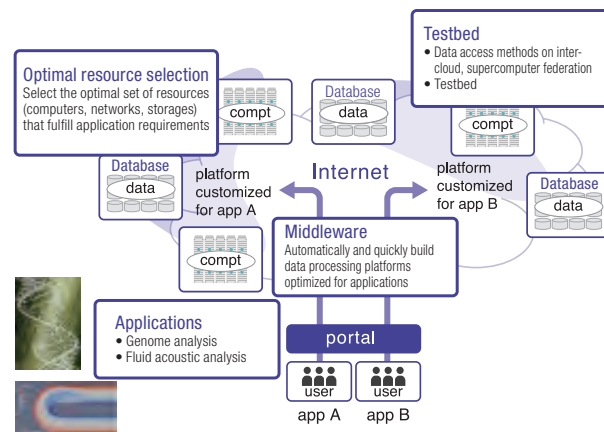
[Symbiotic Interaction] Creation and development of core technologies interfacing human and information environments

VoicePersonae: Speaker identity cloning and protection

Research Director: Junichi Yamagishi, 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. It is an important factor in multiple different fields (e.g., biometric authentication, voice synthesis, voice quality conversion and privacy). However, research is being conducted separately toward conflicting goals in these fields currently.
This project will remove the barriers in the field relating to voice identity. It will then (a) increase the precision of speaker identity modeling technology, (b) improve the safety and robustness of speaker recognition biometric authentication by voice, and then (c) realize new technologies relating to voice privacy protection. Detailed modeling of speaker identity is needed for application examples such as avatars that reproduce personal characteristics. In the past, research was conducted separately on voice synthesis, voice quality conversion and voice enhancement. However, in this project, we will realize a new model through integration as various voice generation tasks for multiple speakers. We are also examining integration with speaker recognition technologies in addition to voice generation. Furthermore, we will conduct research on voice liveness detection, which is a technology to automatically detect spoofed voice, to enhance the safety of speaker recognition. In addition, we will be the first in the world to hold a challenge to compete over voice anonymization and re-identification to speed up research on voice privacy.
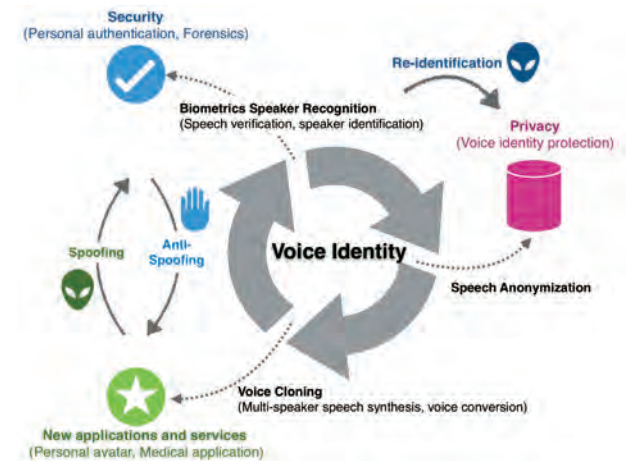
SIP Phase2

The Cross-ministerial Strategic Innovation Promotion Program (SIP) has been running since FY2014 under the leadership of the Council for Science, Technology and Innovation (CSTI) of the Cabinet Office. This program aims to promote science, technology and innovation through the management that 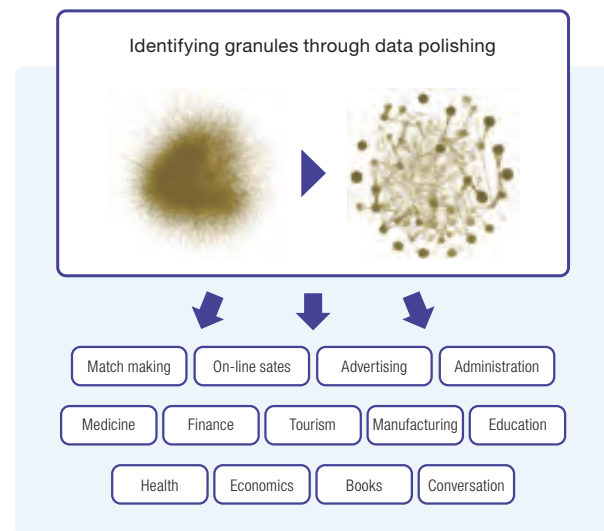transcends the boundaries of government departments and conventional fields. The second phase of SIP has started from FY2018.

[Big-data and AI-enabled Cyberspace Technologies]

This project is looking to establish cyberspace technologies in the area of (1) highly sophisticated human interaction technology which contributes to cooperation between humans and AI, (2) a cross-domain data exchange platform, and (3) inter-AI collaboration technology, as a basis for the Cyber-Physical System (CPS) that will form the foundation of Society 5.0.

Research & Development Subject Headed by NII Researchers

A Cross-domain Data Exchange Platform based on Metadata Structuring by AI Technology and its Evaluation through Applications for Spatio-temporal Big Data

Research Director: Atsuhiro Takasu, Professor, Digital Content and Media Sciences Research Division

We are jointly developing a service platform for promoting cross-domain data exchange (CDXP), studying the role and functions of CDXP, operational rules for healthy ecosystem development among users, and evaluating its effectiveness using demonstration applications working with industry partners. By enabling linkage and expansion of open data from local authorities as well as data from various domains, it is expected to provide a basis for cyberspace technology development.
The main research subject for NII is to develop technology for supporting smooth and effective operation of CDXP by contributing to enhance the major functions of the platform such as data set search and data linkage & conversion from multiple domains. A key function for linking data among different domains is information integration, for which we are promoting researches on characteristic expressions (embeddings) in language data and matching algorithms of semi-structured data contained in each domain. We also plan to develop demonstration applications to evaluate the effectiveness of the platform functions and to extract various operational challenges sharing data from multiple domains.

Overall Picture of the Cross-domain Data Exchange Platform and the Research & Development Tackled by NII
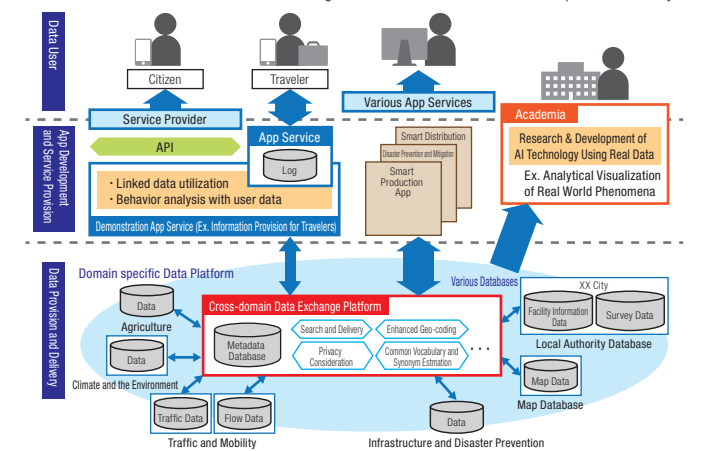
Kakenhi

Grants-in-Aid for Scientific Research (Kakenhi) -Various research challenges, from basic to applied research-

Kakenhi provide broad support for academic research based on the free ideas of the researchers themselves, over a wide range of fields and spanning from basic to applied research. Both teaching and research personnel actively apply for Kakenhi, and many are accepted. Awarded Kakenhi can also be distributed to researchers at other research institutions (co-investigators) based on collaboration in the research.
Similarly, many NII researchers are participating as co-investigators in projects funded by Kakenhi acquired by researchers at other institutions.

Applications accepted (FY2018)

	No. of Applications Accepted	Amount (Thousands of yen)
Principal Investigator	75	433,429
Co-Investigator (Other institution → NII)	69	92,861

[Research with Kakenhi]

Grant-in-Aid for Scientific Research (S)

Large Graphs: Theory and Algorithms

Principal Investigator: Ken-ichi Kawarabayashi, NII Deputy Director General and Professor, Principles of Informatics Research Division

Algorithms based on mathematical theory have created progress for human civilization. At present, algorithmic innovations, information searches, and genome information processing are connected to the creation of large business on a national scale. In the 21st century, it is expected that developments in advanced computer science will solve mankind's various problems, but many of these are difficult problems which cannot be solved even if a supercomputer is used. In order to solve these problems, new innovations in algorithms are needed, and new algorithmic technologies which are based on mathematical science have top-priority significance. In particular, the high-speed implementation for large networks and data on the scale of billions of units shall be raised, and will be applied to a wide range of fields, such as transportation, Web analysis and biotechnology. Theoretical research in this proposal could be a breakthrough for solving these global problems.
We plan to work on the following three projects.

1. Submodular function appears everywhere in optimization problems and machine learning problems. In this proposal, we attempt to consider the online setting, the adaptive setting, and some robust algorithms.

2. Graph minor theory, by Robertson and Seymour, is perhaps the deepest theory in all of Discrete Mathematics, and it also creates the deepest discrete algorithms. But this theory applies only for undirected graphs. In this proposal, we will extend graph minor theory to digraphs.

3. Graph Coloring is one of the fundamental problems in graph theory and algorithms. In this proposal, we will work on graph coloring problems for planar graphs (i.e., the four color theorem), and graphs on a surface. Our special focus would be to obtain a faster algorithm for these problems.
*Reference: https://bigdata.nii.ac.jp/kibans/english/

Grant-in-Aid for Scientific Research (S)

Advanced Reasoning Support for Judicial Judgment by Artificial Intelligence

Principal Investigator: Ken Satoh, Professor, Principles of Informatics Research Division

In the trial process, the intellectual tasks that the judges are carrying out are roughly divided into the fact finding process, the subsumption process, and the judgement process. The fact finding process is a process of recognizing facts actually occurred in the case from evidence, the subsumption process is a process of making the facts correspond to legal concepts, and the judgement process is a process of making a judgement according to the legal concepts corresponding the facts based on legal rules. Furthermore, in court cases, there are conflicting structures of plaintiffs and defendants, and prosecutors and an accused. Therefore, in the trial process, various complicated high-order inferences are executed, and more accurate and prompt high order inference should be realized by support by artificial intelligence. For this research, we aim to develop a system that supports advanced reasoning by using the following fundamental technologies and a system that analyzes argumentation in each process (Figure).

1. Fact finding process support system using evidence reasoning based on Bayesian network
2. Subsumption process support system by acquiring subsumption rules based on natural language processing
3. Judgement process support system by extending the existing civil code reasoning system PROLEG to handle criminal cases and administrative cases
4. Argumentation analysis system based on argumentation theory

Grant-in-Aid for Scientific Research (A)

Bio-information Protection and Utilization Platform to Secure the Convenience of Individuals and Prevent Impersonation

Principal Investigator: Isao Echizen, Acting Director General/ Deputy Director General and Professor, Information and Society Research Division

The spread of high-performance cameras and microphones means that the bio-information of other people (e.g., their faces, voices, walking motions, fingerprints, veins and irises) is shared in cyberspace via shooting and recording from remote locations. It has been pointed out that there is a danger this will lead to a penetration in biometric authentication and to impersonation for fraud and misrepresentation.
On the other hand, biometric authentication is spreading widely as a means of identity verification. Accordingly, it is desirable to be able to provide bio-information without inconvenience when verifying individuals. We will establish a technology platform that can control according to a person's intentions the acquisition of bio-information from remote locations and the distribution of bio-information in cyberspace while securing the convenience of biometric authentication in real spaces in this research. We will clarify the details of the bio-information jamming techniques, anonymization techniques and bio-information control techniques with policies that will become the components in the technology platform. This will help in our aim of realizing a human-friendly bio-information protection and utilization platform that offers peace of mind.

Grant-in-Aid for Scientific Research (A)

Seeking A Sentence Unit of Sign Language: An interdisciplinary approach using the methods of sign language linguistics, deep learning and crowdsourcing

Principal Investigator: Mayumi Bono, Associate Professor, Information and Society Research Division

The objective of this research is to recognize sign language dialogue at the sentence level with the aim of constructing a sign language translation system. The sentence is the basic level of translation when aiming to construct sign language translation systems. Surprisingly, spontaneous sign language dialogue has not been clarified in research at the sentence level. On the other hand, the sentence level is self-evident between sign language speakers who use sign language as their living language. It is sometimes the case that sentences are not formed at the sentence level in dialogue. Let's take the example of speech language. Sentences in such dialogue are not necessarily completely separated with sentence-ending particles such as "da", "desu" and "masu" in Japanese; there are many cases in which sentences are left incomplete with the ends omitted. Specifically, in this research, we will (1) identify the non-finger movement (NMS) elements that appear at the end of sentences (TRP) with the cooperation of sign language speakers, (2) construct a system to perform automatic segmentation at the sentence level with image processing technology using deep learning, (3) use crowdsourcing to ask a large number of sign language speakers about the appropriateness of the sentence level recognition results, and then (4) examine the design of a sign language translation system.

Flow of Recognition Research (Voice and Sign Language)

Fund for the Promotion of Joint International Research (Fostering Joint International Research (A))

Creation of a Fusion of the Data Centered Science and International Political Science Fields to Unravel Complex Global Relationships

Principal Investigator: Takayuki Mizuno, Associate Professor, Information and Society Research Division

Many companies, people and governments are linked in the world to form a giant and complex global economic network. Previous studies have worked on the detection and measures of indirect connections through an economic network with "bad companies" that ignore us and human rights. This has been done by analyzing the structure of globalization with data science (e.g., economic big data and complex network science). We will extend these results to political science together with the mainstream of political science. This will solve the problem in which the pursuit of profit by companies generates indirect connections with bad companies without realizing it and the problem in which globalization indirectly connects armed forces and citizens. In addition, we will show the ability to deter international disputes by indirect profit/loss through an economic network to create a fusion of the data science and international political science fields.
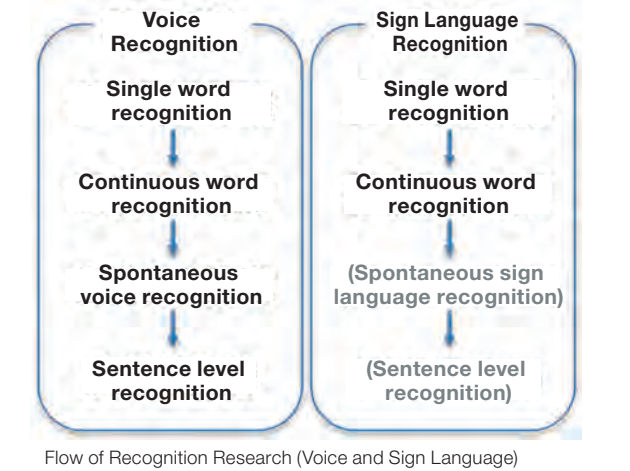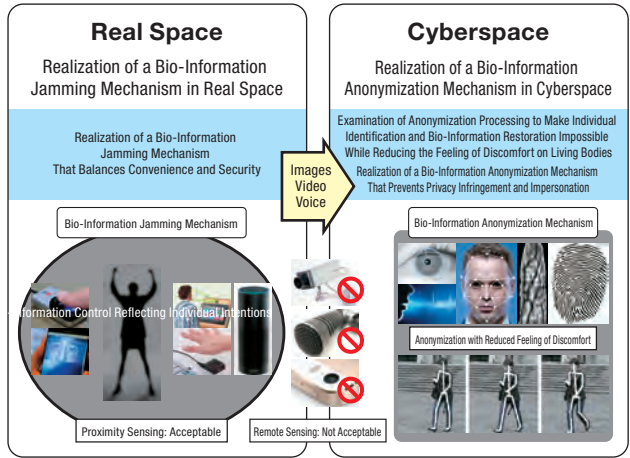
Grant-in-Aid for Early-Career Scientists

Evaluation and Optimization of Market Mechanisms Based on Quantitative Analysis

Principal Investigator: Yu Yokoi, Assistant Professor, Principles of Informatics Research Division

In situations such as matching and auctions where many people participate, it is necessary to have a mechanism to calculate allocations and distribution with consideration for the preferences of each individual. There is a need for various characteristics (e.g., fairness and efficiency) in this mechanism. However, there are many cases in which it is impossible to design a mechanism that satisfies all the desired characteristics from the aspects of the problem structure and computational complexity. Therefore, there is a frustrating debate about which characteristics to prioritize and which to abandon when designing mechanisms. We will aim to make it possible to design a well-balanced mechanism that meets the needs of each application. We will do this by proposing a technique to measure quantitatively and in detail the achievement level relating to each characteristic in the mechanism and the trade-off relationship in the desired characteristics.

Research

Collaborative Research Promotion

NII is actively conducting research in collaboration with private facilities and utilizing external forting through means such as contracted research. Also, in order to produce real value for people and society as never before with new theories and methodologies, and expanded applications (future value), as is demanded of informatics, we are promoting informatics research by seeking and performing public collaborative research and cultivating research through collaboration with other academia fields.

① Application
② Decision on acceptance
③ Contract for collaborative research
④ Request transfer of research fees and funding
⑤ Perform research, report on results

[Various joint research performed with enterprises of different types]

Joint research with private facilities   https://www.nii.ac.jp/research/collaboration/minkan/

NII faculty performed the following joint research, receiving research staff and expenses from private and other external facilities. In principle, projects last one year, but there are also multiple-year contracts.

(1) Taking on researchers
We take on researchers from private institutions and other external bodies to carry out cooperative research at NII while continuing with their regular job. Essential overheads are covered under out research cost up to a certain limit.

(2) Receiving funding only
We receive funding required for cooperative research from private institutions and other external bodies. Cooperative researchers then work from their respective locations.

(3) Taking on researchers and receiving funding
We take on researchers and receive funding to carry out cooperative research.

Projects performed (FY2018)

	No. of projects accepted	Funding received (thousands of yen)
FY2016	55	176,239
FY2017	47	144,121
FY2018	43	146,803

[Paving the way for wide-ranging collaboration with researchers and conducting research aimed at creating value]

NII open collaborative research   https://www.nii.ac.jp/research/collaboration/koubo/

We accept proposals for collaborative research, with NII staff acting in a liaison capacity. We accept proposals every year for the following three types of open collaborative research,
● **Strategic research proposals** based on strategic themes set out by NII.
● **Proposals for research planning meetings** aimed at paving the way for new collaboration or further existing research, through meetings at International Seminar House for Advanced Studies in Karuizawa.
● **Open subject proposals** in which the applicant is free to set their own research subject.

Researchers affiliated with a wide range of domestic institutions are eligible to apply for open collaborative research. This includes the option for staff members and graduate students to become collaborative researchers, as well as staff from private companies, universities, and technical colleges (although the applicant may not be a graduate student). We are particularly interested in proposals for research planning meetings, so please collaborate with us in taking things to the next level.

Selection status (FY2018)

	No. of proposals accepted
Strategic research applications	15
Research planning meeting applications	9
Open subject applications	30
Total	54

Intellectual Property

NII creates, acquires, and manages intellectual property, and promotes the use of this intellectual property in industry-academia-government collaborations that contribute to society.

Number of Invention Reports, Applications for Patents, and Registrations (total number since FY2004)   (as of the end of March 2019)

■ Number of Reports

257	Attribution: Organization Attribution	242
	Attribution: Individual Attribution	15

■ Number of Applications

290	Domestic	239
	Foreign	51

■ Number of Registrations

115	Domestic	91
	Foreign	24

List of Japanese patents owned

Title of invention	NII Inventors	Joint application	Registration
Image information apparatus, and method and program for retrieving and displaying image information	Tomoko Kajiyama	●	Patent No. 4441685
Quantum key delivering method and communication apparatus	Yodai Watanabe	●	Patent No. 4231926
Time-series data analysis device, and time-series data analysis program	Ryutaro Ichise	●	Patent No. 4734559
Information-Sharing System, Information-Sharing Server, Information-Sharing Method, and Information-Sharing Program	Shinichi Honiden		Patent No. 4799001
Sequential content delivery device, sequential content receiving device, and method therefor	Noboru Sonehara	●	Patent No. 4734563
Contents presentation apparatus, contents presenting method and contents presentation program	Noboru Sonehara	●	Patent No. 4403276
Text content presentation apparatus, text content presentation method and text content presentation program	Noboru Sonehara	●	Patent No. 4143628
Method and apparatus for evaluating communication traffic that uses fragmentary self-similarity process	Yusheng Ji	●	Patent No. 4081552
Imaging device and imaging method using out-of-focus structure	Kazuya Kodama	●	Patent No. 4437228
Information resource retrieval device, information resource retrieval method and information resource retrieval program	Noriko Kando	●	Patent No. 4324650
Active content distribution system, active content distribution program and active content distribution method	Shinichi Honiden	●	Patent No. 4392503
Device and method for generating traffic congestion prediction information, and route search program	Shinichi Honiden	●	Patent No. 4729411
Content selling device and method	Noboru Sonehara	●	Patent No. 4304278
Document indexing device, document retrieval device, document classifying device, and method and program thereof	Noboru Sonehara	●	Patent No. 4362492
Video provision device and method	Kenro Aihara	●	Patent No. 4359685
Projection image correction system and correction information generation program	Imari Sato	●	Patent No. 4982844
Digital content registration distribution apparatus, system and method	Noboru Sonehara	●	Patent No. 4956742
Airing structure of three dimensional integrated electrical circuit and layout method therefor	Michihiro Koibuchi	●	Patent No. 5024530
Quantum key distribution method, communication system, and communication service	Yodai Watanabe	●	Patent No. 4862159
Time reference point information transmitting system and receiver	Hiromichi Hashizume	●	Patent No. 4621924
Collection/delivery route route selection system	Ichiro Satoh	●	Patent No. 4374457
Device and method for learning data management, and vehicle air-conditioning device and equipment control device	Tetsunari Inamura	●	Patent No. 5224280
Air conditioner for vehicle and its control method	Tetsunari Inamura	●	Patent No. 5177667
Route Switching method, server apparatus, boundary node apparatus, rout switching system, and switching program	Shigeo Urushidari	●	Patent No. 5062845
Direct path establishing method, server device, sender network node device, direct path establishment network, and program thereof	Shigeo Urushidari	●	Patent No. 4999112
Virtual stereoscopic image display device and method of displaying virtual stereoscopic image	Asao Fujiyama	●	Patent No. 5263960
Path management control method, path management control program, path management controller and path management control system	Shigeo Urushidari	●	Patent No. 4806466
Emission allowance trading system and emission allowance trading method	Ichiro Satoh	●	Patent No. 5207195
Quantum computing device and method for Ising model	Yoshihisa Yamamoto	●	Patent No. 5354233
Spoken language estimating device, method, and program	Shuichi Itahashi	●	Patent No. 5544575
LSI arithmetic device and failure detection method for the same	Tomohiro Yoneda	●	Patent No. 5582472
Measurement device, measurement system, and measurement method	Hiromichi Hashizume	●	Patent No. 5593062
Information retrieval display device, method, and information retrieval display program	Noboru Sonehara	●	Patent No. 5599068
Information retrieval display device, method, and information retrieval display program	Noboru Sonehara	●	Patent No. 5608950
Information retrieval display device, method, and information search display program	Noboru Sonehara	●	Patent No. 5608951
Information providing device, method, and program	Noboru Sonehara	●	Patent No. 5614655
Control server, control method, and control program	Michihiro Aoki	●	Patent No. 5682932
Doppler radar system, Doppler radar transmission device, and method for optimizing transmission wave	Hiromichi Hashizume	●	Patent No. 5704695
Image collation device, image collation method and computer program	Shin'ichi Satoh	●	Patent No. 5713398
Speed/distance detection system, speed/distance detection device, and speed/distance detection method	Hiromichi Hashizume	●	Patent No. 5739822
Information processing device, schedule determining method, and computer program	Ken'ichi Kawarabayashi	●	Patent No. 5733722
Search tree drawing device and search tree drawing method and program	Yusheng Ji	●	Patent No. 5754676
Encoding device, method, program, and recording media	Nobutaka Ono	●	Patent No. 5789816
Word reordering device, translation device, translation model learning device, method, and program	Yusuke Miyao	●	Patent No. 5800206
Acoustic signal analysis device, method, and program	Nobutaka Ono	●	Patent No. 5807914

Title of invention	NII Inventors	Joint application	Registration
Data delivery system and data delivery device and method	Kensuke Fukuda		Patent No. 5818262
Distributed data management system and device, method, and program	Kensuke Fukuda		Patent No. 5818263
Acoustic signal analysis device, method, and program	Nobutaka Ono		Patent No. 5911101
Image search device, method, and program	Shin'ichi Satoh		Patent No. 5979444
Semiconductor chip, semiconductor chip connection system	Tomohiro Yoneda	●	Patent No. 6029010
Distance measuring method and radar device	Hiromichi Hashizume	●	Patent No. 6029287
Superconducting quantum bit state detection using light	Kae Nemoto		Patent No. 6029070
Optical parametric oscillator and random signal generating device, and ising model using the oscillator and ising model computation device	Yoshihisa Yamamoto		Patent No. 6029072
Word order sorting device, translation device, method, and program	Yusuke Miyao		Patent No. 6040946
Signal processing device, method, and program	Nobutaka Ono		Patent No. 6005443
Spoken language evaluation device, parameter estimation device, method, and program	Nobutaka Ono		Patent No. 6057170
Signal processing device, signal processing method, and computer program	Nobutaka Ono	●	Patent No. 6099032
Interactive information search device using eye gaze interface	Noriko Kando	●	Patent No. 6099342
Face detection prevention tool	Isao Echizen		Patent No. 6108562
Legal reasoning submission method as well as legal reasoning submission system and program	Ken Satoh		Patent No. 6112542
Ising model quantum computation device and ising model quantum computation method	Shoko Utsunomiya		Patent No. 6143325
Word reordering device, translation device, translation model learning device, method, and program	Yusuke Miyao		Patent No. 6083645
Doppler imaging signal transmission device, doppler imaging signal reception device, and doppler imaging system and method	Hiromichi Hashizume	●	Patent No. 6179940
Encoding device and decoding device for contrast image	Gene Cheung	●	Patent No. 6188005
Flip-flop circuit	Tomohiro Yoneda	●	Patent No. 6210505
Method for initialization of superconducting quantum bit	Kae Nemoto		Patent No. 6230123
Generation model creation device, estimation device, method therefor, and program	Nobutaka Ono		Patent No. 6241790
Ising model quantum computation device, ising model quantum parallel computation device, and ising model quantum computation method	Shoko Utsunomiya		Patent No. 6255087
Ising model quantum computation device	Yoshihisa Yamamoto		Patent No. 6260896
Adaptive positioning interval setting system, adaptive positioning interval setting device, action model calculation device, and action model calculation	Atsuhiro Takasu		Patent No. 6253022
Quantum key distribution system and quantum key distribution method	Yoshihisa Yamamoto		Patent No. 6257042
Apparatus and method for voice signal processing	Nobutaka Ono		Patent No. 6278294
Calculation using networks of optical parametric oscillators	Shoko Utsunomiya		Patent No. 6300049
Saliency image generation device, method and program	Akihiro Sugimoto		Patent No. 6318451
Information processing device network system	Michihiro Koibuchi	●	Patent No. 6325260
Data cache method, node device and program	Shigeo Urushidari		Patent No. 6319694
Natural language system, natural language inference method and program	Yusuke Miyao		Patent No. 6327799
Virtual state definition device, virtual state definition method and virtual state definition program	Shigeo Urushidari		Patent No. 6332802
Coupon system	Kenro Aihara		Patent No. 6347383
Magnetic resonance device	Kae Nemoto		Patent No. 6347489
Streaming delivery system	Gene Cheung		Patent No. 6367030
Optical generator and optical generation method	Timothy Byrnes	●	Patent No. 6376697
Rehabilitation support device and rehabilitation support method	Tetsunari Inamura	●	Patent No. 6381097
Ising model quantum computation device	Shoko Utsunomiya		Patent No. 6429346
Information processing device and information processing method	Ken'ichi Kawarabayashi		Patent No. 6445246
Object region identification method, device and program	Shin'ichi Satoh		Patent No. 6448036
Sugar chain compound and method to manufacture sugar chain compounds	Hiroko Satoh		Patent No. 6455857
Image processing device, image processing method and recording media	Imari Sato		Patent No. 6471942
Network design device and program	Hideaki Takeda		Patent No. 6475966
Liveness detection device, liveness detection method and program	Junichi Yamagishi	●	Patent No. 6480124
Noise addition device and noise addition method	Isao Echizen		Patent No. 6501228

List of registered trademarks   (as of the end of March 2019)

Trademark mode	Registration number	Trademark mode	Registration number	Trademark mode	Registration number	Trademark mode	Registration number	Trademark mode	Registration number
NII	4811291	n c net commons	5152641	edubase	5296963	Picture (CiNii/CiNii)	5580217	Eduroam	6029580
NII	4830960	neXt commons	5191260	GakuNin/GAKUNIN	5341899	Picture (Michael)	5600802	(Picture) Eduroam	6029579
Net Commons	4832775	researchmap	5261160	NetCommons Ready	5369242	meQuanics	5622078	(Picture) School Cap and Clouds	6062452
Picture+SINET	4934163	GRACE+ Picture	5275386	Picture (Palette)	5498318	Picture (GeoNLP)	5645544	QNNcloud*	6072214
NAREGI	4952143	Picture (grace)	5261216	Picture (GakuNin/GakuNin)	5498319	SIGVerse*	5649553		
トップエスイー	4943324	Picture (TOP Software Engineer/NPO)	5279082	Info Dog	5538785	PrivacyVisor*	5653596		
WebELS	4980388			Picture (Info Dog)	5538784	WillingRing	5789533		
Net Commons	5182361								

*SIGVerse (International Registration No. 1203063) and PrivacyVisor (International Registration No. 1208262) are also registered trademarks in Europe, the United States, and China. *We have acquired registered trademarks for QNNcloud in Europe and China as well.

Industry-Government-Academia Collaboration
(Practical R&D and Industry-Government-Academia Collaborative Activities)

NII conducts research in the field of informatics and engages in information infrastructure projects with the aim of furthering practical R&D that will help solve various problems facing society. Collaborations between industry, government, and academia are vital in achieving these goals. In order to further strengthen such collaborations, NII promotes activities that help ensure that we meet the requirements of companies, local authorities, and others.

Expectations of companies, local authorities, and others	NII's industry — government — academia collaborative activities
Advanced technology/ seeds of innovation	**NII Shonan Meetings** — Sharing world-leading research information
Solution exploration	**Industry-government-academia networking seminars** / **Industry-government-academia collaboration workshops** — Providing information on advanced findings
Skill acquirement/ personnel development	**TopSE** — Developing top-level IT personnel

NII's industry — government — academia collaborative activities
NII open collaborative research — Searching for appropriate partners in academia according to research theme
Joint Research Division
Comprehensive collaborative research
Collaborative research
Commissioned research — Working together to generate new results
Academic Consulting — Technical guidance, advice, and other consultations

Action program for industry—government—academia collaboration

Expectations of companies, local authorities, and others	NII's industry — government — academia collaborative activities

Advanced technology/seeds of innovation

Decision-making support at research conception stage
To keep abreast of world-leading research and technology trends, and information of related companies, research institutions and researchers based on those trends.

Research launch preparation/assessment
To determine preparation for launching the research and launch timing.

Solution exploration

Outsourcing to promote research
To organize exchange of research personnel who will supplement the system for promoting the research. To make use of external research capabilities for research skills and know-how that cannot be covered within the company.

Multidisciplinary cooperation
To be involved in multidisciplinary cooperation regarding research challenges faced in the broad and diverse field of informatics.

Skill acquirement/personnel development

Development of research personnel
To develop future research personnel and acquire new research skills.

Development of personnel who contribute to business
To acquire advanced technical skills required in future propels and address personnel shortages in driving business.

- **NII Shonan Meetings** — Proposal of seminar theme by corporate organizer
- **Industry-government-academia networking seminars** — Networking/exchange of views based on advanced research themes
- **Industry-government-academia collaboration workshops** — Creation of matching opportunities through cutting edge research introductions and sharing problems
- **Academic Consulting** — Problem solving through technical guidance, advice, and other consultations
- **NII open collaborative research** — Searching for appropriate partners in academia according to research theme
- **Joint Research Division** — Establishment and operation of a Specialized Laboratry with industry-academia cooperation
- **Comprehensive collaborative research** — Solving problems in diverse research fields through cooperation at the organizational level
- **Collaborative research (including hosting of researchers)** — Problem solving by bringing research resources together
- **Commissioned research** — Providing findings from research commissioned by corporations and others
- **TopSE Education Program** — Developing top-level IT personnel

Academic Consulting by Researchers

NII offers a consulting service that aims to expand our industry—government—academia collaborative initiatives, explore possible collaborations with new partners, and contribute widely to society. Through communication between researchers and people involved in business, our consulting service supports startup companies by providing relevant policy advice from researchers on issues that are likely to lead to contributions to society or to the generation of innovation through industry—academia collaborations.

- We want to know appropriate targets for the value of the data that we possess
- We want to know what is technically possible regarding analysis
- We want to determine policies quickly

NII Academic Guidance

Researchers' knowledge
- Limits of technical possibilities from the perspective of advanced research (advice on target setting)
- Insight, expertise, advice, and consultation on new developments
- Identifying the key personnel who tend to be overlooked are (advice on organization)
- Analyzing how to carry out initiatives effectively (advice on policies and plans)

Offerings from NII
- Advice by way of lectures and group meetings
- Guidance on policymaking under short-term contracts
- Group guidance by multiple staff in different fields is also available

Education Services for Developing Top-Level IT Personnel

TopSE provides education programs in intelligent manufacturing for professionals found in science for mastering leading-edge software science as basic theoretical and practical learning at the Grace Center for the purpose of cultivating the world's highest standard of human resources in IT who have foresight of societal changes and are able to create innovations through IT.

The educational programs aim to:
1. Teach techniques to analyze and resolve on-site problems with a high degree of difficulty and standardize solutions by leveraging the leading-edge technologies in the advanced TopSE course.
2. Teach fundamental software science technologies to ensure future job security in the TopSE course.

Advanced TopSE Course — Resolve new challenges with a high degree of difficulty leveraging leading-edge technologies

Professional Study
Instructors guide students one-on-one in the analysis of difficult issues faced on development sites and the setting of tasks as well as the creation, execution, evaluation, and expansion of solutions. Instructors also supervise students who would like to proceed on to a doctoral degree in writing dissertations.

■ Examples of Professional Study
- Proposal for a software license authentication system using smart contracts
- Research on the method of detecting layout collapse on webpages
- Proposal for machine learning system quality management techniques in specific financial business

Problem Analysis—Task Setting
↓ What is the solution?
Problem Solving
↓ How will the problem be solved?
Evaluation - Standardization
What will be done with the results?
Professional Study Process

Leading Software Science Seminars
All of the students and multiple instructors research, try, report, and debate advanced software technologies that aid in solving problems faced on development sites over one year and share the latest information.

■ Examples of Leading Software Science Seminars
- Block chains ● Machine learning ● Security
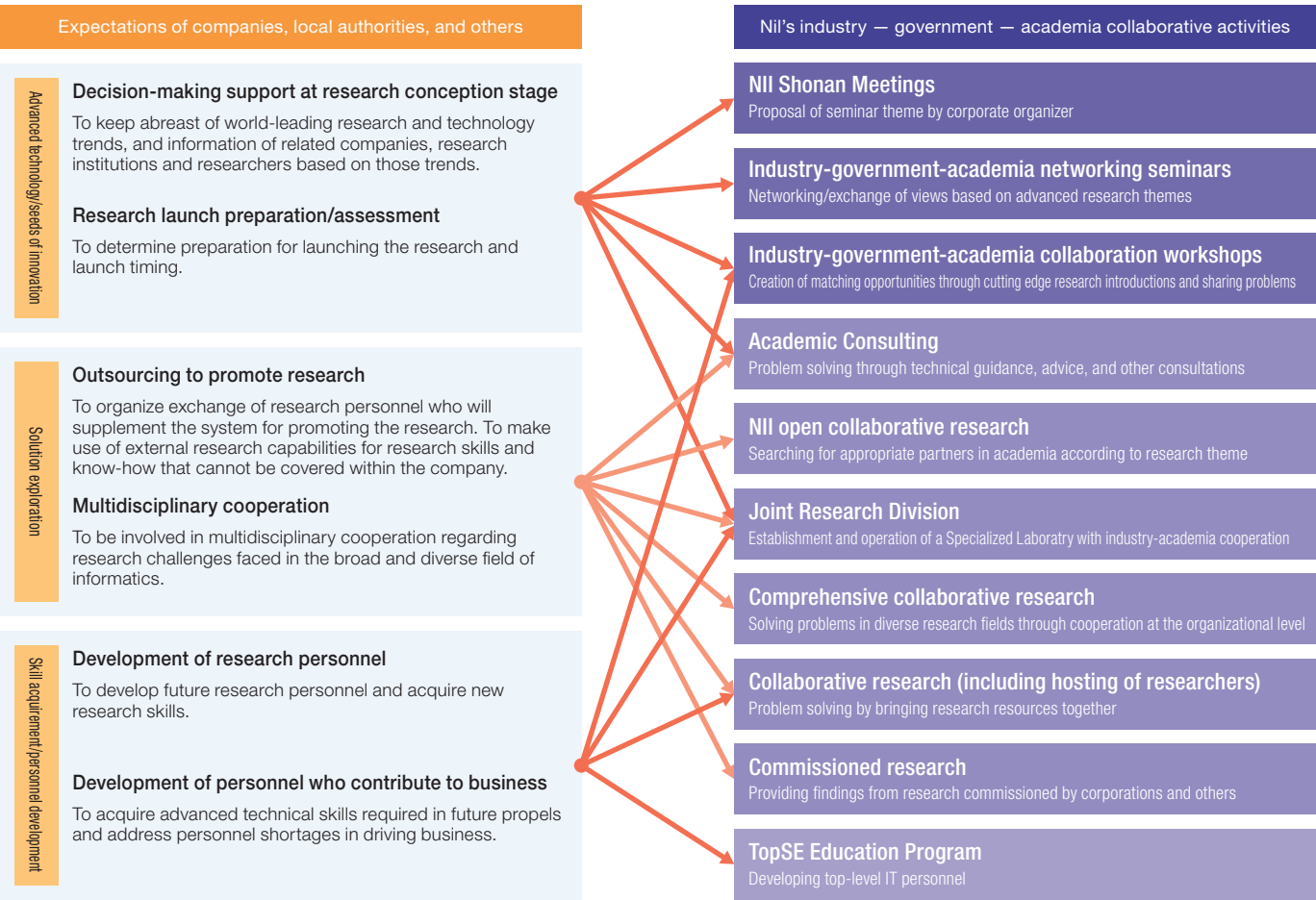
Leading Software Science Seminar

Leading-edge Technology, Tools, and Information   Fundamental Knowledge

TopSE Course — Learn fundamental software science technologies

Practical Software Development
Students use exercises to solve problems using the techniques learned in the practical challenges of software development. Students put into practice what they have learned on tasks proposed by the instructor in a group or tasks proposed by the student individually. The instructor also otters advice from time to time.

■ Examples of Practical Software Development Exercises
- Proposal for a test generation technique from a functional constraint model
- Proposal for a communication template that enables efficient problem sharing between members with different knowledge backgrounds
- In-cluster document ranking for FAQ creation support
- Extraction and evaluation of machine learning algorithm application patterns with reference to Kaggle
- Examination of desire × emotion × behavior interaction quantification technique and its utilization scheme proposal

Lecture
TopSE provides lectures on 36 subjects in 9 different fields for requirements engineering, formal specifications, model inspections, testing, architecture, security, cloud computing, big data, and the project management software system design, implementation, and testing as well as system infrastructure, development management, and the creation of innovations.
The content of these lectures can be expanded into operations because they establish know-how learned from practical learning exercises.

■ Collaboration with Foreign Universities – UCL Training -

In the eighth session (October 29 to November 2, 2018), we held hackathon project-style learning training to design and develop requirements for AR collected from doctors and surgeons in teams at the University College London (UCL). This was done with nine engineers from partner companies being added one each to groups of five or six UCL students.

UCL Students,
Partner Company Engineers and Teachers

Research

Research

Research

Graduate Program

Service

Organization/Other

International Exchange
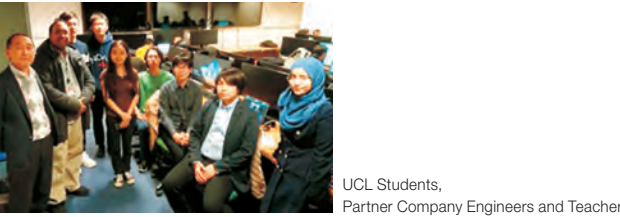
NII has set up Global Liaison Office (GLO) to promote international exchange by concluding memorandum of understanding (MOU) with a large number of major universities and research institutes worldwide. Associated with the MOUs, the GLO conducts the NII International Internship Program, MOU Grant/Non-MOU Grant as well as other programs to dispatch and invite researchers and students.

Number of MOU

80 (2012), 91 (2013), 95 (2014), 103 (2015), 105 (2016), 112 (2017), 117 (2018)

Number of MOU Institutes

As of March, 2019

Legend: Others, Saudi-Arabia, Asia-Pacific, Brazil, Greece, Ethiopia, Morocco, Argentina, Africa, Egypt, EU, Swiss, Finland, Czech, Italy, Portugal, Netherlands, Austria, Germany, UK, Spain, France, Canada, USA, Australia, India, Singapore, Korea, Bangladesh, Vietnam, Thailand, Taiwan, China

International Exchange Agreements (MOU)

MOUs for research cooperation
in 32 countries and regions: 106 institutes

(as of the end of March 2019)

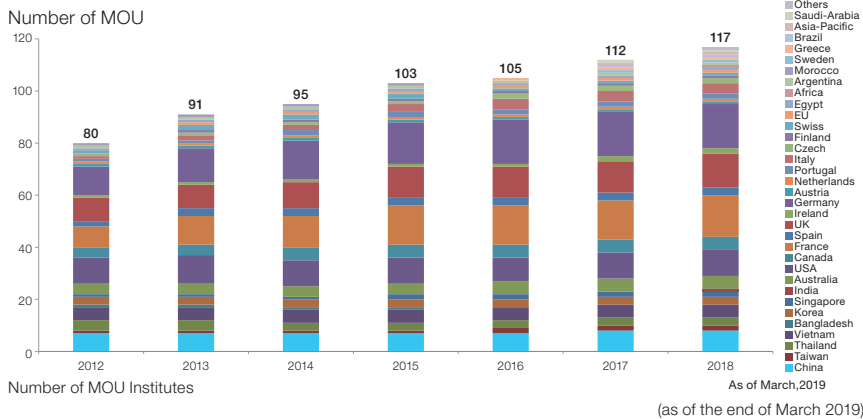| Country/Region	Name of Institution
China	School of Information Science and Technology, Department of Automation, Tsinghua University
	Institute of Computational Mathematics and Scientific/Engineering Computing, Academy of Mathematics and System Sciences, Chinese Academy of Sciences
	Tongji University
	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)
Taiwan	College of Electrical Engineering and Computer Science, National Taiwan University
	National Tsing Hua University, College of Electrical Engineering and Computer Science (NTHU EECS)
Thailand	Department of Computer Engineering, Chulalongkorn University
	School of Engineering and Technology, Asian Institute of Technology
	Faculty of Science, Kasetsart University
Vietnam	International Research Institute, Multimedia Information, Communication, and Applications (MICA)
	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
S. Korea	Department of Computer Science and Engineering, Seoul National University
	Korea Institute of Science and Technology Information (KISTI)
Singapore	School of Computing, National University of Singapore (NUS)
	INSTITUTE FOR INFOCOMM RESEARCH
India	Indraprastha Institute of Information Technology, Delhi
Australia	Commonwealth Scientific and Industrial Research Organisation (CSIRO) (Data 61)
	University of Queensland
	The Faculty of Engineering and Information Technologies, The University of Sydney
	Department of Computing & Information Systems, Melbourne School of Engineering, The University of Melbourne
	Royal Melbourne Institute of Technology
Saudi Arabia	King Abdullah University of Science and Technology
America	College of Engineering & 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
	University of Illinois at Urbana-Champaign
Canada	Faculty of Mathematics, University of Waterloo
	Faculty of Science, Department of Computing Science, the Alberta Machine Intelligence Institute, University of Alberta (Ami)
	School of Computer Science, McGill University
	Simon Fraser University
	Polytechnique Montréal
Brazil	Pontifical Catholic University of Campinas
Argentina	The Faculty of Exact and Natural Sciences of Buenos Aires University
Ireland	The Irish Software Research Centre (LERO; University of Limerick)
	Trinity College Dublin
France	University of Nantes (Atlantic 2020)
	Institut National de Recherche en Informatique et en Automatique (INRIA)
	Institut National Polytechnique de Grenoble
	Université Grenoble Alpes (Joseph Fourier University)
	Sorbonne University (Pierre and Marie Curie University/University of Paris VI), Computer Science Laboratory of Paris 6 (LIP6)
	INP Toulouse ENSEEIHT
	National Center for Scientific Research (CNRS)
	Université Toulouse III – Paul Sabatier

Country/Region	Name of Institution
France	Claude Bernard University Lyon I
	Université Paris Sud
	The Electronics and Information Technology Laboratory
	University of Nice Sophia Antipolis
	LIMOS Research Laboratory, University of Clermont Auvergne (formerly Blaise Pascal University, 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	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
	University of Kent, Faculty of Sciences, School of Computing
	Department of Theoretical and Applied Linguistics, University of Cambridge
	UCL Big Data Institute (UCL Big Data Center), University College London
	Alan Turing Institute
Germany	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
	Ludwig-Maximilians-Universität München
	Berlin Institute of Technology (TUB, TU Berlin)
	Technische Universität Braunschweig (TU Braunschweig)
	Technische Universität Munchen (TUM)
	Georg-August-Universität Göttingen
	Department of Computer and Information Science at the University of Konstanz (ISGUK)
	Bochum University of Applied Sciences, Department of Electrical Engineering and Computer Science
	The Faculty of Science at the University of Potsdam
Austria	Vienna University of Technology
Italy	Dipartimento di Informatica, Università degli Studi di Torino
	Politecnico di Milano, Dipartimento di Elettronica, Informazione e Bioingegneria
	Università degli Studi di Ferrara (UNIFE)
	Dipartimento di Informatica - Scienza e Ingegneria (DISI), Università di Bologna
Switzerland	Institute of Electrical Engineering in Ecole Polytechnique Federale de Lausanne
Finland	Aalto University
Sweden	School of Computer Science and Communications (CSC), KTH Royal Institute of Technology
Czech Republic	Faculty of Electrical Engineering, Czech Technical University in Prague
	The Institute of Physiology of the Czech Academy of Sciences
Spain	Universitat Politècnica de València (UPV)
	Universidad Politécnica de Madrid (UPM)
	Facultat d'Informàtica de Barcelona, Universitat Politècnica de Catalunya (UPC)
Greece	Athena Research & Innovation Center
Netherlands	Faculty of Electrical Engineering, Mathematics, & Computer Science, Delft University of Technology
Portugal	Instituto de Engenharia de Sistemas e Computadores, Investigação e Desenvolvimento em Lisboa (INESC-ID)
	INESC Technology and Science (INESCTEC)
Egypt	Egypt-Japan University of Science and Technology (E-JUST)

Development and operational cooperation: 11 institutes

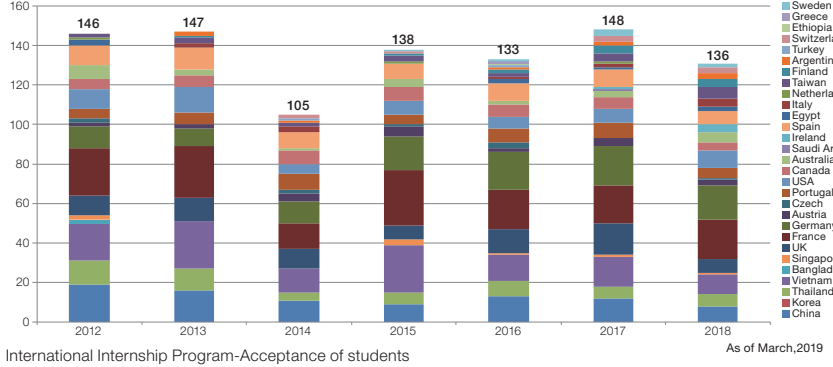| Country/Region	Name of Institution
Asia-Pacific	Asia-Pacific Ring (APR) Collaboration
America	Indiana University
	North American Coordinating Council on Japanese Library Resources (NCC)
	The New Venture Fund (NVF) on behalf of the Scholarly Publishing & Academic Resources Coalition (SPARC)
S. Korea	Korea Education & Research Information Service (KERIS)

Country/Region	Name of Institution
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)
Europe	European Organization for Nuclear Research (CERN)
Africa	West and Central African Research and Education Network (WACREN)

NII International Internship Program

NII International Internship Program is organized for Master's and PhD students from institutions with which NII has concluded MOUs. During the internship period, they work on each research topic under the supervision of NII supervisors. This program has contributed significantly to NII's research activities such as presentations at international conferences and an increase in international papers by promoting exchange with our partners and by hosting and sponsoring interns since its inception in 2005.

International Internship Program-Acceptance of students

146 (2012), 147 (2013), 105 (2014), 138 (2015), 133 (2016), 148 (2017), 136 (2018)

International Internship Program-Acceptance of students

As of March, 2019

Legend: Sweden, Greece, Ethiopia, Turkey, Switzerland, Argentina, Finland, Taiwan, Netherlands, Egypt, Saudi Arabia, Ireland, Australia, Canada, USA, Portugal, Austria, Germany, France, UK, Singapore, Bangladesh, Vietnam, Thailand, Korea, China

Applicant	Graduate students from MOU institutes (master's and PhD students)
Research period	2 months to 6 months (180 days)
Paid expenses	Accommodation expenses: ¥5,700/day
Recruitment	The program recruits students working on research topics proposed by NII faculty. Students are recruited twice per year and each MOU institution is notified by a recruitment notice sent to the person in charge as well as postings on the NII homepage.
Application	The person in charge of each institution selects a student and submits an application by the deadline designated on the application.

*A certificate of completion is issued to students when they complete the internship program.

Supervisor provides guidance to an internship student

Research Seminar

MOU/Non-MOU Grant

MOU Grant was established in 2005 and Non-MOU Grant was established in 2006 as a system of financial support for the research exchange with our partner institutions and non-partner institutions. MOU Grant dispatches and invites personnel to perform research exchanges with institutes with MOU. Non-MOU Grant accepts foreign researchers to aim for research exchanges with institutes/universities without MOU. For both, travel expenses are covered to pursue further research collaborations with foreign research institutes.

International Exchange Activities

Research Activities of Internship Students

International Exchange

NII Shonan Meetings
https://shonan.nii.ac.jp

NII launched the NII Shonan Meeting in February 2011. The NII Shonan Meeting is the first Dagstuhl*-style seminar in Asia and brings together world-leading researchers around the world to intensively debate on research topics in informatics in a training-camp-style. The purpose of this meeting is to solve difficult problems in informatics. The meetings are hosted by NII in collaboration with Kanagawa Prefecture based on a partnership agreement.
The meeting's venue, Shonan Village Center (SVC) is easy to access from Narita Airport and Haneda Airport, offering an environment full of nature where participants can focus on their research activities.
More than 130 seminars have been held so far, and August 2014 saw the launch of the NII Shonan School, which is intended primarily for students and young researchers.

*Dagstuhl Seminar: A renowned seminar series in the field of informatics, held about every week in Dagstuhl, Germany. It is famous for the style which lodges participants at the venue for one week to have intensive discussions on the topics of informatics.

Support by the Office of NII Shonan Meeting and SVC
NII Office: Coordinating the seminar by supporting general administrative arrangements such as sending invitations, handling numerous inquiries and requests via e-mail exchanges and so on.
SVC: Arranging and operating the venue of the seminar on the spot. The program also includes events like a historical tour of Kamakura to cultivate personal exchanges and friendship among participants.

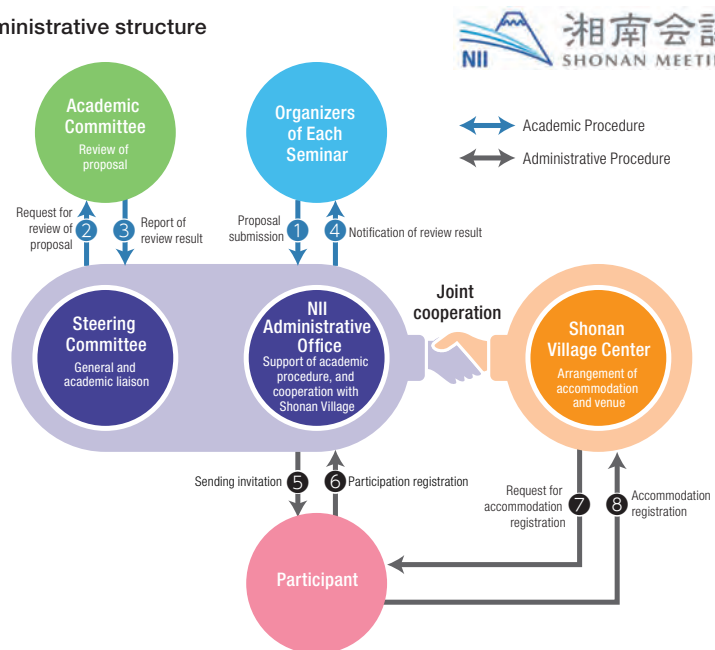Shonan Village Center, located in beautiful natural surroundings

NII Shonan Meetings

Participants of the NII Shonan Meetings

Administrative structure

Academic Committee
Review of proposal

Organizers of Each Seminar

Academic Procedure
Administrative Procedure

Request for review of proposal ② ③ Report of review result

Proposal submission ① ④ Notification of review result

Steering Committee
General and academic liaison

NII Administrative Office
Support of academic procedure, and cooperation with Shonan Village

Joint cooperation

Shonan Village Center
Arrangement of accommodation and venue

Sending invitation ⑤ ⑥ Participation registration

Request for accommodation registration ⑦ ⑧ Accommodation registration

Participant

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

NII Shonan Meeting Memorial Lectures

Call for proposals
We accept seminar proposals for the NII Shonan Meetings throughout the year. There are deadlines for submission twice a year, June 15 and December 15. Following the reviewed proposals by the Academic Committee in NII, organizers will be notified as to whether or not their proposals are accepted.

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

Agreement with German Academic Exchange Service (DAAD)
https://www.nii.ac.jp/en/glo-daad/

NII has a special agreement with the German Academic Exchange Service (DAAD) that allows German Postdoctoral researchers to stay at NII to conduct their research projects under the supervision of NII researchers.
In the frame of the agreement, researchers can stay at NII for minimum three months (six months is recommended) up to two years supported by DAAD. During that period, they implement their own projects in connection with NII supervisors. The post-docs have the possibility to recruit Master's/Ph.D. students or engineers to help their research during their stays. Since NII is an inter-university organization, researchers can visit NII's partner universities and research institutions in Japan to strengthen their networks in Japan.
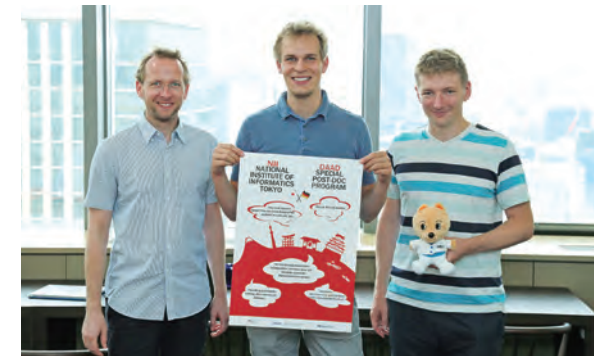
A special agreement has been reached with DAAD, and we are directing post-doc research

Japanese-French Laboratory for Informatics (JFLI)
http://jfli.cnrs.fr

Sorbonne University (University of Paris VI), The University of Tokyo (Graduate School of Information Science and Technology), Keio University, and NII joined the National Center for Scientific Research (CNRS) to establish the Japanese-French Laboratory for Informatics (JFLI) in 2008 as a base for informatics research exchange between France and Japan. The JFLI has been entrusted with invigorating research exchange since 2012 by promoting the International Joint Unit (UMI), international research organization of the CNRS.
The Japanese-French Laboratory for Informatics promotes collaborative research by emphasizing important and challenging fields in informatics with the themes of (1) Next Generation Internet, (2) Images and Multimedia, (3) Software, Programming Models and Formal Methods, (4) Grid Computing and High Performance Computing, and (5) Quantum Computing. Up until now, joint research has been promoted at each institution, including the acceptance of researchers and graduate students from French research institutes. Research presentations are also held as workshops to enhance collaborative research as well as venues for graduate internship students to present their research. The JFLI Seminar is another activity. Many networks of researchers have formed recently around the JFLI thanks to the conduct of activities up until now. A JFLI-wide workshop was held at NII by inviting outside researchers involved with JFLI in March 2016.
In addition, JFLI is also planning joint workshops with universities and other outside institutions. JFLI also now plans to collaborate with UMIs that have similar research themes even at the UMI international research organizations of CNRS spread widely throughout Asia.
JFLI will promote informatics research by working together with each university in Japan while also putting its effort into collaborative research between two countries in the future.

Minister of Higher Education, Research and Innovation of France Frédérique Vidal and Director General Masaru Kitsuregawa

Active Research Exchange Conducted by JFLI

Research
Graduate Program
Service
Organization/Other

Graduate Program

The Department of Informatics, SOKENDAI (The Graduate University for Advanced Studies)

Establishment of graduate school

National Institute of Informatics joined SOKENDAI (The Graduate University for Advanced Studies) and opened the Department of Informatics (three-year doctoral program) in April 2002, seeing its first students graduate in March 2005. A doctoral course (five-year integrated program) was launched in 2006. The first graduate university in Japan, SOKENDAI was founded with the aim of promoting original, international research that goes beyond the boundaries of conventional academic disciplines, and opening up advanced scientific fields that create new streams of science.

Content and structure

The Department of Informatics aims to develop young IT researchers and engineers who will play key roles on an international level in the 21st century. Students are able to acquire a Ph.D. (Informatics) (or depending on the content, a Ph.D. (Science)). Education and research guidance is provided 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. The Department offers more than 60 subjects, including Department's Special Subjects and Common Specialized Basic Subjects.

Feature of the Dept

The Department of Informatics welcomes students from overseas and is a place of lively cross-cultural communication between students. There are also many working students; in fact, they account for around 20% of all the department's students.

SOKENDAI (Hayama Campus)

Lecture in the Department of Informatics

Number of students in Department of Informatics (as of April 2019) *( ) indicates foreign students

Doctoral course (Five-year integrated program)	Doctoral course (Three-year transfer program)	Total
45 (30)	48 (23)	93 (53)

[Greetings from the Dean of the School of Multidisciplinary Sciences]

Tomohiro Yoneda

(Professor, Information Systems Architecture Science Research Division, National Institute of Informatics)

The School of Multidisciplinary Science conducts research and education on complicated natural and social phenomena, as systems that govern the occurrences, functions, and interactions of these phenomena, from the comprehensive and transdisciplinary viewpoint. Through such research and educational activities, the school aims to nurture researchers and highly specialized professionals in the area of information and systems who will take the lead in academic research and address various important issues relating to changes in human society in the 21st Century. The School, consisting of the Department of Statistical Science, the Department of Polar Science, and the Department of Informatics, has been involved in multidisciplinary research fields from the beginning. In addition, the school further strives to enhance its research and education by promoting close collaboration between the Departments by, for example, setting common subjects in curricula. The school covers diverse research subjects but studies the principles of multidisciplinary science, research approaches, and methodologies as an essential part of the school's research and education activities. The Department of Statistical Science and the Department of Informatics seek to determine the common probability or complexity among various phenomena by statistical mathematics and data analysis, The Department of Polar Science studies the geophysical and the biological complex system in the polar regions of extremes on Earth and approaches its subject from the viewpoint of multidisciplinary science. By continuing to explore new research fields, including advanced and leading research fields, and systematizing them through such activities, the school strives for further development of the multidisciplinary sciences.

[Greetings from the Chair of the Department of Informatics]

Katsumi Inoue

(Professor, Principles of Informatics Research Division, National Institute of informatics)

The Department of Informatics consists of six fields: Foundations of Informatics, Information Infrastructure Science, Software Science, Information Media Science, Intelligent Systems Science, and Information Environment Science. These fields are based on the traditional domains of computer science and information engineering, and are also multi-disciplinary sciences, encompassing the humanities and social sciences. Moreover, our department covers research and education in all three phases: basic, applied and practical phases. We aim to develop not only researchers, but also highly-skilled professionals, who would become the next leaders in the field of informatics. Instruction is tailored to individual student's ambitions, interests, and academic research plans through a system of personal guidance and a Ph.D. mentorship program by top-level researchers at National Institute of Informatics. We employ a sub-advisor system whereby students can obtain advice from staff in different research fields, or with different areas of specialization within the same field of research, who can provide a variety of perspectives, Our department has a doctoral course (five-year integrated program) and doctoral course (three-year transfer program): the former for undergraduate university graduates, where students can take plenty of time to develop appropriate research subjects, and the latter for students coming from a master course, where students can concentrate on themes extending their research experiences, Informatics students are students of SOKENDAI (The Graduate University for Advanced Studies) as well as members of NII. They can loam in an internationally collaborative environment on a daily basis, participate in various research projects, and train to become international researchers through human resource exchange programs with foreign universities and institutes, Roughly half of our students from Japan are professionals affiliated with companies and other organizations who have pined the school to systematically review their work up until that point from a research perspective while also learning the latest technology. Our high percentage of exchange students is also an important feature of our department. Many of the lectures are available in English and quite a few laboratories have seminars in English. There is a great deal of cross-cultural communication between students, and this environment is valuable for students envisioning an international career. Collaborations with other departments in SOKENDAI and their founding institutes further extend the sphere of exchange, and students can participate in a valuable network of students, teachers, and researchers.
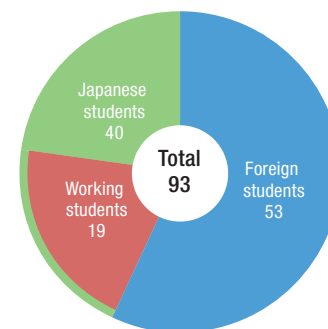
Message from a Current Student

Tri Phuc Nguyen

2015: Completed a master's course at the University of Information Technology, Vietnam National University, Ho Chi Minh City, School of Multidisciplinary Sciences,
2017: Joined a doctoral course (three-year transfer program) the Department of Informatics, SOKENDAI (The Graduate University for Advanced Studies)
Main Supervisor: Professor Hideaki Takeda

I am researching data integration. This is technology that combines tabular numeric data from various sources to form a unified view of them. It is expected that this will be applied to the integration of databases of different companies and to the linking of research results in many fields in science. I also hope to discover new knowledge from integrated sources in addition to simply answering advanced analytical questions using integrated data. I am approaching this by combining the semantic web and machine learning techniques. I have built a tabular numerical data knowledge base from Wikidata as the former approach. I am using deep learning to obtain data patterns corresponding to the knowledge base in the later approach.

Student data (as of April 2019)

Number of students

- Japanese students 40
- Working students 19
- Foreign students 53
- Total 93

Numbers of foreign students by country

- Malaysia 1
- Taiwan 1
- Australia 1
- Indonesia 1
- Argentina 2
- Bangladesh 3
- S. Korea 3
- France 4
- Thailand 6
- Vietnam 13
- China 18
- Total 53
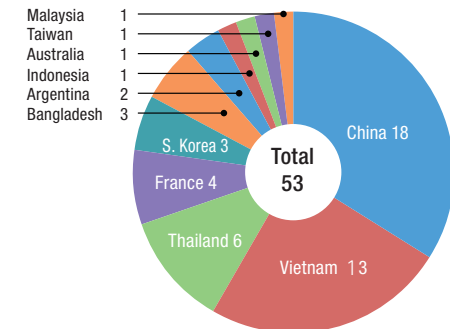
Age distribution of students

- 50s 5
- 40s 8
- 30s 21
- 20s 59
- Total 93
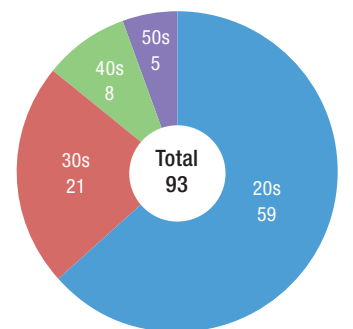
Career paths of students after completion of doctoral program (Over the past 3 years) *( ) indicates number of foreign students

Year of completion	University/Research institution	Company	Undetermined	Total
FY2018	5 (5)	5 (2)	1 (1)	11 (8)
FY2017	5 (4)	2 (1)	0 (0)	7 (5)
FY2016	9 (6)	6 (4)	3 (3)	18 (13)

Degree Conferring Ceremony and Excellent Student Award (September 2018)

Research
Graduate Program
Service
Organization/Other

Curriculum

The Department of Informatics provides research instruction and guidance by top-level researchers within the advanced environment and international atmosphere of National Institute of Informatics.

A broad range of academic fields are offered: from fundamental disciplines such as mathematics, to the basics of computer architecture and networks, and extending to software and media engineering, artificial intelligence, infosocionomics, and informatics for research. Ever since the Department was first established, lectures and research guidance have been given in small groups, meaning that the system of education is flexible to suit the individual students. Advanced research instruction and guidance are given on a daily basis to develop people capable of working at the forefront of informatics. The academic year consists of two semesters: the first semester runs from April to September and the second semester runs from October to March.

In order to complete the course, students are required to acquire a certain number of credits, to carry out research under appropriate guidance, and to pass the doctoral dissertation review of their research results. The minimum number of credits required is 10 for the doctoral course (three-year transfer program) and 40 for the doctoral course (five-year integrated program). The duration of the program is flexible and may be shortened for students with excellent research results. If a student enrolled in the five-year doctoral program has to withdraw before graduation, they may also be awarded a master's degree as long as certain requirements are met.

1. Special Subjects of the Department of Informatics

Foundations of Informatics	Logic in Computer Science (Makoto Tatsuta) / Theory of Numerical Methods (Ken Hayami) / Algorithm (Takeaki Uno) / Discrete Mathematics (Ken-ichi Kawarabayashi) / Mathematical Logic (Makoto Tatsuta)
	Quantum Information Systems (Kae Nemoto) / Quantum Computtations (Keiji Matsumoto) / Computational Neuroscience (Ryota Kobayashi) / Sublinear Algorithms (Yuichi Yoshida)
	Control and Optimization (Masako Kishida) / Numerical Analysis (Undetermined) / Graph Algorithms (Yoichi Iwata) / Algorithmic Market Design (Yu Yokoi)
Information Infrastructure Science	Computer System Design Theory (Tomohiro Yoneda and Masahiro Goshima) / Information and Communication Systems Theory (Yusheng Ji, Shunji Abe, Kensuke Fukuda and Megumi Kaneko)
Software Science	Program Structure Theory (Undetermined) / Distributed Systems (Ichiro Satoh) / Data Engineering (Atsuhiro Takasu) / Software Engineering (Shin Nakajima) / Signal Processors (Hiromichi Hashizume)
	Stochastic Information Processing (Asanobu Kitamoto) / Modeling in Software Development (Fuyuki Ishikawa) / Mathematical Structure in Formal Methods (Ichiro Hasuo)
	XML Databases (Hiroyuki Kato) / Programming Languages and theory (Kanae Tsushima) / Formal Methods for Physical Information Systems (Ichiro Hasuo) / Software Verification Theory (Taro Sekiyama)
Multimedia Information Science	Digital Media Infrastructure (Isao Echizen, Norio Katayama, Ryoichi Ando, Kenshi Takayama and Akiko Aizawa) and Fundamentals of Media Processing (Kazuya Kodama, Satoshi Ikehata, Hiroshi Mo and Shin'ichi Satoh)
	Applications of Multimedia Processing (Akihiro Sugimoto, Imari Sato, Hironobu Gotoda and Yinqiang Zheng) / Interactive Media (Noriko Arai, Kenro Aihara, Junichi Yamagishi and Yi Yu)
Intelligent Systems Science	Logical Foundations for Artificial Intelligence (Katsumi Inoue) / Knowledge Sharing System (Hideaki Takeda) / Deductive Science (Ken Satoh) / Human-Agent Interaction (Seiji Yamada)
	Machine Learning (Ryutaro Ichise) / Natural Language Processing (Tetsunari Inamura) / Intelligent Robotics (Tetsunari Inamura) / Intelligent User Interfaces (Helmut Prendinger)
	Cluster Analysis (Michael E. Houle) / Intelligent Web Systems (Ikki Ohmukai) / Communication Environments (Mayumi Bono) / Econophysics (Takayuki Mizuno)
	Data Mining (Mahito Sugiyama) / Cognitive Robotics (Shingo Murata)
Information Environment Science	Digital Publication (Keizo Oyama) / Information Retrieval (Noriko Kando) / ICT-enabled Business (Hitoshi Okada) / Introduction to Statistical Methods in Bibliometrics (Yuan Sun) / Methodology of Scientmetrics (Masaki Nishizawa)
Common Subjects (Faculty in Charge of the Department of Informatics)	Research in Informatics for PhD thesis IA, IB to VA and VB
	Research in Informatics for Master Thesis IA, IB to IIA and IIB
	Seminar on Basic Knowledge in Informatics IA, IB to IIA and IIB

2. Common Specialized Subjects of the School of Multidisciplinary Sciences

Introduction to Mathematical Logic (Makoto Tatsuta) / Introduction to Algorithms (Takeaki Uno) / Quantum Information and Computing (Kae Nemoto and Keiji Matsumoto)
High Performance Computing (Kento Aida, Michihiro Koibuchi and Atsuko Takefusa) / Information Sharing System Architecture (Shigeo Urushidani, Hiroki Takakura and Takashi Kurimoto)
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)
Introduction to Intelligent Systems Science I (Katsumi Inoue, Seiji Yamada, Tetsunari Inamura, Ryutaro Ichise, Shingo Murata and Michael E. Houle)
Introduction to Intelligent Systems Science II (Ken Satoh, Hideaki Takeda, Helmut Prendinger, Ikki Ohmukai, Mahito Sugiyama, Mayumi Bono and Takayuki Mizuno) / Introduction to Information Environment Science (All professors in Information Environment Science)
Scientific Presentations (Michael E. Houle, Megumi Kaneko, Masako Kishida, Ken Hayami and Caryn Jones (external lecturer))
Scientific Writing (Michael E. Houle, Megumi Kaneko, Masako Kishida, Ken Hayami and Caryn Jones (external lecturer)) / Introduction to Information Security Infrastructure (Isao Echizen, Hitoshi Okada and Hiroki Takakura)
Applied Linear Algebra (Ken Hayami, Hironobu Gotoda, Shin'ichi Satoh and Masako Kishida) / Introduction to Big Data Science (Professors related to Big Data) / Practical Data Science (Kazutsuna Yamaji)

Cooperation with Graduate Schools

National Institute of Informatics actively cooperates with graduate education at the University of Tokyo, Tokyo Institute of Technology, Waseda University, Japan Advanced Institute of Science and Technology (JAIST), Kyushu Institute of Technology, the University of Electro-Communications, and Tokyo University of Science. We conduct classes in partnership with these institutions and accept graduate students for research guidance.

Cooperation with Graduate Schools

Name of Institution	Name of School	Notes
The University of Tokyo	Graduate School of Information Science and Technology	Since FY2001
Tokyo Institute of Technology	Graduate School of Information Science and Technology	Since FY2002
	Interdisciplinary Graduate School of Science and Engineering	Since FY2003
	School of Engineering	Since FY2016
	Graduate School of Engineering	
Waseda University	Graduate School of Fundamental Science and Engineering	Since FY2005
	Graduate School of Creative Science and Engineering	
	Graduate School of Advanced Science and Engineering	
Kyushu Institute of Technology	Graduate School of Computer Science and Systems Engineering	Since FY2010
	Faculty of Computer Science and Systems Engineering	
University of Electro-Communications	Graduate School of Information Systems	Since FY2012
	Graduate School of Informatics and Engineering	
Tokyo University of Science	Graduate School of Science	Since FY2015

Special Collaboration with Research Students

As an inter-university research institute, National Institute of Informatics accepts graduate students from other universities in Japan and overseas as research students in special collaborative projects.
Special research with research students receives guidance from faculty of National Institute of informatics according to the research subjects.

Universities to which research students for special collaboration belong   (2018 results)

Tokyo University of Science	Chlalongkorn University	Macquarie University
Tokyo University of Agriculture and Technology	Ecole Nationale Supérieure d'Ingénieurs de Caen (ENSICAEN)	National Tsing Hua University
Graduate School of Tokyo City University	Ecole Normal Supérieure Paris	Shanghai Jiao Tong University
Tokyo City University	Ecole Normale Supérieure Paris-Saclay	Technical University of Braunschweig
The University of Tokyo	Georgia Institute of Technology	University of Konstanz
Graduate School of University of Tsukuba	Graduate School Eindhoven University of Technology	University of Luxembourg
Chiba University	Hanoi University of Science and Technology	University of Milan
Keio University	Indian Institute of Technology Hyderabad	University of Science and Technology of China
Australian National University	INP-ENSEEIHT, National Polytechnic Institute of Toulouse	University of Victoria
Beijing Jiaotong University	ISIMA, University Clermont Auvergne	Xidian University

Number of students accepted through both systems of collaboration with graduate schools and research students   (FY2018)

Master's program	Doctoral program	Total
53	47	100

SINET5 (Science Information NETwork): Ultrahigh-Speed and Low Latency Network

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

The full-meshed network composed of 100 Gbps linkages opens up new possibilities

The Science Information NETwork (SINET5: Science Information NETwork 5) is an information and telecommunications network built and operated as academic information infrastructure for universities and research institutions throughout Japan. The network has nodes (network connection points) located in all prefecture, and it is designed to promote research and education as well as circulation of scientific information among universities, research institutions, and similar entities. In addition, SINET is also interconnected with national research and education networks(NRENs), such as Internet2 in the U.S. and GÉANT in Europe, to facilitate research communication of progressive international projects.
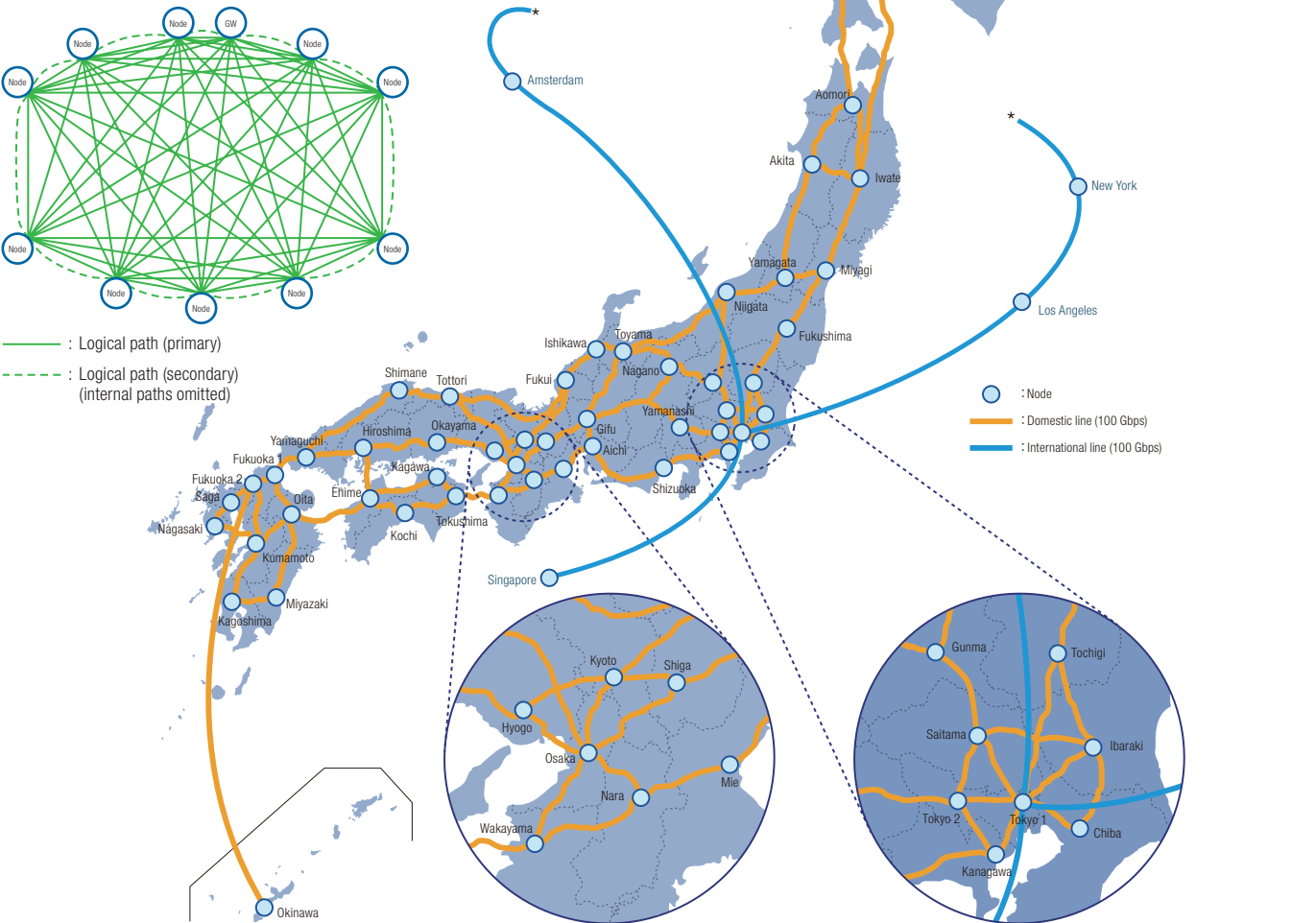
SINET4, the previous version of the network was upgraded to SINET5, and full-scale operation of SINET5 was started in April 2016. SINET5 provides high-level academic information infrastructures to more than 900 universities and other institutions by connecting the network with cloud computing, security infrastructures and academic contents through 100Gbps lines.

We started a experiment for a service function that directly connects mobile networks and SINET in December 2018. The service enables users to deal flexibly with data collected in environment for analysis, such as compute resources at universities and commercial cloud resources. On the other hand, we started operation of international ultra-high speed ring network from March 2019, that circles Japan – the U.S. – Europe – Japan.
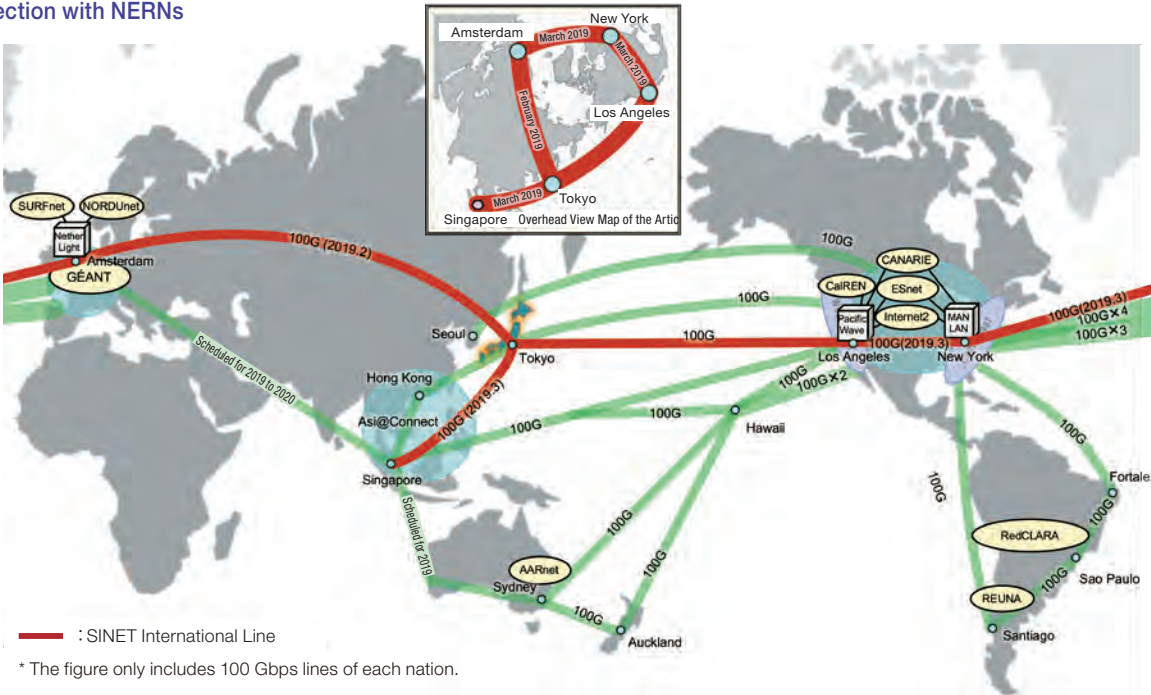
We built the first international network of NRENs that circling the world operated by a single institute. At the same time, we also upgraded bandwidth of the Asia line to 100Gbps connected between Japan and Singapore. To support stable and continuous academic research projects and meet the increase in demand of traffic in Japan, we plan to introduce a 400 Gbps line that connect between Tokyo and Osaka directly in the latter half of FY2019 (scheduled for December). It is expected to contribute to a further strengthening of international cooperation and international competitiveness, and also hoped to speed up the advanced combination of cyberspace (virtual space) and physical space (real space) toward realizing Society 5.0, which is called for in the vision of society in the future in Japan.

Number of institutions participating in SINET (as of the end of March 2019)

National universities	86
Municipal universities	83
Private universities	398
Junior colleges	80
Technical colleges	56
Inter-university research institutes	16
Others	191
Total	910

— : Logical path (primary)
---- : Logical path (secondary) (internal paths omitted)

○ : Node
— : Domestic line (100 Gbps)
— : International line (100 Gbps)

Interconnection with NERNs

Overhead View Map of the Artic

— : SINET International Line

* The figure only includes 100 Gbps lines of each nation.

Services of SINET5

SINET5 have developed and provided new services with joint consideration and creation based on requests from universities.

Users can connect their campuses with ultrahigh-speed network interfaces, such as 100GE and 40GE. To meet the requirement for advancement of research environment, we have developed and offered network services such as university LAN virtualization, L2 on-demand and the wide area data collection infrastructure.

	Service menu	Remarks
L3 services	Internet connection (IP Dual)	
	Full Route Provision	
	IP multicast (+QoS)	
	QoS for each application	
	L3VPN (+QoS)	
L2 services	L2VPN/VPLS (+QoS)	Rapidly increasing
	University LAN Virtualization	Expanding into multiple campuses
	L2 on-demand (Basic)	Used frequently in high capacity transmission experiments
	L2 on-demand (International collaboration: NSI)	Used in international experiments
	L2 on-demand (Cloud system collaboration: REST)	
L1 service	Lambda Leased Line	
Wide area data collection infrastructure	Secure mobile connection	Started on December 21, 2018
Redundant trunk group service	Multihoming	
	Link aggregation	
	Redundant trunk group service	
Stabilization of network operations	DDoS Mitigation function	Security measures function
Next-generation network functions	NFV service	Undergoing experiments as next generation functions
Enhanced transfer performance	Performance measurement	
	High-speed file transfer supporting 100 Gbps	Achieves the world's fastest 231 Gbps between Japan and the U.S.

The Wide Area Data Collection Infrastructure

(https://www.sinet.ad.jp/en/wadci-e)

In December 2018, SINET5 launched new experimental service "The Wide Area Data Collection Infrastructure".

The service allows users to collect research data from various areas that could not be connected by wired network lines by using the mobile network provided by mobile carriers. In conjunction with secure network services (L2 VPN), research data can be collected and stored safely. User networks can connect to various data processing environments that realize one-stop and wide-ranging research processes.

It is expected to contribute to IoT researches toward the realization of Society 5.0.

Users can select data processing environment freely from computing facilities in universities, commercial cloud services, processing services offered by cooperative corporation to store and analysis data

The service can support users to expand research activities not only by point-to-point wired connections but on extended area services with mobile connections.

Service

Service

Research

Graduate Program

Service

Organization/Other

The Main Features of SINET5

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

Five Major Concepts of SINET5

(1) Advanced Infrastructure

The Latest Technologies to Minimize Transfar Delays
SINET5 is introduced the cutting-edge network with optical transmission technologies and adopts the fully-meshed topology to minimize transmission delays of domestic connection.

(2) Ultra High Speed

The Fully-Meshed 100Gbps Network throughout Japan
SINET5 is an ultrahigh-speed network consisted of all 100Gbps lines that connects between nodes.

(3) High Reliability

Robust and Highly Reliable Network
SINET5 provides a highly reliable and robust network services, that is realized by redundancy function of the latest network architecture in each network layer (optical network layer, MPLS-TP network layer, and IP/MPLS network layer) to avoid failures and bypass traffics.

(4) Internationality

International High-Bandwidth Lines Directly Connected to the U.S., Europe and Asia
Delay time of international lines had been cut down by built a direct lines to Europe, that doesn't go through the United States. SINET5 international connections were improved to strengthen supports of international projects.
Each line connected to the U.S., Europe and Asia has 100 Gbps bandwidth, and connection of Japan-Europe, Japan-U.S., U.S.-Europe is formed a ring topology.

(5) Multifunction/Flexibility

Promote Expantion of Academic Information/Infrastructures development, such as Security, Use of Cloud Systems, Academic Contents

Features of SINET5

SINET5 has been built and operated as a platform for academic activities;(1) collaborative use of large laboratories, (2) strengthening cooperative capabilities in each research field, (3) international collaboration between,(4) distribution of academic information and sharing of big data, (5) quality development of education at universities,(6) regional recreation, knowledge-base creation of regional universities and industry-academic collaboration.
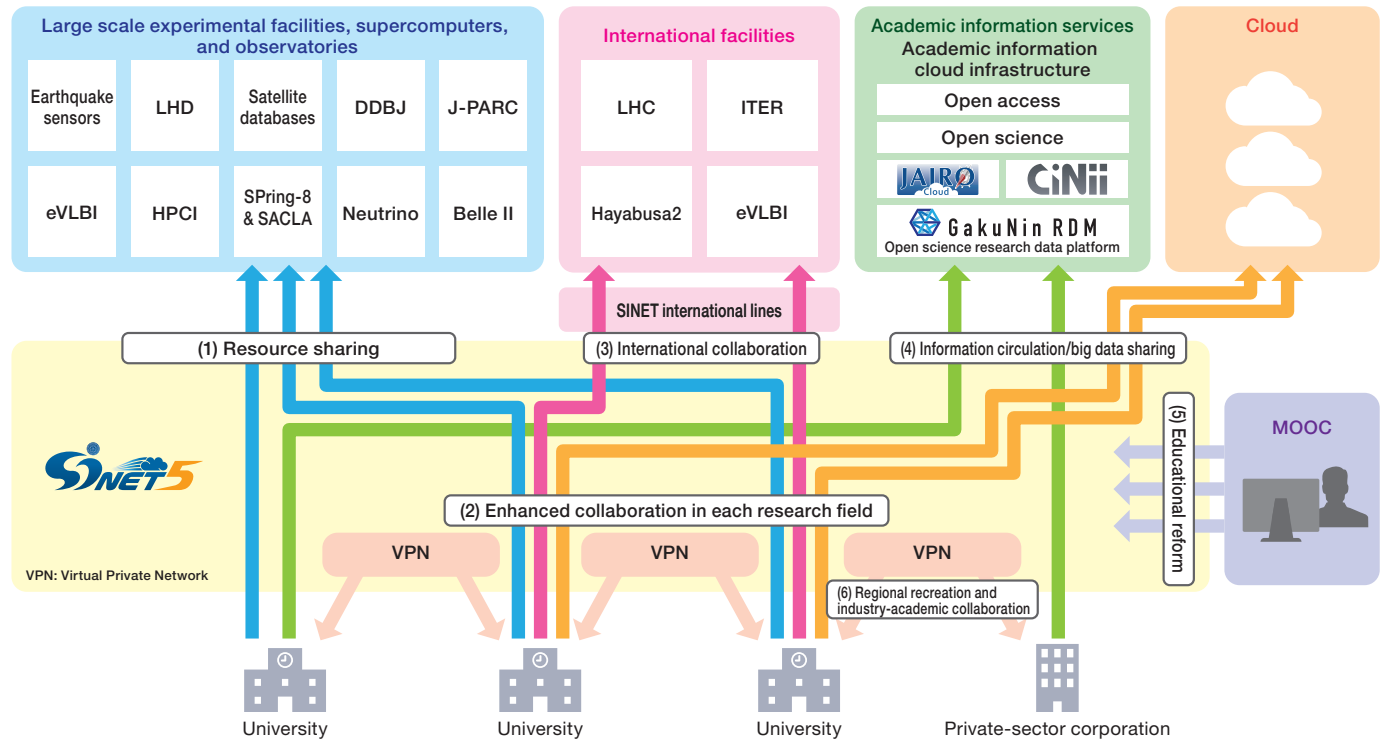
SINET Cloud Connection Service

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

The service allows universities and research insutitutes to access cloud environments at high speed and safely.
SINET does not provide cloud services, but SINET and commercial clouds connect directly with L2VPN.
Users can build systems over cloud or use cloud services through private connections.
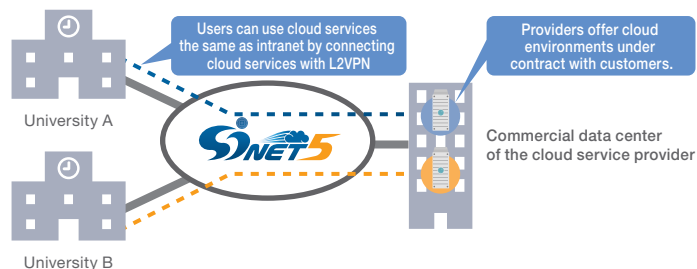
Support for Cloud Introduction and Utilization
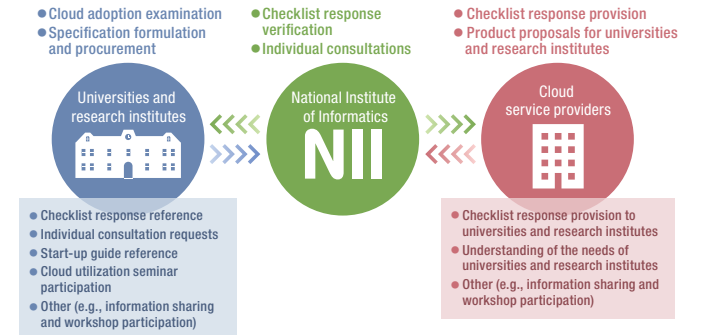
GakuNin Cloud

https://cloud.gakunin.jp/

The NII provides three services under the GakuNin Cloud brand as those that support the introduction and utilization of clouds in universities and research institutes. We do this with the aim of developing an advanced academic information infrastructure using clouds.

GakuNin Cloud Adoption Support Service

NII's GakuNin Cloud Adoption Support is a service for preparing, distributing, and sharing information about the required standards when a university or research institute adopts cloud services. The items that should be checked when universities and research institutes introduce a cloud are publically available as a checklist. We have also added the cloud service provider support situation to this checklist based on responses from service providers. The results verified by the NII are available to institutions participating in this service.
It is possible to compare multiple clouds with the same indictors upon examining specifications when procuring a cloud with this verified checklist. Accordingly, it is possible to adopt clouds tailored to the needs of the institution.
In addition, NII conducts individual consultations of cloud adoption, hosts seminars on cloud services for universities and research institutes, and provides cloud start-up guides as well as cloud usage examples.

GakuNin Cloud Gateway Service

GakuNin Cloud Gateway Service provides portal functionality to access all of the online services from one place, such as the various cloud services necessary for research and educational activities as well as electronic journals.
Users in universities and research institutes (faculty and students) can see the various available services in their institutes when they access the portal site via the authentication infrastructure operated by their institutes. This makes it possible to quickly and simply access services. IdP administrators in universities and research institutes can also customize the list of services displayed for the users in their own institutes. Furthermore, users themselves can add services. This provides a high degree of flexibility and convenience.
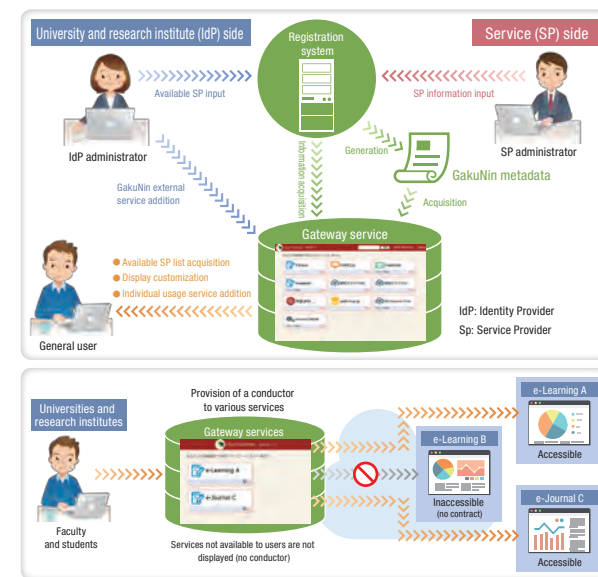
GakuNin Cloud On-demand Configuration Service

The GakuNin Cloud On-demand Configuration Service is a service to set up a complex cloud environment.
Users of this service can install and set up cloud environments relatively easily by using the prepared templates. It also supports the SINET5 cloud connection service. Therefore, it is possible to configure multiple cloud environments connected to SINET5 and inter-cloud environments consisting of the computers of universities and research institutes on-demand and securely. These can then be utilized in research, education and IT system operation.
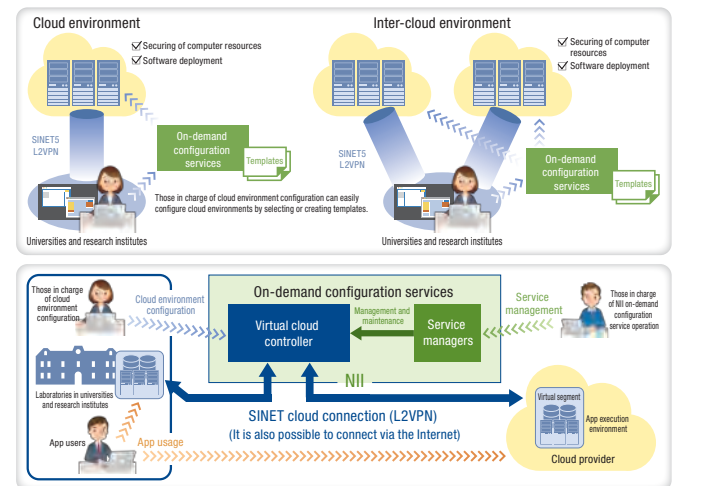
SINET cloud connection: Provides a connection environment to participating institutions by directly connecting commercial clouds to SINET. This is a SINET service in which it is possible to use commercial cloud services at high-speed, safely and with low expense.

Establishment of Authentication Infrastructure

Academic Access Management Federation in Japan "GakuNin"

GakuNin https://www.gakunin.jp/

The Academic Access Management Federation "GakuNin" is a structure that utilizes university's authentication infrastructures not only for internal services but also for university collaboration and commercial services including the cloud, thus facilitating the safe and secure use of academic services on the internet by collaborative utilization of identity information. With Single Sign-On, users can seamlessly and automatically log into multiple internal and external services with a simple single logon procedure. For universities, building an authentication infrastructure with GakuNin raises the baseline of security measures and reduces the cost of ID management.

Participants (as of the end of March 2019)

Number of organizations (IdP: Identity Provider)	220
Number of services (SP: Service Provider)	164

[Features]
● Single Sign-On (SSO) by authenticate only once with one ID/password to use various services
● Accessible from anywhere in the world without VPN nor other complicated technologies (remote access)
● Only a web browser is required
● Ease to improve security level with client certificate authentication and/or multi-factor authentication

GakuNin strives to maintain reliability by annual assessment of the IdPs operated by universities and institutions. GakuNin also provides LoA1 (Level of Assurance 1) certification service specified in the trust framework of the Federal Identity, Credential, and Access Management (FICAM) in the United States.
Universities that have been certified for LoA1 are able to use the US government services, including the databases of the National Institutes of Health (NIH).
The Steering Committee for Academic Authentication designs, plans and operates related items for GakuNin. Three task forces have been established under the Steering Committee for Academic Authentication: the Operation Working Group that performs examinations for operation, the Trust Working Group that performs examinations relating to trust in GakuNin and the Library Service Working Group that performs examinations for the library related services in GakuNin.
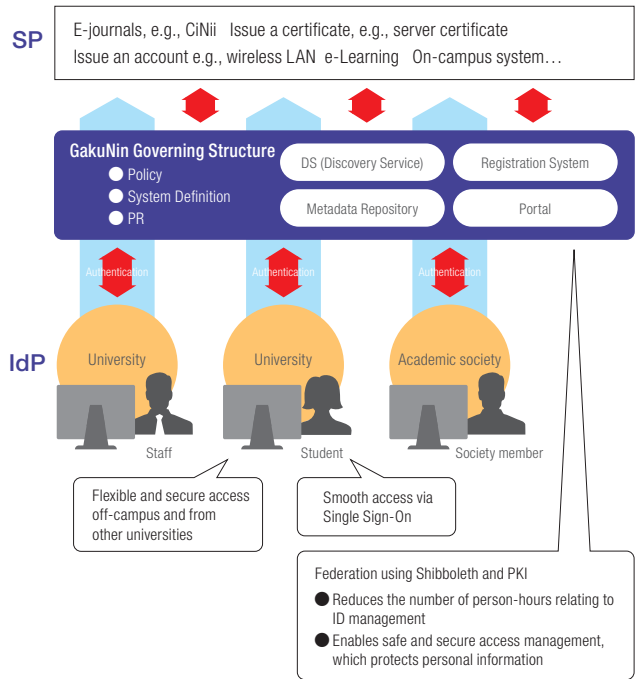
Digital Certificates: UPKI Digital Certificate Issuance Service

UPKI https://certs.nii.ac.jp/

NII started the UPKI Digital Certificate Issuance Service, a business issuing digital certificates aimed at universities and research institutions, in January 2015. In addition to the server certificates provided in advance, NII now also issues client certificates and code signing certificates. As before, the server certificates issued by NII are highly secure and conform to the unified international Web Trust for CA (WTCA) standard. The use of server certificates improves web security by providing that the provider of a web server (domain name and organization name) is legitimate and, for example, making them easy to distinguish from phishing websites. NII also issues client certificates to members of institutions for authentication, and these can be applied for security purposes such as multi-factor authentication and preventing identify theft.
Additionally, signing software with code signing certificates confirms the existence of a developer and guarantees that the software is not fake. This gives users peace of mind when using the software.
By providing these certificates, the UPKI Digital Certificate Issuance Service improves the security of universities and research institutions across the board.

Institutions using UPKI Digital Certificate Issuance Service (as of the end of March 2019)

Number of target institutions for issuance	334
Number of target domains	451
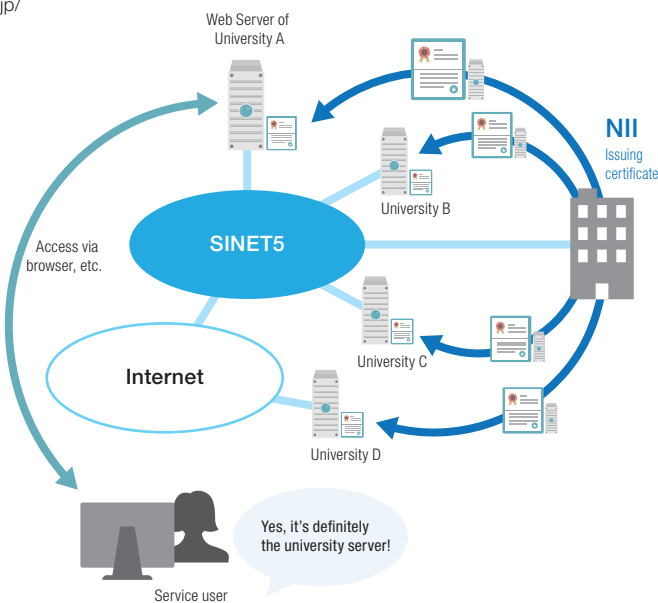
eduroam: International Academic Wireless LAN Roaming Platform

eduroam https://www.eduroam.jp/

eduroam is an academic wireless LAN roaming platform developed by GÉANT (formerly TERENA) in Europe. It realizes wireless LAN service that is mutually interoperable between campuses of universities and research institutes. In 2006, eduroam was introduced in Japan as part of NII's nationwide Common University Authentication Platform Construction Project. "eduroam JP" is being jointly operated, supported, and developed in Japan by NII and Tohoku University. Based on the IEEE802.1X industrial standard, eduroam provides a secure and highly convenient wireless LAN environment.

eduroam JP participants (as of the end of March 2019)

Number of organizations in Japan	249
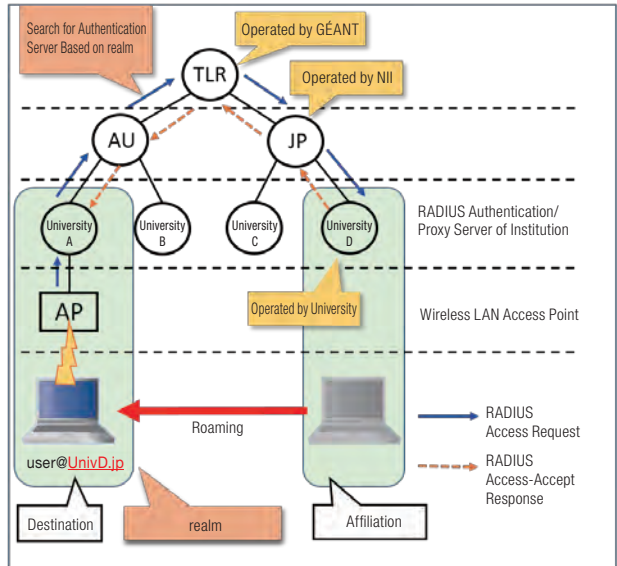
Support of Inter-university Collaboration-based Information Security Framework

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

NII established the Center for Cybersecurity Research and Development in FY2016, to support system configuration which can rapidly respond to the incidents and accidents at national universities and other institutions under cyber attacks. The NII Security Operation Collaboration Services (NII-SOCS) began operation in FY 2017.
By cultivating personnel based on inter-university collaboration while applying appropriately the research results of attack detection and defense capability, the quality of cyber security infrastructure of national universities and other institutions is improved. In addition, extensive research and development activities are committed to facilitating cybersecurity research and providing secure environments for the research and education in all scientific research fields.
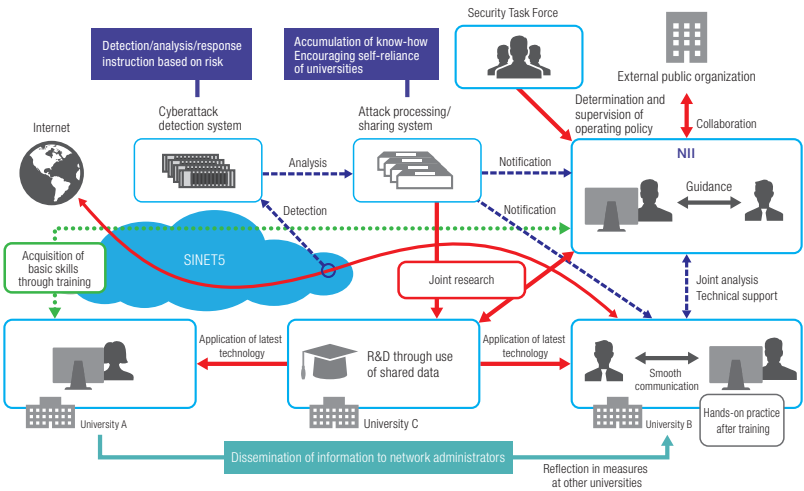
Organization for Science Network Operations and Coordination

The science information network is operated by collaboration and cooperation with partners that include centers for informational infrastructure at universities and research institutions and four research and development centers of National Institute of Informatics (NII) under the supervision of the Organization for Science Network Operations and Coordination, which is a partner of the universities and research institutions as well as the National Institute of Informatics.

Universities and Research Institutions	National Institute of Informatics (NII)
Organization for Science Network Operations and Coordination	Research and Development Center for Academic Networks
Planning Task Force	Center for Cloud Research and Development
Network Task Force	Center for Cybersecurity Research and Development
Cloud Computing Task Force	Center for Open Science Infrastructure Research and Development
Security Task Force	Cyber Science Infrastructure Development Department
Task Force for Information Security Policy at Higher Education Institutions	SINET Promotion Office
	Academic Authentication System Office
	Cloud Promotion Office
Open Science Research Data Infrastructure Task Force	Academic Information Security Operations Center

Publishing and Communicating Academic Information CiNii

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

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

This is a database service that can be exhaustively searched for academic information such as articles, books, journals, and doctoral dissertations.
NII is expanding the pool of data available and improving text hit rates by linking various database services.
In addition, NII is promoting intersystem links with university libraries and other facilities by providing search APIs (application program interfaces) such as OpenSearch.
The service also offers a dedicated smartphone display so that the database can be searched with ease using a smartphone.

CiNii Articles: Searching for Japanese research papers   https://ci.nii.ac.jp/en

Contains more than 20 million information items on Japanese academic articles including academic society publications, research bulletins, and the Japanese Periodicals Index of the National Diet Library.

Collection status   (as of the end of March 2019)

Number of article information items
21.54 million

CiNii Books:
Searching for books in university libraries   https://ci.nii.ac.jp/books/en

This service allows searching of information on books and journals held by university libraries in Japan.
Contains approx. 12 million bibliographic records of books and authors held by university libraries nationwide accumulated through the Catalog Information Service (NACSIS-CAT) operated by NII.

Collection status   (as of the end of March 2019)

Number of bibliographic records	Number of holding records	Number of participating libraries
11.98 million	142.52 million	1,337

CiNii Dissertations:
Searching for Japanese doctoral dissertations   https://ci.nii.ac.jp/d/en

Allows comprehensive, centralized searching of Japanese doctoral dissertations.
In addition to dissertation texts digitized by the National Diet Library, it is also possible to search and view dissertation texts published in the institutional repositories of universities and research institutes.

Collection status   (as of the end of March 2019)

Total number of doctoral dissertations	Number of full texts
650 thousand	Approx. 260 thousand
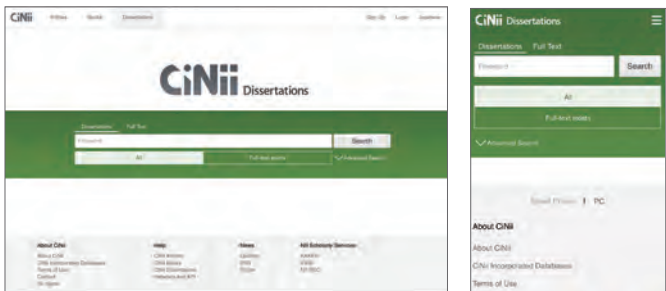
Support for Construction and Linkage of Institutional Repositories (JAIRO Cloud)

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

To contribute to the establishment of next-generation academic content platforms, NII supports the construction and linkage of institutional repositories to communicate university education/research results and promotes open access. NII has so far supported content enrichment, system linkage, and community formation at academic institutions in Japan, and institutional repositories have been built and are in operation at more than 780 institutions.

JAIRO Cloud (shared repository service)   https://community.repo.nii.ac.jp/

For institutions that find it difficult to independently build and operate their own repositories, NII provides a shared repository system environment in the form of a cloud service based in our institutional repository software WEKO (http://weko.at.nii.ac.jp/).

Number of users   (as of the end of March 2019)

Number of institutions using the service
558

■Numbers of institutional repositories in Japan

Integrated Search of Academic Information Accumulated in Institutional Repositories in Japan

IRDB (Institutional Repositories Database)   https://irdb.nii.ac.jp/en

This database enables integrated search of education/research results of university and research institution (journal articles, dissertations, research bulletins, research papers, teaching materials, etc.) accumulated in institutional repositories in Japan. Users are able to access full texts available in each institutional repository, as well as linking to CiNii. This is the successor service to JAIRO (an institutional repository portal) that ended in March 2019.

Collection status   (as of the end of March 2019)

Number of institutional repositories	Number of contents
703	2.97 million
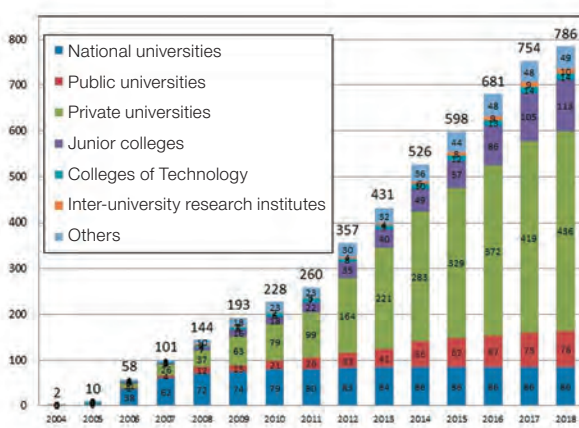
■Number of contents collected by IRDB

Japan Consortium for Open Access Repository

https://jpcoar.repo.nii.ac.jp/
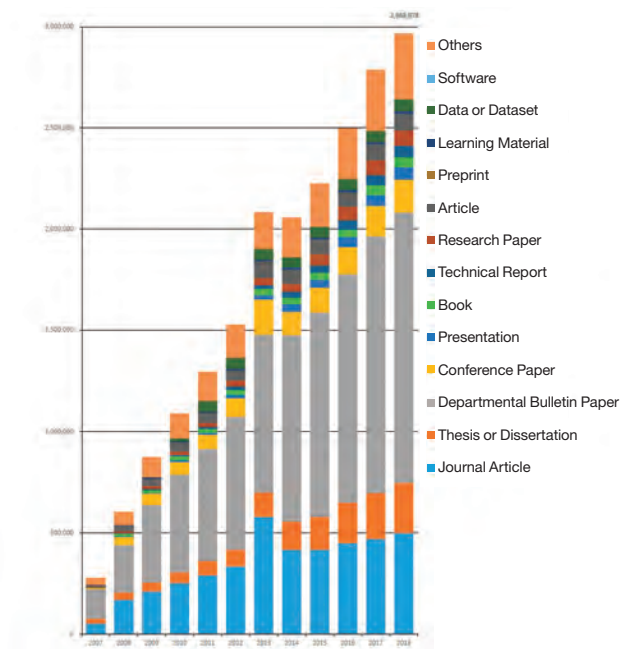
JPCOAR:Japan Consortium for Open Access Repository

JPCOAR is a repository community of institutions where universities and other research institutes engage as a way to more effectively promote their efforts for the purpose of spreading the dissemination of research results and enhancing the benefits of building and operating institutional repositories.
The consortium also works in efforts that include improvements to the distribution of open science and other academic information as well as the joint operation of system infrastructure for an institutional repository (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

Database of Grants-in-Aid for Scientific Research

KAKEN 科学研究費 助成事業データベース

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

This database allows users to browse adopted projects and research results (reports, summaries, etc.) funded by Grants-in-Aid for Scientific Research from 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 information in japan in a wide variety of fields. 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).

Collection status (as of the end of March 2019)

Number of adopted projects
880 thousand

Catalog Information Service

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

The Catalog Information Service consists of the Cataloging System (NACSIS-CAT) and the Interlibrary Loan System (NACSIS-ILL).

Cataloging System (NACSIS-CAT)

NACSIS-CAT is a system for building comprehensive catalog database designed to provide at-a-glance information on academic literature (books/journals) archived at university libraries and other such institutions throughout Japan. To improve efficiency, the system provides the capability to refer to standard cataloging data (MARC), and university libraries and other institutions nationwide share the work of inputting records online.

Collection and usage status (As of end of March 2019, * indicated FY2018 (one year)'s value)

Number of NACSIS-CAT participating institutions	Cumulative no. of registered records	Number of NACSIS-ILL participating institutions	Number of NACSIS-ILL copies *	Number of NACSIS-ILL loans *
1,337	137.88 million	1,109	457 thousand	78 thousand

Interlibrary Loan System (NACSIS-ILL)

NACSIS-ILL makes use of the comprehensive catalog databases constructed using NACSIS-CAT to support the exchange of books and journal articles between libraries and so facilitate the provision of academic literature to researchers at universities and other institutions. As well as supporting interlibrary loan services with university libraries overseas by linking to systems such as KERIS in South Korea, NACSIS-ILL promotes the efficiency of library work through an offsetting service for ILL document copying and other changes.

Electronic Resources Data Sharing Service

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

ERDB-JP is a service that develops and shares knowledge databases of electronic resources, such as e-journals and e-books, published in Japan. It is operated by NII and the "Electronic Resources Data Sharing Task Force," made up of staff responsible for managing e-resources at each university. Content metadata are collected and updated by partners consisting of universities, publishers, and knowledgebase vendors.
The accumulated metadata of contents are provided under the CC0 license. They can be exported and used for creating lists of e-resource titles, for OPAC provided by universities, and for discovery services.

No. of participating institutions   *Partner A: All content can be changed / Partner B: Only the content of one's own organization can be changed   (as of end of March 2019)

	Universities (national)	Universities (municipal)	Universities (private)	Inter-university research institutes	Publishing companies	Others	Total
Partner A	29	2	9	4	3	10	57
Partner B	5	0	10	1	0	4	20
Total	34	2	19	5	3	14	77

Data registrations (as of end of March 2019)

Number registered	Number of new registrations (FY2018)	Number of updates (FY2018)	
19,237	1,008	Automatic Update 155,291	Manual Update 3,644

Electronic Archives

NII-REO   https://reo.nii.ac.jp/index_en.html

NII carries out the following activities to store and provide electronic academic information on a permanent basis.

NII-REO (NII Electronic Resource Archives)

Back issues of international electronic journals (approx. 3.34 million records) and an electronic collection of humanities and social science materials (approx. 620,000 items) are saved 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 2019)

OJA e-journal archive	Archived Years	Number of items
Springer Online Journal Archive	1832-1999	Titles: Approx. 1.1 thousand Number of records: Approx. 2 million
Springer Lecture Note in Computer Science	1973-1999	Titles: 1,501
Oxford Journal Archive Collection	1849-2003	Titles: 311 Number of records: Approx. 640 thousand
Kluwer Online	1997-2005	Titles: Approx. 800 Number of records: Approx. 350 thousand
IEEE Computer Society Digital Library　(CSDL)	1988-2011	Titles: 30 Number of records: Approx. 350 thousand
Taylor & Francis Online Journals Classic Archives (Science and engineering collection in three fields)	1798-1996	Titles: 124 Number of records: Approx. 220 thousand
HSS Humanities and Social Sciences e-collection	**Archived Years**	**Number of items**
Nineteenth / Twentieth Century House of Commons Parliamentary Papers（19C HCPP & 20c HCPP）	1801-2004	Number of records: Approx. 186 thousand
Eighteenth Century House of Commons Parliamentary Papers（18c HCPP）	1660-1834	Number of records: Approx. 58 thousand
The Making of the Modern World：Goldsmiths'-Kress Library of Economic Literature（MOMW）	1450-1850	Number of records: 61 thousand books, 445 journals
The Making of the Modern World, Part II（MOMW II）	1851-1914	Number of records: Approx. 5 thousand
Eighteenth Century Collections Online	1701-1800	Number of records: Approx. 180 thousand
Early English Books Online	1475-1700	Number of records: Approx. 130 thousand
America's Historical Imprints Series I:Evans	1639-1800	Number of records: Approx. 36 thousand titles *
The Making of the Modern World Part III(MOMW III)	1890-1945	Number of records: Approx. 5 thousand titles *

* scheduled to be registered from 2019 onward

Promotion of Academic Information Distribution   https://www.nii.ac.jp/sparc/en/

SPARC Japan

The Scholarly Communication Initiative started working with SPARC (USA) and SPARC Europe in FY2003 and has conducted services with the collaboration of academic societies and university libraries for the purpose of promoting greater dissemination of results from scientific and academic information research in Japan, while promoting digitalization and internationalization of academic magazines published by organizations, such as academic societies in japan, and promoting improvements to international standards for the distribution of academic information.
In particular, the SPARC Japan Seminar covers the latest challenges of distributing academic information as place for exchange between academic information stakeholders.
From FY2019, we will strive to understand the trends and actual conditions of academic information distribution in Japan and overseas to promote open access and open science under the Academic Information Distribution Promotion Committee. We will examine and adjust strategies pertaining to publishing and utilizing academic information based on those trends and actual conditions while performing advocacy activities. We will do this in cooperation with stakeholders focused on the academic community.

Education and Training Service   https://www.nii.ac.jp/hrd/

We offer education and training services such as those below to develop human resources, such as university staff who support academic information infrastructures in Japan.

- Training course (NACSIS-CAT/ILL self-learning)
- Specialized training course (bibliography creating training for catalog systems/information processing technology seminars)
- Comprehensive training (training held by the National Institute of Informatics/comprehensive academic information systems workshops), etc.
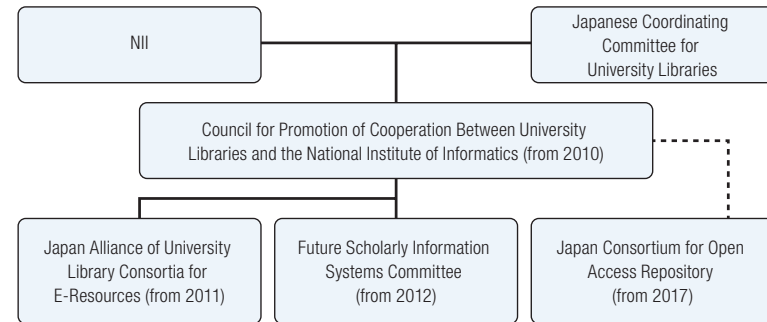
国立情報学研究所 教育研修事業

■ Collaboration with University Libraries

https://www.nii.ac.jp/content/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 in order to promote projects in cooperation with university libraries. Based on this agreement, NII established the Council for Promotion of Cooperation Between University Libraries and the National Institute of Informatics. This Council and the committee established beneath it (including the Japan Alliance of University Library Consortia for E-Resources and Future Scholarly Information Systems Committee) promote collaborative projects concerning electronic materials and the distribution of academic information.

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

```
                          ┌──────────────────────┐
         ┌─────────────┐   │ Japanese Coordinating │
         │     NII     │   │     Committee for     │
         └─────────────┘   │  University Libraries │
                          └──────────────────────┘
         ┌────────────────────────────────────────────┐
         │  Council for Promotion of Cooperation       │
         │  Between University Libraries and the        │
         │  National Institute of Informatics (from 2010)│
         └────────────────────────────────────────────┘
  ┌──────────────┐  ┌──────────────┐  ┌──────────────┐
  │Japan Alliance │  │Future Scholarly│ │Japan Consortium│
  │of University  │  │Information     │ │for Open        │
  │Library Consortia││Systems Committee││Access Repository│
  │for E-Resources │ │(from 2012)     │ │(from 2017)     │
  │(from 2011)     │ └──────────────┘  └──────────────┘
  └──────────────┘
```

■ Japan Alliance of University Library Consortia for E-Resources

https://www.nii.ac.jp/content/justice_en/

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

Aiming to implement a range of activities to provide stable and continuous access to academic information, including e-journals, JUSTICE is one of the world's largest consortia with over 500 participating national, public, and private university libraries.

We established the JUSTICE Secretariat in the Library Liaison Cooperation Office to support the activities of JUSTICE. Full-time staff seconded from university libraries work there.

ICOLC

ENGLAND Jisc
FRANCE Couperin
RUSSIA NEICON
CHINA CALIS
KOREA KESLI
JAPAN
JUSTICE Japan Alliance of University Library Consortia for E-Resources
AMERICA LYRASIS

■ Future Scholarly Information Systems Committee

https://www.nii.ac.jp/content/korekara/

Future Scholarly Information Systems Committee

The Future Scholarly Information Systems committee was established for the purpose of further promoting activities related to the construction, management, sharing and provision of infrastructures for academic information resources. This committee is made up of university librarians recommended by each national, public, and private university library association and council, experts as well as NII faculty. In addition to organizing the challenges in reaching the ideal form of future academic information systems, the committee examines the ideal form of the community for examination and operation in the future and measures to realize that ideal form.

NII participates as a member and supports activities such as the role entrusted to the secretariat.

Working Group for the Examination of System Model

This working group performs two tasks: (1) Examination of new library system networks that enable integrated discovery environments and examination of sustainable operation structures, and (2) examination of challenges toward the joint procurement and operation of systems.

Working Group for the Examination of System Workflow

This working group performs five tasks: (1) Examination on integrated discovery environments, (2) examination on electronic information resource data sharing, (3) examination on the sophistication of metadata distribution, (4) ERDB-JP operation work and (5) operation structure transition support for CAT2020. The members of the task force are comprised of university librarians in charge of electronic resource contracts, management and provision or catalog operations.

■ Open Science

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

Open Science, which promotes open access and open research-data over the Internet, is gaining traction as a new way of conducting research. The three platforms deployed along the research workflow allow researchers to manage, publish and search various types of research outputs in the respective workflow. NII Research Data Cloud - deployed and enhanced by the collaboration of NII, Japanese universities, and research centers - contributes to accelerating Open Science in Japan*.

GakuNin RDM

Research Data Management Platform is for managing and sharing research data with collaborators during the research process.

Effective data management can be realized by connecting GakuNin RDM with institutional storage. Many of external research tools are used via add-ons. Time-stamping function objectively proves the existence of research data and protects researchers from the view point of research integrity. GakuNin RDM is now enhancing its customizability in order to fulfill requirements from various types of use case.

WEKO3

Publication Platform is for publishing research data for building up the new scholarly communication network.

Researchers can simple publish their research outputs from this platform by using the GakuNin RDM, because of the system integration between the two. This platform is delivered as our cloud service named JAIRO Cloud. In addition to the institutional repository, it can be used as a research domain repository by maximizing the potential of its flexibility and extensibility.

CiNii Research

Discovery Platform is for providing findability and visibility of research outputs from a variety of angles.

Research data are originated from researcher, experimental equipment and research project, and an expressed within a journal article. Information of these components is linked together in the database and formulated as a large scale academic knowledge-graph which is the core of our discovery platform. CiNii Research provides intuitive navigation into the knowledge-graph in order to support new discovery experience.

* NII Research Data Cloud will be in production level operation in FY2020.

NII Research Data Cloud	
Purpose	For facilitating Open Science, a common infrastructure which consists of research data management, publication, and discovery platforms is developed by the collaborations of academic communities.

Discovery Platform
- Linking Func between Article and Data
- Reseacher and Research Project Identification and Management Func
- Data Exchange with International Discovery Service

RDM Platform
- Expanded Functions for Management and Use of Research Data
- Highly-efficient Data Save Functions through the Use of Cloud Computing
- Management Functions for Tracking Research for Research Integrity

Publication Platform
- Data Oriented Self-archiving Function
- Paper/Research Data Publishing Workflow Function
- Discipline Oriented Metadata Management Function

Operation and Maintenance of Authentication Infrastructure for High Performance Computing Infrastructure (HPCI)

HPCI implements a revolutionary computing environment that meets the needs of various users, including the industrial sector, by linking the K computer in Kobe and other supercomputers and storage installed at universities and research institutes in Japan. It began service in the second-stage project of FY2017. HPCI has a single sign-on authentication mechanism that allows users to gain access to any computing resource by using a common login account to improve usability. As the first-stage project, NII is continuing to operate and maintain the authentication system, including the certificate authority and a certificate issuing system, which are the core of this single sign-on authentication mechanism, in collaboration with the K computer and universities. The authentication system takes advantage of a highly secure framework that uses certificates for HPCI users to ensure security in communication and data. It also provides a single

sign-on environment that enables users to seamlessly use the HPCI super computer and storage resources.

In addition, the NII plays a central role in the investigation and research of the steadily progressing authentication infrastructure technology and international usage trends. We are researching and developing next generation authentication platforms with the aim of improving user convenience and efficiency of operation management while being based on the utilization of existing technologies and systems in addition to new technologies.

The Science Information NETwork (SINET5) has been given the role of a high-speed network infrastructure for linking to super computers remotely and sharing large-scale test data as well as calculation results.

National Institute of Informatics (NII)

User

https://

HPCI certificate authority

Certificate issuing system

Single sign-on through a unified account

Hokkaido University

Tohoku University

Tokyo Institute of Technology
University of Tsukuba
National Institute of Advanced Industrial Science and Technology
The University of Tokyo
Japan Agency for Marine-Earth Science and Technology

NII

The Institute of Statistical Mathematics

Kyoto University

Nagoya University

Osaka University

(K Computer)

Kyushu University

NII Library (Contributing to Informatics Research and Education)

The NII Library holds online journals, books, and periodicals on informatics as part of its role as an informatics research/education center.
The library collaborates with the nearby Meiji University Library to provide access to academic materials for students of SOKENDAI.

Number of books / journal titles (as of the end of March 2019)

Document type	Book	Bound journal	Journal (title)
Japanese	17,379	10,171	130
Foreign	13,822	8,310	7
Total	31,201	18,481	137

Facilities and equipment

Service	Reading room	Stack room
Area	140m^2	151m^2
Seats	10	—
Other	Automatic lending and returning machine	
	Copier	

Reading room

Major online journals and databases

Service	Publisher
ACM Digital Library	Association for Computing Machinery
APS online	American Physical Society
IEL	IEEE, IEE
MathSciNet	American Mathematical Society
SpringerLink	Springer Nature
ScienceDirect	Elsevier B.V.
Wiley Online Library	John Wiley & Sons.
IEICE	The Institute of Electronics, Information and Communication Engineers
IPSJ Digital Library	Information Processing Society of Japan

Reading room

Research

Graduate Program

Service

Organization/Other

Dissemination of Research Results

Delivering NII's Research and Services to the Wider Society

NII holds public lectures and publishes information with the aim of sharing its latest research findings on informatics widely with the general public and society at large and deepening understanding of its services.
NII also delivers timely information via digital media such as the NII website, NII email newsletter, and social media (Twitter, Facebook).

NII Open House

NII holds an annual Open House to present its various research projects and results to a broad audience including the general public, researchers, and Ph.D. candidates. Besides "NII Research 100," a program where ten NII researchers each introduce ten research studies for a total 100 presentations, and demonstrations and poster exhibits, workshops for elementary and junior high school students were also held.

Workshop in which junior high and high school students took on the challenge of solving problems for the International Olympiad in Informatics (June 2018)

"NII Research 100" at which 10 researchers presented a total of 100 studies (June 2018)

Public Lectures The National Institute of Informatics holds free public lectures from time to time.

■National Institute of Informatics Public Lectures: "The Forefront of Informatics"

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

In these free lectures, researchers at the National Institute of Informatics explain various subjects at the forefront of Informatics-related fields to the general public. Images, materials, and Q&As from past lectures are available on the Institute's website.
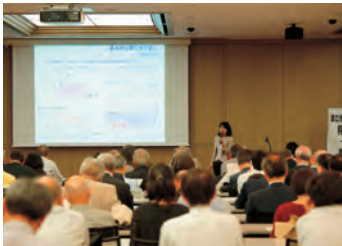
The fourth lecture on future new wireless communication technologies by Associate Professor Megumi Kaneko (October 2018)

■Karuizawa Saturday Salon

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

Several lecture meetings a year about informatics and various other fields are held at the International Seminar House for Advanced Studies (Karuizawa, Nagano Prefecture) for people living in the surrounding area. A portion of the contents of past lectures have been published in Karuizawa Doyo-Konwakai Koenshu: Chi to Bi no Harmony (Collection of Lectures from the Karuizawa Saturday Salon: Harmony of Intelligence and Art) (Volumes 1-6).

The third lecture on the theme of animal communication and the origin of language by Professor Kazuo Okanoya of the Graduate School of Arts and Sciences at the University of Tokyo (September 2018)

Exhibitions

NII participates in various exhibitions to introduce its research findings, operations, and services. In FY2018, NII had exhibitions at various venues, including the CEATEC JAPAN 2018, 20th Library Fair, and the Inter-University Research Institute Symposium 2018.

CEATEC Japan at which we exhibited under the theme of infrastructure maintenance and management utilizing the IoT (October 2018)

Inter-University Research Institute Symposium 2018 at which we deployed VR that made it possible to experience the 100 Gbps bandwidth of SINET (October 2018)

Publications

■NII Series

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 newest edition, Everything You Want to Know About Big Data and AI, was released in July 2018.

We issue our NII Today public relations magazine four times a year.

■Public Information Magazines

• NII Today (Japanese/English)
• Catalogue of National Institute of Informatics (Japanese/English)
• Outline of National Institute of Informatics (Japanese/English)
• Annual Report of National Institute of Informatics
• NII SEEDs
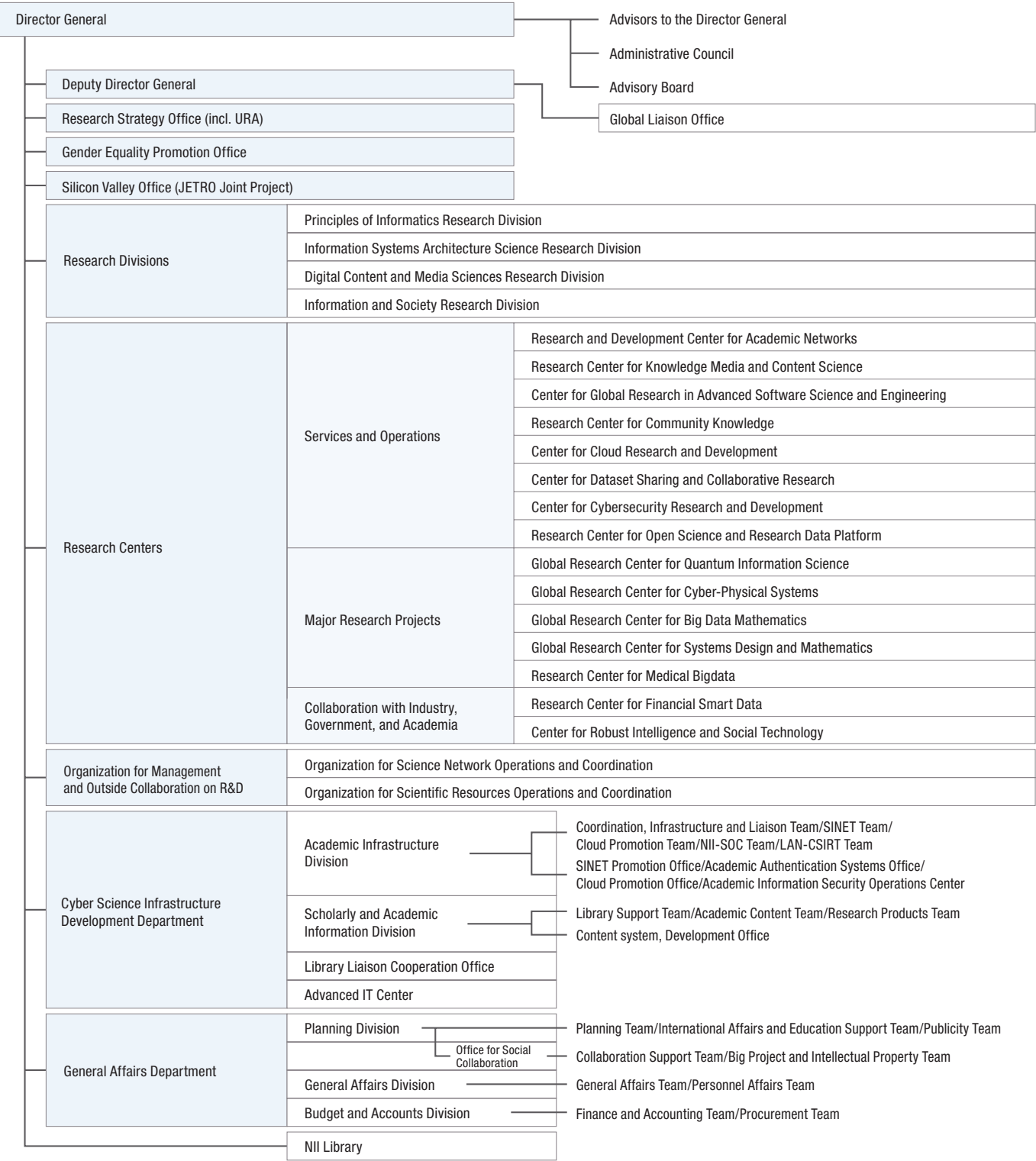• Getting to Know NII (Info Dog "Bit-kun")

Digital Media

■NII website: https://www.nii.ac.jp/en/
Visit the NII website for details about events and publications.

■NII YouTube Channel https://www.youtube.com/user/jyouhougaku
Watch videos of NII lectures and research presentations.

■Email newsletter https://www.nii.ac.jp/mail/

■Twitter
Official NII account (@jouhouken) https://twitter.com/jouhouken
Tsubuyaku Bit-kun (@NII_Bit) https://twitter.com/NII_Bit

■Facebook https://www.facebook.com/jouhouken

News Release List

(FY2017)

| Date issued	Title
April 2, 2018	Establishment of the New Research Center for Robust Intelligence and Social Technology: Aiming to Build a Robust Knowledge Platform to Solve Social Issues
April 10	Kazutsuna Yamaji, NII Professor, Wins a Science and Technology Award: Commendations for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology FY2018
April 12	Research on Social Issue Solving Techniques Utilizing LINE: Conclusion of a Collaboration Agreement between Hyogo Prefecture, Amagasaki City, Tamba City, LINE Corporation and the Graduate School of Informatics in Kyoto University
April 13	Ideathon on the Utilization of SINET5 & Clouds: Competition of Ideas Utilizing the Characteristics of Broadband and Low Delay
May 16	Competition over Graph Discoveries Demonstrating Efficient Network Configuration Again Held This Year: How Would You Connect CPUs in Supercomputers?
June 18	Exhibition of a Visualization Projection Work That Maps the Data Flow Rate of the Science Information NETwork (SINET) onto a Map of Japan
June 28	Provision of Market Research Data Sets for Research for Free: Collaboration with INTAGE Inc. / Contribution to Research on Marketing
Sept. 07	Success with the Visualization of Optical Transmission on Object Surfaces Using Ordinary Cameras: Development of a Visualization Technique for the Surface Configuration of Objects with Variable Ring Light Imaging
Sept. 20	Creation of LINE Stamps Featuring the Info Dog "Bit-kun" – the Official Mascot of the National Institute of Informatics: Sale of Eight Stamps Selected by a Vote with Visitors from the General Public to the NII
Oct. 01	Simple Configuration and Reconfiguration of Cloud Computing Environments: Start of Full Operation of the GakuNin Cloud On-demand Configuration Service from October 1
Oct. 04	Junichi Yamagishi, NII Associate Professor, Wins the Advanced Technology Category Excellence Award at the 17th DOCOMO Mobile Science Awards
Oct. 12	Open Call for Demonstration Testing Utilizing the SINET Wide Area Data Collection Infrastructure: New Services Directly Connecting the Science Information NETwork 5 (SINET5) and Mobile Communications
Nov. 06	Technique for Preventing Extraction of Finger Vein Patterns from Photographs: Winner of the Computer Security Symposium 2018 Excellent Paper Award
Nov. 27	Discovery of a Huge Graph with 400,000 Vertices That Mimics Next Generation Supercomputer Design – Hopes for Practical Use in the Drastic Reduction of Communication Delays: Competition over the Discovery of Graphs Leading to Efficient Supercomputer Design with Graph Golf
Dec. 04	Superradiant Emission from Color Centers in Diamond: A Flash of Light from a Solid-state Hybrid Quantum System
Dec. 11	Succeeded: World's Fastest 600Gbps per Lambda Optical Transmission with 587Gbps Data Transfer Prospect for Realizing 600Gbps per Lambda Optical Network and Data Transfer Protocol Maximizing its Utilization, Aiming for Ultra-fast Transfer of Big Data Yielded by Advanced Science and Technology Research
Dec. 20	Start of the SINET Wide Area Data Collection Infrastructure New Service Demonstration Testing: Realization of Data Collection and Processing in a One-stop Service from Mobile Devices in Environment, Organism and IoT Research toward the Realization of Society 5.0
Dec. 25	New Method for High-speed Synthesis of Natural Voices: Neural Source-filter Model Uses Neural Networks to Update Classical Speech-synthesis Methods
March 1, 2019	NII Builds the World's First Round-the-Globe Ultra-High-Speed 100 Gbps Academic Communications Network: by upgrading direct international connections of SINET to the United States, Europe and Asia subsequently to upgrading domestic connections towards Society 5.0
Mar. 13	Number of Institutions Participating in the Science Information NETwork (SINET) Breaks Through 900: Ultra-high Speed 100 Gbps Information Communications Network Dedicated to Academics Used by Three Million Researchers in Universities and Research Institutes across Japan
Mar. 15	NII and WACREN Sign a Memorandum of Understanding on R&D of Open Science Infrastructure
Mar. 27	Japan Open Science Summit 2019 Held on May 27 and 28: Largest Event Taking an Overarching Look at Open Science Trends Starts Entry on March 27

Research
Graduate Program
Service
Organization/Other

Organization

- Director General
  - Advisors to the Director General
  - Administrative Council
  - Advisory Board
  - Global Liaison Office
  - Deputy Director General
  - Research Strategy Office (incl. URA)
  - Gender Equality Promotion Office
  - Silicon Valley Office (JETRO Joint Project)
  - Research Divisions
    - Principles of Informatics Research Division
    - Information Systems Architecture Science Research Division
    - Digital Content and Media Sciences Research Division
    - Information and Society Research Division
  - Research Centers
    - Services and Operations
      - Research and Development Center for Academic Networks
      - Research Center for Knowledge Media and Content Science
      - Center for Global Research in Advanced Software Science and Engineering
      - Research Center for Community Knowledge
      - Center for Cloud Research and Development
      - Center for Dataset Sharing and Collaborative Research
      - Center for Cybersecurity Research and Development
      - Research Center for Open Science and Research Data Platform
    - Major Research Projects
      - Global Research Center for Quantum Information Science
      - Global Research Center for Cyber-Physical Systems
      - Global Research Center for Big Data Mathematics
      - Global Research Center for Systems Design and Mathematics
      - Research Center for Medical Bigdata
    - Collaboration with Industry, Government, and Academia
      - Research Center for Financial Smart Data
      - Center for Robust Intelligence and Social Technology
  - Organization for Management and Outside Collaboration on R&D
    - Organization for Science Network Operations and Coordination
    - Organization for Scientific Resources Operations and Coordination
  - Cyber Science Infrastructure Development Department
    - Academic Infrastructure Division
      - Coordination, Infrastructure and Liaison Team/SINET Team/Cloud Promotion Team/NII-SOC Team/LAN-CSIRT Team
      - SINET Promotion Office/Academic Authentication Systems Office/Cloud Promotion Office/Academic Information Security Operations Center
    - Scholarly and Academic Information Division
      - Library Support Team/Academic Content Team/Research Products Team
      - Content system, Development Office
    - Library Liaison Cooperation Office
    - Advanced IT Center
  - General Affairs Department
    - Planning Division
      - Planning Team/International Affairs and Education Support Team/Publicity Team
      - Office for Social Collaboration
      - Collaboration Support Team/Big Project and Intellectual Property Team
    - General Affairs Division
      - General Affairs Team/Personnel Affairs Team
    - Budget and Accounts Division
      - Finance and Accounting Team/Procurement Team
  - NII Library

Research / Graduate Program / Service / Organization/Other

* Silicon Valley Office (JETRO Joint Project)

NII and the Japan External Trade Organization (JETRO) established an office in Silicon Valley in May 2017. This new base is expected to further efforts to expand NII research results overseas by understanding and investigating international needs to help with NII research results activities and commercialization in the United States, especially on the west coast, based on the information that is collected. The Silicon Valley Office is also involved in activities that include the execution of joint research contracts with foreign companies, universities, research groups and other organizations in addition to providing administrative support to neighboring international societies and exhibitions.
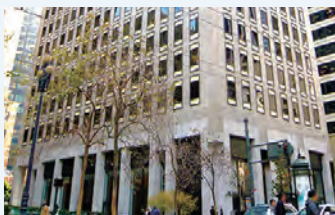
Executives

| Director General | Masaru Kitsuregawa | | | | |

Acting Director General/ Deputy Director General	Isao Echizen	Deputy Director General	Shigeo Urushidani	Deputy Director General	Ken-ichi Kawarabayashi
Deputy Director General	Motoshi Shinozaki	Deputy Director General	Jun Adachi		
Advisor to the Director General	Akiko Aizawa	Advisor to the Director General	Ichiro Satoh		

■ Cyber Science Infrastructure Development Department

Director	Shigeo Urushidani	Deputy Director	Satoru Kinoshita	Senior Coordinator	Toyomi Takekawa
◇Academic Infrastructure Division Director	Hideki Higuchi	◇Scholarly and Academic Information Division Director	Wataru Ono	◇Library Liaison Cooperation Office Director	Yoshiro Hirata
◇Advanced CT Center Director	Shunji Abe				

■ General Affairs Department

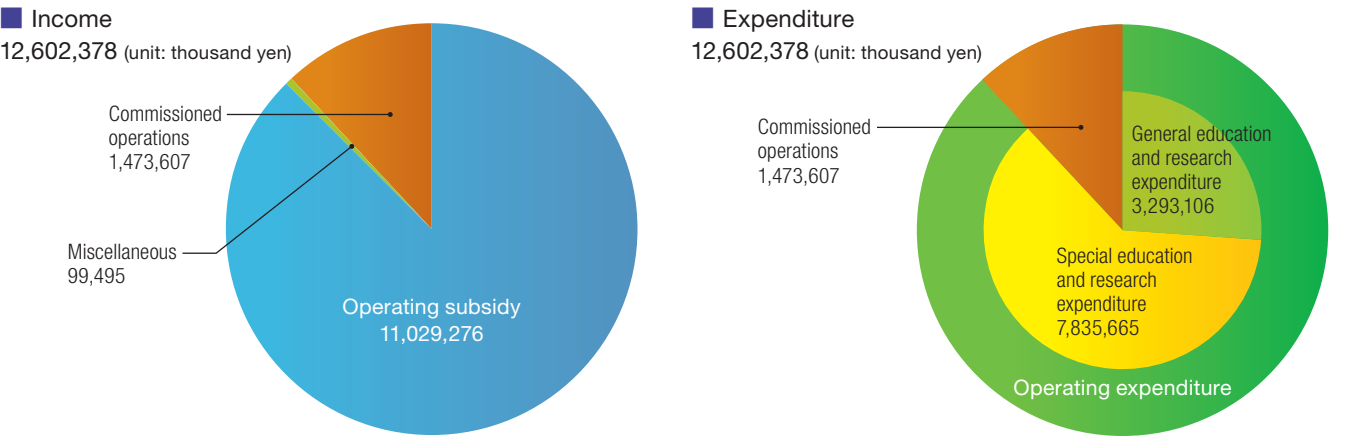| Director | Hirokazu Mizoguchi | | | | |
| ◇Planning Division Director | Masako Suzuki | ◇General Affairs Division Director | Takahiro Kishitani | ◇Budget and Accounts Division Director | Hiroyuki Saito |

Staff Numbers

(as of May 2019)

Category	Director General	Deputy Director	Advisor to the Director General	Professor	Associate Professor	Lecturer	Assistant Professor	Subtotal	Administrative Staff	Total
Full-time employees	1	4	2	27	28		12	74	56	130
Adjunct professors, etc.		1		11	15		17	44		44
Special term/fixed-term/short-term staff										222

Budget

(FY2019)

■ Income
12,602,378 (unit: thousand yen)

- Commissioned operations 1,473,607
- Miscellaneous 99,495
- Operating subsidy 11,029,276

■ Expenditure
12,602,378 (unit: thousand yen)

- Commissioned operations 1,473,607
- General education and research expenditure 3,293,106
- Special education and research expenditure 7,835,665
- Operating expenditure

Administrative Council

Discusses important matters concerning the management and operation of NII. These matters include the selection of candidates for the post of Director General, as well as academic personnel, joint research plans, and matters concerning NII in the mid-term targets and plans of the Research Organization of Information and Systems (ROIS).

Advisory Board

Consists of Japanese and overseas experts who are external to NII and have extensive, advanced knowledge of academic information. The Board responds to inquiries from the Director General regarding issues involving informatics research, the development and establishment of infrastructure for distributing academic information, and so on.

Professors Emeriti

National Center for Science Information Systems (NACSIS)

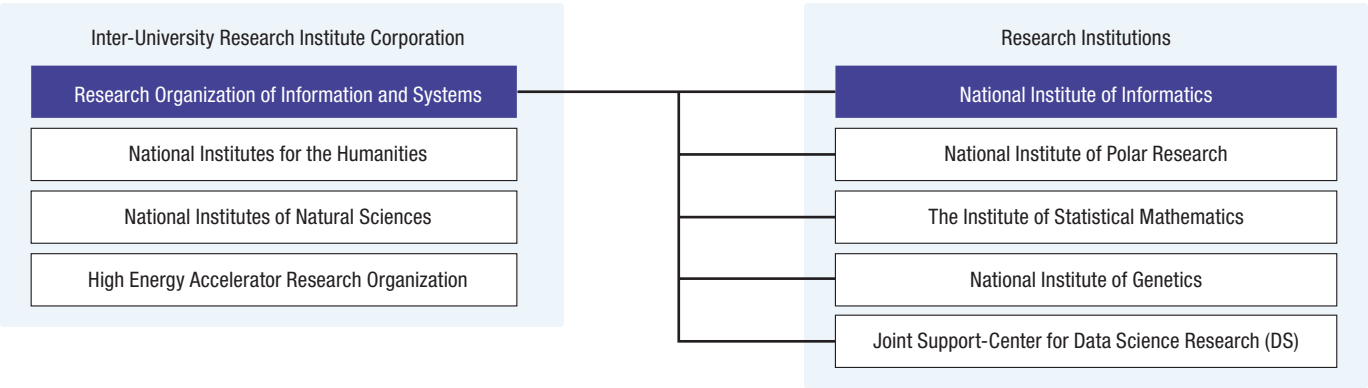| Name	Award date
Hitoshi Inoue	23 June 1999

National Institute of Informatics (NII)

Name	Award date	Name	Award date
Takamitsu Sawa	1 April 2002	Masao Sakauchi	1 April 2013
Eisuke Naito	2 July 2002	Shoichiro Asano	1 April 2013
Mitsutoshi Hatori	19 November 2004	Teruo Koyama	1 April 2015
Kinji Ono	19 November 2004	Akira Miyazawa	1 April 2015
Takeo Yamamoto	1 April 2005	Shigeki Yamada	1 April 2015
Yasuharu Suematsu	1 April 2005	Yoshihisa Yamamoto	1 April 2015
Haruki Ueno	1 April 2007	Noboru Sonehara	1 April 2017
Katsumi Maruyama	1 April 2010	Jun Adachi	1 April 2018
Masamitsu Negishi	1 April 2010	Shinichi Honiden	1 April 2018
Kenichi Miura	1 April 2011		

Inter-University Research Institute Corporations

The National Institute of Informatics is one institute operating under the auspices of the Research Organization of Information and Systems (ROIS), which itself is one of four Inter-University Research Institute Corporations.

It is these "corporations" that make it possible for Japan's universities to share the utilization of facilities for every field of study, including larger types of leading-edge equipment that individual institutions would have a hard time installing and maintaining on their own. While promoting original, collaborative research that exceeds the purview of individual universities, the corporations provide, as a service to researchers nationwide, volumes of scientific data, access to valuable materials, plus recommended analytical methods.

The aim of ROIS is to carry out integrative studies beyond the boundaries of traditional disciplines by framing complex phenomena concerning live, Earth, the natural environment, and human society in the 21st century from the information and systems perspective.

Inter-University Research Institute Corporation
- Research Organization of Information and Systems
- National Institutes for the Humanities
- National Institutes of Natural Sciences
- High Energy Accelerator Research Organization

Research Institutions
- National Institute of Informatics
- National Institute of Polar Research
- The Institute of Statistical Mathematics
- National Institute of Genetics
- Joint Support-Center for Data Science Research (DS)

History

Time		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, and Culture. The Science Council issues a response in January 1980.
April	1983	The 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	The National Center for Science Information Systems (NACSIS) is established, with the reorganization of the center for Bibliographic Information, 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 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-ward, 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 (Karuizawa, 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, 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 Filed 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 Filed; 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-ward, 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 CiNii (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	2011	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 NETwork5 (SINET5) is launched.

Facilities / Locations

National Center of Sciences (Chiyoda Ward, Tokyo)
https://www.nii.ac.jp/en/

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

The high-rise wing consists primarily of three organizations: NII, Hitotsubashi University Graduate School of International Corporate Strategy, and part of the National Institution for Academic Degrees and Quality Enhancement of Higher Education. The Center aims to provide an advanced base for intellectual creativity through comprehensive application of the academic functions of each institute.

Conference facilities such as Hitotsubashi Hall are located in the low-rise wing, and these accommodate activities such as international conferences, lectures, and academic meetings organized by national university corporations and other institutions.

National Institute of Informatics

National Center of Sciences Bldg.
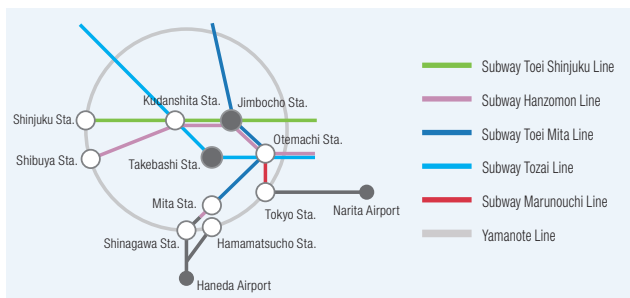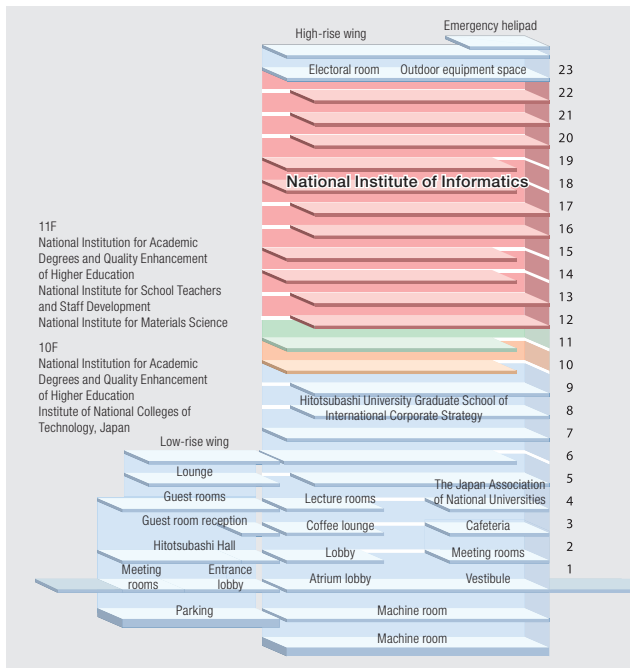2-1-2 Hitotsubashi, Chiyoda-ward, Tokyo 101-8430
Tel: +81-3-4212-2000 (exchange)

■Site area: 6,842m² (occupied by NII: 3,036m²)
■Floor space: 40,585m² (occupied by NII: 18,145m²)

National Center of Sciences

Chiba Annex (Inage-ward, Chiba City)

Chiba Annex is a building that houses the computer systems and networking equipment used to operate academic information systems and provide academic information services. It was built in November 1994.
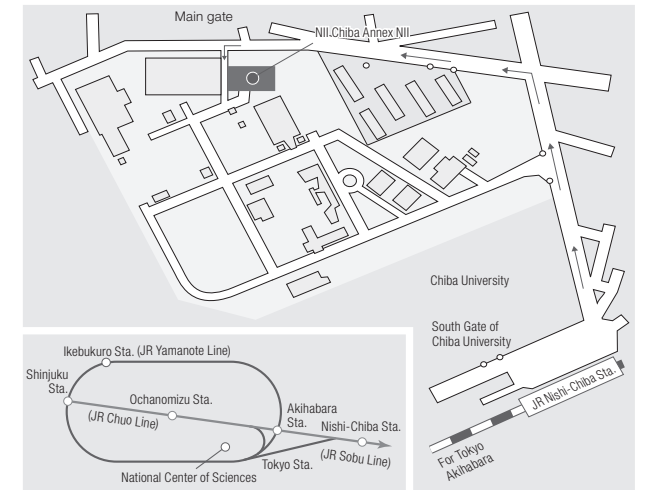
Chiba Annex

1-8 Yayoi-cho, Inage-ward, Chiba-shi, Chiba 263-0022
Tel: +81-43-285-4911 (exchange)

■Site area (rented): 3,212m²　■Floor space: 3,943m²

Guide Map

Exterior of Chiba Annex

International Seminar House for Advanced Studies (Karuizawa, Nagano Prefecture)
https://www.nii.ac.jp/access/karuizawa/

Inose Lodge

The International Seminar House for Advanced Studies (Inose Lodge) was built on land donated by Dr. Hiroshi Inose, the first director general of NII. His idea was to create an ideal place for interdisciplinary and international 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.

International Seminar House for Advanced Studies Inose Lodge

1052-471 Okan Minamihara Nagakura, Karuizawa, Karuizwa-cho, Kita Saku-gun, Nagano 3890-0111
Tel. +81-267-41-1083　Fax. +81-267-41-1075

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

Guide Map

Exterior of Seminar House