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NII

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

National Institute of Informatics

2017

Overview

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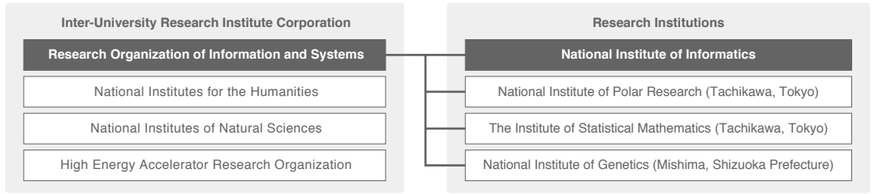
Inter-University Research Institute Corporations

The National Institute of Informatics is one of four institutes 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.

At present, a total of 19 research institutes like NII are set up under the four corporations, which include ROIS. The aim of ROIS is to carry out integrative studies beyond the boundaries of traditional disciplines by framing complex phenomena concerning life, Earth, the natural environment, and human society in the 21st century from the information and systems perspective.



Top Message

Our multidisciplinary approach to research makes the National Institute of Informatics unique in Japanese academia. Beginning with basic research valued from the long-term view, NII is pushing ahead with practical studies aimed at resolving current social problems. At the same time, operations developed by this inter-university research institute—such as providing state-of-the-art information infrastructures, content systems, and related services—have become vital to the conduct of research and instructional activities throughout the academic community.

The Science Information Network (SINET) is one project that underscores NII's efforts to have research and operations act in tandem. It has supported Japan's academic infrastructure since its start in 1992. In 2007, the network was upgraded to SINET3 with a world-leading communications speed of 40 Gbps. SINET4, which came online in 2011, demonstrated enhanced operations reliability and durability by withstanding the Great East Japan Earthquake. The transition to SINET5 in April 2016 heralded the arrival of 100-Gbps connectivity between Japan's prefectures and the augmentation of links with the United States. From either a regional or global perspective, SINET is a powerful network. Clearly its construction over the past 25 years has been extremely significant for Japan's academic community.

Big Data is a term often tossed around these days. Environments that enable casual exchanges of lots of data are indispensable for scientific projects to keep their edge. Amid demands by Big Science for computer resources that can deal with voluminous amounts of experimental data, cooperation on data exchanges across borders and regions is becoming commonplace. For that reason, the 100-Gbps SINET5 has received a triple endorsement from the Japan Association of National Universities, the Japan Association of Municipal and Prefectural Colleges and Universities, and the Federation of Japanese Private Colleges and Universities Associations. We are grateful for their backing and for the support received from many others, including the recommendation of the Science Council of Japan.

The shift to SINET5 will play a big part in cloud computerization at universities. A surge in off-site communications traffic will accompany cloud computerization supported by 100-Gbps SINET5. The huge cost savings likely through cloud-enhanced consolidation of university computing resources are expected to accelerate the currents favoring the conduct of open science. We are expecting new scientific applications such as the delivery of 8K-video instructional materials for medical use. This fiscal year we began work with the Japan Agency for Medical Research and Development to support medical-image data sharing and remote examinations. The application of SINET at actual healthcare sites is evolving along with advanced utilization of academic information.

The focus of NII is open science. The unfolding of the informatics field is influencing science and technology research. Traditionally scientific expertise was passed along in articles and books, but responsibility for this task is shifting in this era of open science involving collective ownership of research data itself. With their gaze fixed on the changing times, a number of universities are aiming to construct infrastructures for sharing research data, utilizing SINET5, a remarkable, high-speed network. Data sharing takes a variety of forms. Access to data may be open to the general public or limited to designated researchers and organizations. Refinements to the technology of data sharing come out in GakuNin Cloud, the inter-university authentication service provided by NII. In a similar vein, the idea behind the Research Center for Open Science and Data Platform, established in April 2017, is to promote the use and application of research data among universities and institutions in Japan. GakuNin Cloud is adding to the future development of open science by serving as the gateway that connects universities and research institutions with research data and with cloud-driven research infrastructures.

In fiscal 2015, NII opened the Center for Cloud Research and Development. American university projects at the time were beginning not only to take over cloud resources from cloud vendors but also to do research on cloud computing itself. It could be said that cloud research had entered a new stage. Our intention has been to spur next-generation cloud research that is completely different. So, in fiscal 2016, NII opened the Center for Cybersecurity Research and Development "to protect the security of academic networks." We feel duty-bound to provide cybersecurity-related information and technical support to universities and research institutions. We also strive to build the training infrastructures needed to prepare talented prospects for the responsibilities of managing cybersecurity.

As NII puts much effort into encouraging academic-industrial collaboration, in February 2016 we established the Research Center for Financial Smart Data. Until recently it was unheard of anywhere for an information systems research facility to engage in the financial sphere. After processing and analyzing finance-related Big Data, NII takes up the challenge of converting "financial smart data" into useful knowledge. Those efforts have enabled us to answer requests to clarify complex economic and social phenomena. The research center is the first that NII has established with private sector funding of research activities and operations. Another facility that deals with real-world issues is the Cognitive Innovation Center, which was established to foster innovation that brings reforms to Japanese society and industry. In the new stage of artificial intelligence (AI), which is leveraged by deep learning, we are working together with enterprises toward development of diverse solutions.

In addition to operations like SINET, NII conducts basic research in the AI-inclusive field of informatics as well as concurrent applied research aimed at implementing beneficial developments in society. Moreover, it is one of the few institutions in the world performing feedback on such research. In recent years the tendency has been to stress only the "by IT" aspect of IT. We prefer the balanced "of IT" approach, emphasizing the strength of flexible research systems.

The Fifth Science and Technology Basic Plan approved by the Japanese government highlights the role of IT in describing the new vision for "Society 5.0." As basic research on IT steadily advances, NII's intention with regard to the realization of Society 5.0 is to work on IT-related solutions to social problems and to contribute to data-sharing platforms. Of course, all development won't happen at NII. The idea is to push ahead with various academic institutions, thinking and creating together.

Finally a word about education. The National Institute of Informatics considers this field so important that it offers informatics-related courses leading to doctoral programs at the Graduate University for Advanced Studies. NII coordinates with a number of universities and graduate schools. "Making full use of IT education and IT" in Japan reflects our policy commitment to having more and more students master the foundations of IT. We are delighted that discussion has begun in Japan, as it has in Britain, on teaching computer programming starting in elementary school. After all, do not education and the elucidation of life's mysteries go hand in hand with IT?

Take a look at the descriptions of the research activities and operations that engage NII and feel free to share your thoughts with us. We appreciate your continued support.

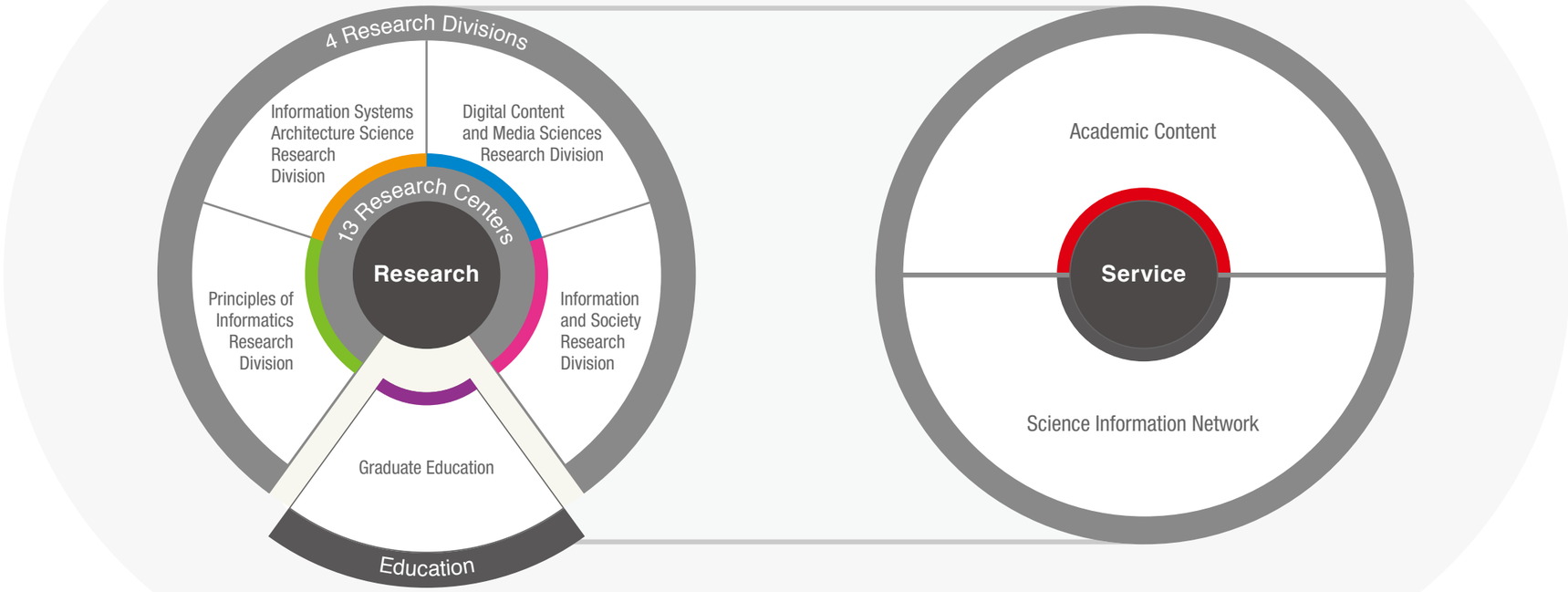
Masaru Kitsuregawa
Director General

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

Weaving Information into Knowledge

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

The National Institute of Informatics (NII) is an inter-university research institute corporation and a research organization of information and systems. The mission of this unique national academic research institute is to "create future value" in the new academic field of informatics. From the basic methodology of informatics to cutting-edge themes such as artificial intelligence, Big Data, the Internet of Things (IoT), and information security, NII features in a wide range of research activities. We push forward with fundamental research valued from the long-term view as well as practical studies aimed at resolving current social problems.
As an inter-university research institute corporation, NII has taken on the task of building and running essential research and education information infrastructures for Japan's academic community, including the SINET5 science information network. In addition, NII develops and advances operations that provide academic content and online service platforms. Mutual feedback on the expertise gained through operations as well as from research enables us to carry out projects that relate scientific research to real problems, utilizing state-of-the-art technology. NII uses these activities in its efforts to train talent and contribute to society at large, while administering vital collaborative ties to private enterprise and various social programs in addition to our connections with foreign/domestic universities and research institutions.
The National Institute of Informatics also is committed to providing graduate education that promotes creative, world-class 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 technologies like computer science and information/communications engineering but also the humanities, social studies, and the life sciences. This new academic domain involves every aspect of culture and economics. NII has established four basic Research Divisions—namely, Principles of Informatics, Information Systems Architecture Science, Digital Content and Media Sciences, and Information and Society—plus 13 Research Centers charged with systematically accomplishing specific tasks. From the basic methodology of informatics to the state-of-the-art in artificial intelligence, Big Data, the Internet of Things (IoT), and information security, NII advances the integration of research and development. Furthermore, our informatics research is directed toward spurring international study activities and collaboration with industry, government, and academia.

Services to Support Research Infrastructure and Education

As an inter-university research institute, NII coordinates with academic institutions and the research community. For starters, it built and now operates the Science Information NETwork (SINET5), the world's most-advanced, high-speed network linked to domestic and international sites. NII furthers the development of cloud systems and, in its push for open access and open science, drives the development of academic information infrastructures as well as practical ways to utilize them. NII also collaborates with national universities to promote the education of cybersecurity personnel through its unique capacity to detect serious cyber attacks, supply defensive information, and sponsor in-service training. Our aim is to enable national universities to respond quickly to security incidents. In addition, NII strives to contribute to improving the international competitiveness of education research, accelerating studies on leading-edge topics, developing interdisciplinary programs, promoting more efficient research, and enhancing the functions of universities.

Graduate Education

Fostering New Leaders of the Advanced Information-Communication Society

The National Institute of Informatics graduate education involves (1) participation in courses at the Graduate University for Advanced Studies, (2) cooperation with other graduate schools, or (3) acceptance of special joint research fellows. The Graduate University for Advanced Studies (a national university corporation) is Japan's first graduate university. It was established to push original, world-class scholarly research beyond the borders of conventional disciplines and to open up new paths of scientific inquiry. For its part, the National Institute of Informatics has set up a graduate department of multidisciplinary science and informatics to offer a five-year doctoral program as well as a post-doctorate program. Six areas of instruction are covered: fundamentals of information science, information infrastructure science, software science, information media science, intelligent systems science, and information environment science. These areas break out into more than 70 class subjects. The department is pleased to accept talented people from overseas into the many English-language lectures. Working adults account for around 30 percent of registered students.

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. Public appeals go out to universities, private-sector institutions and municipalities for investigative partnerships. NII's efforts include cultivating cybersecurity talent, sponsoring programs that train top-level systems engineers, and supporting cooperative supplementary schools that encourage the collaborative approach by providing information gathered on the frontiers of research. Our research facilities were set up with the objective of returning accomplishments to society through industry-academia collaboration.

International Exchange

Beginning with the dissemination of research results, our global contributions to the study of informatics include the formation of research centers that foster international collaboration and aggressive exchanges of researchers and students. The world's top researchers gather together for the NII Shonan Meeting, which consists of intense, training-camp-style discussions of issues affecting the informatics field. The conclusion of MOU agreements that NII actively seeks out with foreign universities and research institutes leads to researcher-student exchanges for international collaborative investigations, study exchange assistance, and internship programs.

Organization

- Director General
  - Advisors to the Director General
  - Administrative Council
  - Advisory Board
  - Global Liaison Office
- Deputy Director General
- Research Strategy Office
- Gender Equality Promotion Office
- Research Divisions
  - Principles of Informatics Research Division
  - Information Systems Architecture Science Research Division
  - Digital Content and Media Science Research Division
  - Information an 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 Data Platform (est. April 2017)
  - Major Research Projects
    - Global Research Center for Quantum Information Science
    - Global Research Center for Cyber-Physical Systems
    - Global Research Center for Big Data Mathematics
  - Collaboration With Industry, Government and Academia
    - Research Center for Financial Smart Data
    - Cognitive Innovation Center
- 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 and 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 Systems 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

Close-Up on Researchers

Make things perform as we desire: control theory opens the door to a new world

Principles of Informatics Research Division

Associate Professor **Masako Kishida**

After receiving a Ph.D. from the University of Illinois at Urbana-Champaign, she held a post-doc position at the same university and a Visiting Scholar position at the Massachusetts Institute of Technology. She also worked as a Project Researcher, and later as an Assistant Professor at the University of Tokyo, as a Lecturer at the University of Canterbury, Christchurch, New Zealand, and as a Humboldt Research Fellow at the Otto-von-Guericke University Magdeburg, Germany. Since 2016, she has been an Associate Professor at the National Institute of Informatics (NII). Her research interests lie in the wide area of control theory and optimization. In the past, she has worked on problems in tissue engineering, biochemical networks, statistics, acoustic signal processing, and matrix analysis. Her current research focuses on the development of theories and algorithms in networked control, where control is performed over the communication network.

We now live in the world of the Internet of Things (IoT), where things communicates through the Internet. IoT takes convenience to a whole new level and generates new values in our lives. In this world of IoT, control over the communication network is essential to achieving the desired performance of a system. An issue here is, however, the limited availability of resources such as communications, computations, and powers that are needed for control. Thus, it is very important to reduce the usage of these resources.

Becoming a control theorist was not her childhood dream. When she was a child, she read a story of Dr. Hideki Yukawa (Nobel laureate in Physics), became fascinated with his life and physics, and dreamed of being an elementary particle physicist. So, it was natural that she started undergrad in physics. However, this all changed one day when she happened to attend a lecture on controls. She recalls that, "as a physics major, I was taking classes that were filled with mathematical equations and formulas. In the controls class, however, I met block diagrams that visualize how elements of a system are connected and how they work together along with mathematics. I was surprised how a complicated system could be represented in an intuitive and easy-to-understand way. I became interested in using block diagrams." Since then, she has been studying control theory where she can apply her strength in mathematics. Control is a "strategy designed for a system to achieve a desired performance," and control theory deals with a wide variety of systems that exhibit dynamical behavior. This nature of the field has allowed her to work on various kinds of problems as she moved from one lab to another around the world.

Her academic life with controls started in the summer of her junior year when she moved to the U.S. and started studying at the University of Michigan, Ann Arbor. Among the many departments in which control is studied, she chose aerospace engineering as a major because she believed that the U.S. was a leading country in the field. Later on, she worked in New Zealand and Germany on various problems ranging from tissue engineering to electrical engineering. While her research topics have changed over the years, her work has been always about controls. "At first glance, a mechanical system with springs and masses and an electronic circuit with condensers and coils look very different. Once expressing each of them using mathematics to design a controller, however, you'll realize both expressions are mathematically equivalent. As such, study in control is generally carried out using a high level of abstraction to uncover the intrinsic similarities of systems. The beauty of abstraction is very much appreciated."

Currently, she is working on resource-efficient approaches to control over network communications because she is at NII. "Why shouldn't I be working on information-related control problems when I'm at a top research institute of informatics?"

All she needs for her work are pens and paper. But she also admits that usually "after a half day of delving into math, I'm exhausted." Looking to the future, she expects control theory combined with informatics makes our lives better.

Juris-informatics: amalgamating informatics and law

Principles of Informatics
Research Division

Professor **Ken Satoh**

After earning a Doctor of Science (D.Sc.) degree from the Department of Information Science, University of Tokyo, he accepted a position at Fujitsu Laboratories in 1981. From 1987 to 1992 he was on assignment to the Institute for New Generation Computer Technology (ICOT) where he worked on the "5th Generation Computer Project" promoted by the (then) Ministry of International Trade and Industry. He completed a doctoral dissertation in science at the University of Tokyo in 1993. He served first on the Faculty of Engineering at Hokkaido University as an Associate Professor, then took a position as full professor at the National Institute of Informatics (NII) in 2001. He completed work at Tokyo University Graduate School of Law in 2009, and the University of Tsukuba Law School in 2016. He has for many years investigated the logical basis of artificial intelligence, and more recently come to advocate a new discipline of juris-informatics, that integrates informatics and law.

His primary research interest is deductive systems that are capable of making reasonable judgments even if some information is lacking or missing. Most events in real life are not monotonic like mathematical axioms. In many cases, decisions must be made on the basis of incomplete information, and conclusions may have to be revised later as additional information becomes available.

The typical case is that of a trial: plaintiff and defendant give testimony, and the judge renders a verdict. However, if new evidence becomes available, the initial verdict may be set aside or overturned on appeal. In cases where a decision is reversed, the judge may have guessed wrong based on incorrect assumptions to complement uncertainty. He is currently trying to develop Artificial Intelligence (AI) that makes a rational conclusion even under incomplete information.

He began this quest long ago when he chanced to see the "Integrated Narrative Generation System" on display at Osaka Expo world's fair back in 1970. Thinking back on it now, it was really a very simple program, but he was in sixth grade at the time. The ability to generate an integrated narrative seemed almost miraculous and inspired dreams of full-blown artificial intelligence." He has been drawn to information science ever since. His first job after graduation was at Fujitsu Laboratories, when he worked on the development of a PROLOG interpreter, PROLOG being a logic programming language capable of describing logic. Building on his earlier work on logic programming, he came to work for NII in 2001. While continuing this line of research, it occurred to him that legal knowledge might be beneficial to develop AI applications, so he enrolled in law school in 2008. He familiarized himself with the concept of ultimate facts in civil law procedure at law school. He found that making a judgement using ultimate facts in a judicial trial corresponds with non-monotonic logic or inference, in which reasoners draw conclusions tentatively, reserving the possibility of retracting those conclusions in light of additional information.

By creating AI that makes a judgement with ultimate facts, we should be able to recreate judicial processes that are capable of drawing the most rational conclusions. To test this hypothesis, they developed the PROLEG (PROlog based LEGal reasoning support system) deductive system making more than 10,000 rules from civil law contract law textbooks, and verified that the system actually works in addressing questions pertaining to ultimate facts on the bar exam. The system is extremely useful as an educational tool for learning ultimate facts (legal structure of judgement) and also as a support tool for legal practitioners. Of course, ultimately judgement must be made by human judges, but this system is nevertheless quite useful. For example, it can be used to ensure that evidence has not been inadvertently disclosed by inexperienced court personnel and otherwise support basic legal procedures. “At NII we are proud of the freedom we have to pursue all kinds of basic research that might not otherwise be addressed. The primary objective of my work is to establish a new discipline of juris-informatics that combines informatics and law by applying logic programming to law.”

Design of efficient wireless communication systems for the IoT era based on creativity fostered by the arts

Information Systems Architecture Science Research Division

Associate Professor **Megumi Kaneko**

She obtained her Ph.D. in Engineering from Aalborg University in Denmark, and her HDR degree (French Doctoral Habilitation for Directing Researches at Professor position) from Paris-Sud University, France. She was a JSPS Post-Doc Fellow and then Assistant Professor at the Graduate School of Informatics, Kyoto University. She joined the National Institute of Informatics (NII) in April 2016 as an Associate Professor. Primary research interests are next-generation mobile communications, IoT/M2M communication systems, radio resource allocation, and wireless signal processing. A key research motivation is to design new wireless communication systems that make the best use of scarce wireless resources. She received the 2009 Ericsson Young Scientist Award, the IEEE Globecom 2009 Best Paper Award, the 2011 Funai Young Researcher's Award, the WPMC 2011 Best Paper Award, the 2012 Telecom System Technology Award and the 2016 Inamori Foundation Research Grant.

With 50 billion IoT devices foreseen for the 2020s, an exponential growth of the amount of mobile data traffic is expected. However, current wireless communication systems are already facing severe spectrum deficits. Thus, improving spectrum efficiency becomes a critical issue. In addition, future 5G/IoT systems are required to provide not only higher data rates, but also better fairness among users, lower latencies, and higher energy efficiency.

For example, if we only focused on maximizing system throughput, users close to a base station would get most of wireless resources, to the detriment of users who are farther from the base station. It would be hardly fair that a large portion of several hundred users within a base station’s coverage receive unsatisfactory service just because their channel qualities are poor. "I am particularly interested in how we can provide the best trade-off among conflicting objectives such as system throughput, fairness among users and individual quality of service (QoS) levels."

This calls for groundbreaking new solutions if we are to balance such contradictory requirements. So far, she has designed novel wireless communication methods based on recent theoretical advances, among which a contention-based channel state feedback method, or a wireless access protocol based on compressed-sensing.

She wasn't much interested in mathematics until her mid-teens. She grew up in France, and as a child loved reading and was absorbed in playing the piano and dancing ballet. As a young girl her goal was to become a pianist, but in her sophomore year at high school she had a change of heart. In the French system, if you deviate from the mathematical course, you cannot go on to pursue scientific studies in the elite Grandes Écoles of engineering. At that point, her parents advised her to keep her options open, so she decided in favor of maths and science. In the event, this opened up a whole new world as she was captivated by maths and physics.

At her Grande Ecole of engineering, she focused on wireless communications for her master's degree. She enjoyed the balance between theory and applied research. She came to Japan because study abroad was a requirement for obtaining her Ph.D. degree. She joined NII in 2016. NII has an international outlook that makes it easier to interact with scientists and researchers from other countries and other disciplines, and she personally feels drawn to environments that are conducive to performing “avant-garde” academic research.

A number of collaborative international projects are now ready to begin. She leads a full and busy life, but still tries to make time for piano and dance. "Experience performing as a soloist in piano concertos in the concert halls and churches of Paris was certainly useful for inspiring research creativity." Creativity fostered by the arts will continue to nourish new breakthroughs in the field of wireless communications in the years ahead.

Upgrading SINET: implementation of an effective system that meets community needs

Information Systems Architecture Science Research Division

Associate Professor **Takashi Kurimoto**

After completing a M.A. in Engineering at the Tokyo Institute of Technology and completing coursework toward a Ph.D. at Keio University, he worked for NTT Network Service Systems Laboratories and NTT East Plant Planning Department from 1994 to 2014. His research at NTT focused primarily on switching technology for high-speed computer networks and deploying a large-capacity, multilayer network architecture. From 2005 to 2009, he was charged with putting the next-generation network (NGN) into service for NTT East. In 2015, he moved to NII and is currently involved in the design and implementation of SDN and virtual network technology for flexible network deployment, the Science Information Network (SINET), and other big projects. He is a member of the IEICE and the IEEE.

"I think we may be on the cusp of a new era and a new style of work where people can work from anywhere they desire, such as from a resort on a south seas island." This kind of idyllic life style has been in the back of his mind for 20 years as he pursued work on network technology that would make such a life style possible. Currently at NII, he is working on the Science Information Network (SINET) that interconnects universities and research institutes throughout Japan.

When SINET 5 was rolled out and became operational in April 2016, he was put in charge of network migration from SINET 4 to SINET 5 and all institutional subscriber lines have to be accommodated to SINET5. Basically, the work involved a physical migration of rewiring all institutional subscriber devices connected to 50 SINET routers scattered around the country, and a logical migration of setting the parameters of each institutional subscriber by remote control from the central office, and the task wasn't completed until both of these changes worked in perfect alignment. By focusing on the switching method and procedure, we were able to migrate approximately 850 universities and institutions to SINET5 within just two months' time, an extraordinary accomplishment. Regarding the impact of this migration work, the network has exceeded all expectations, with communication downtime of only a couple of minutes for the entire time since the network has been up and running.

We are now in the process of upgrading SINET with Network Functions Virtualization (NFV) capability. This will enable us to virtualize services, or implement services using software on generic servers, that are now carried out by proprietary hardware. "SINET was developed specifically for universities and research institutions, so it must be capable of transmitting and receiving vast quantities of experimental data. NII deals with both academic research and development sectors, so naturally it was the logical choice for developing and deploying an academic network to meet these needs."

In high school he had an affinity for the logic of math and physics, and perceived beauty in the way natural phenomena could be expressed with mathematical equations. He pursued physics at graduate school, and earned a Master's Degree in Applied Physics. In studying interactions among molecules and atoms, he became particularly interested in the craftsmanship (monotsukuri) involved in designing and enhancing experimental equipment.

"I came to NTT with the idea of shaping new technologies that would make life easier and more beneficial." NTT Labs is committed to the design of high-speed, high-capacity communications equipment, while also enhancing the reliability of communications. Meanwhile, the Business Division is primarily concerned with building a next-generation network (NGN) that meets the high-speed access and volume capacity needs of the future. He feels fortunate that his current job allows him to exploit everything he learned and achieved in the past.

Ever since he was a youngster, he has always loved building things. On the weekends, you can always find him working on the house or digging in the vegetable garden. "Today you can find practically anything on store shelves, but I always prefer the challenge of figuring out how to build things myself." As an engineer, "it's the process of actually creating something that is interesting." He much prefers to see something take shape using his own hands.

Evolving interest in sound changes future speech technology: Creating human voice signals through deep learning

Digital Content and Media Sciences Research Division

Associate Professor **Junichi Yamagishi**

He holds a M.Eng. and a Ph.D. in Information Processing from Tokyo Institute of Technology for research on speaker adaptation technologies for speech synthesis. He was a Research Fellow at the School of Informatics, University of Edinburgh until 2013, at which time he took a position as Associate Professor of the Digital Content and Media Science Research Division at the National Institute of Informatics (NII). He has presented a series of groundbreaking papers on speaker adaptation technologies for speech synthesis and has established a novel methodology in the speech synthesis field. Building on speaker adaptation technologies, he successfully demonstrated a new speech translation system that can use personalized voices even in foreign languages and features a novel communication device that produces the original personalized voice of individuals with speech disabilities. He has also used the methodology for improving intelligibility of speech in noisy environments. He has received numerous prizes and awards including the Itakura Prize for Innovative Young Researchers from the Acoustical Society of Japan, the Kiyasu Special Industrial Achievement Award from the Information Processing Society of Japan, the Young Scientists' Prize from the Minister of Education, Culture, Sports, Science and Technology, and the JSPS Prize from the Japan Society for the Promotion of Science.

As a young boy he was into rock and roll, and before long found himself playing drums in a band. As he continued to perform the music, he noticed that the way the microphone was positioned and the audio equipment set up made a huge difference in how the audience heard the music. This made him wonder: what could be done to optimize the sound impression or deliver better quality sound to people in general?

His research is still strongly motivated by sound, and currently "focuses on speech synthesis using deep learning. He thinks we are now no more than one or two years away from the ability to produce a natural-sounding computer-synthesized voice that is indistinguishable from human speech, and can generate a voice that perfectly imitates a person's speech."

The flexibility made possible with computers will have an enormous impact on the design of teaching materials and games. Experiments have shown that selecting optimum voice characteristics to deliver audio instructions may keep children engaged in learning longer and help children learn faster. "It made me realize again the amazing potential of one-dimensional voice signals."

Those who could most benefit from speech synthesis are people who, due to a medical condition or an accident, may lose the ability to speak. There may be circumstances where a person's original healthy voice is not digitally recorded in a good enough condition without noise or reverberation. If the person's voice has been lost, then it is not possible to create a new recording. "We have nevertheless developed an algorithm for cloning a person's voice even if the speech recording is impaired by noise and/or reverberation. Now with the availability of deep learning, we have made a significant step toward the ultimate goal of being able to easily create anyone's actual voice."

Up until 2015, we used a probabilistic method called the hidden Markov model. Replacing the basic technology certainly wasn't easy, but we have achieved dramatic improvement in the quality and the utility of speech. We should also mention that this technology could be misused for spoofing and identity theft. "Indeed, voice authentication systems have already been hacked using computer-generated synthesized speech, so great efforts are now under way to find a secure and reliable way of distinguishing human speech from computer-generated speech."

How best to nurture seeds of research that will successively flourish and grow? "To begin with, NII provides an excellent environment where researchers can really focus on their work. A large pool of exceptional researchers has been brought together who are free to discuss ideas with all other NII researchers and staff since there is no compartmentalization or barriers within the organization. There are also plenty of avenues for cooperation with other institutions both within Japan and abroad."

Finally, he would highlight the enormous progress that has been made in recent years the world over in the field of speech synthesis.

People and AI exploiting their respective strengths: moving toward a society of cooperation and problem solving

Digital Content and Media Sciences Research Division

Professor **Seiji Yamada**

He received a Ph.D. degree in Control Engineering and Artificial Intelligence (AI) from Osaka University in 1989, served as a Research Associate and Lecturer at Osaka University, then as an Associate Professor at Tokyo Institute of Technology from 2002 to the present. His research interests include AI and web intelligence, and has focused on "AI collaboration with humans." He is currently involved in a number research projects focusing on human-agent interaction and smart interactive systems working toward a final objective: development of an interactive system with agents or robots engaged in long-term partnerships with human users that fully exploits human capabilities. Since June 2016, he has served as President of the Japanese Society for Artificial Intelligence.

As an elementary student he loved making plastic models, and in middle school and high school he was a great fan of Mr. Spock, the science officer on board the USS Enterprise in Star Trek. He liked building radios and working with electrical circuits, and this naturally led him to the Department of Control Engineering at university. In short, he has always been a science guy.

In graduate school, he was exposed to then state-of-the-art AI expert systems technology, and explored automatic learning of inference rules. "Processing becomes ever faster through learning, much the same as the way an athlete becomes more efficient through training. Looking back, this was pretty excited stuff!" Now he is President of the Society for Artificial Intelligence, but still feels the same driving force and sense of elation that inspired him to pursue AI research.

His research is focused on AI-human cooperation. "First I would note that AI is not complete in and of itself. AI must be subject to trial and error under human management and control, and subject to periodic intervention and modification. By implementing a somewhat equal division of labor with people doing what they are good at and AI doing what it's good at, this can effectively drive down costs while boosting performance." He thinks that this kind of cooperation can be achieved by pursuing two essential strategies: human-agent interaction (HAI) and intelligent interactive systems (IIS).

HAI is an experimental study that clarifies the sense of unease we feel when interacting with anthropomorphic agents—robots, and CG characters, and so on—and has led to generic algorithms and design methods that can be broadly applied. It was found, for example, that a generic beeping sound from a mechanical robot is more intuitive for making people aware of a machine malfunction than having a cuddly dog shaped robot make some sort of sad gesture. Through experiments with a wide range of live action, anime, and other kinds of anthropomorphic agents, we also found that when making onscreen recommendations of products, that the degree of intelligence and friendliness exhibited by the agent had a huge influence on the rate of purchases.

IIS are studies of true AI and human interaction and cooperation in which humans are able to intervene and make corrections when images and other data are misclassified by systems that automatically classify such data. Basically, this research is trying to determine if human intervention can effectively enhance results derived by AI using a wide range of approaches including algorithms and interaction designs. The goal is to develop intelligent systems that are human friendly yet also human adaptable. "NII is an environment giving researchers full rein to pursue any kind of basic research, while also encouraging a wide range of collaborative projects. In this environment, our objective is to implement intelligent, human-adaptable systems and practical applications by integrating component technologies.

Building on cosmic-ray analysis and research skill: contributing to more efficient research activity

Information and Society Research Division

Associate Professor **Masaki Nishizawa**

He obtained Doctor of Science (D.Sc.) degree in physics from Konan University Graduate School of Natural Science (Kobe), served as researcher at the Institute of Cosmic Ray Research, University of Tokyo, and is now investigating the "solar magnetic field using the cosmic-ray shadow of the sun" as a COE postdoctoral fellow. In 1995, he was put in charge of investigating research trends at the National Center for Science Information Systems (NACSIS), the organizational predecessor of the NII, and was instrumental in drafting "International Comparison of Informatics Research" and other studies laying out the direction of research in this area. He was the lead author of several influential studies of scientometrics including "Tracing the history of successful research," "Survey of the relevance of keyword analysis to research," "Study of the characteristics and contribution of each university's international competiveness," and "Quantitative study of media coverage of academic research" based on press releases from various universities.

He seeks to first identify the origin of results based on the relationship between research yielding breakthrough results and support/infusion of funding, then analyze factors derived from the correlation between research-related press releases and coverage in newspapers. "Based on this work, we are trying to determine the optimal timing and most effective method for funding research. More specifically, we're trying to discover the factors and most effective method of dissemination through newspaper and media coverage."

His first area of expertise was cosmic ray physics, and he was long involved in observing and conducting cosmic ray experiments. He is still very much absorbed in this work, and recently came to a better understanding and ability to explain solar magnetic fields. One might assume there is no connection between cosmic rays and the analysis of data pertaining to academia.

"Yet I've found that the skills honed in statistical processing and analysis of vast amounts of cosmic ray-related data is directly applicable to scientometric measurement and analysis. The energy distribution of cosmic rays and the frequency distribution of papers is remarkably similar, and a big change in distribution usually indicates that a different factor is at work in both cases." What sort of factor might be involved? He would like to figure out exactly what this something is, and unravel the background. There is surprisingly little difference in the underlying motivation behind cosmic ray research and academic data analysis.

He started to become interested in press releases and newspaper coverage of academic research when he noticed that groundbreaking physics results written up in the most authoritative scientific journals in the world were barely mentioned or not covered at all in ordinary newspapers. His research began with the obvious question of why this was so, or what factor might be involved?

His spirit of inquiry and sense of curiosity derives from the place he was born and raised, Wakayama prefecture on the Kii Peninsula in the Kansai region. Coming from Wakayama, he has a special affinity for rocks and minerals and mining and clear dark skies and bright stars. In college he was much taken with astronomy, and wondered about the structure of stars as he took photos of nebula and the Milky Way. It seems perfectly natural that he aspired to become a researcher, and NII was the perfect setting to satisfy that ambition. "Statistics demands well-ordered, precise data. Raw data contains a great deal of noise, and the effort to produce clean data can be extremely arduous, but I am happy to report that NII has a vast amount of reliable and trustworthy data."

The study of research trends does not contribute to the development of new products or directly serve the needs of society at large. But it is nevertheless important. Exploring the ways in which people become aware of the importance and implications of research makes a valuable contribution to the research enterprise as a whole. Driven by his characteristic curiosity and inquiring mind, he is quite prepared to work behind the scenes to serve these needs of society.

Close-Up on Researchers

Responding to the needs of the society: the future of higher education in the digital age

Information and Society Research Division

Associate Professor Miho Funamori

Received a Master of Science (M.Sc.) at the Department of Earth and Planetary Science, School of Science, the University of Tokyo Graduate School of Science. Took up a job as a researcher at Mitsubishi Research Institute in 1993. Served as a researcher at the Office for International Cooperation, International Affairs Division, Ministry of Education, Culture, Sports, Science and Technology, and became Associate Professor at the Center for Study of International Development Strategies, National Graduate Institute for Policy Studies. Served as an Associate Professor at the central administration of the University of Tokyo until taking up her present position in April 2016. At the University of Tokyo, she served as an institutional researcher in the Planning Office of the Division of International Relations, Evaluation Support Office, and Educational Planning Office. She played a key role in drafting the “The Internationalization of Todai 2010-2020: Initiatives and Targets.” She investigated the collaborative learning and Massive Open Online Courses (MOOCs) trend for the university's comprehensive educational reform. As an authority on university management, her "Thorough Analysis of School Basic Survey" is widely read amongst higher education researchers. Now at NII, she follows the latest developments in Open Science and research data management.

Miho Funamori is a pioneer of university institutional research (IR) in Japan. As the first institutional researcher at the University of Tokyo, she supported the decision making of the administration through gathering information on the world’s higher education latest trends and analyzing that information to draft the strategies of the university. Now at the National Institute of Informatics (NII), she is envisioning the future of higher education in the digital age and advises on the scholarly communication services NII is providing.

The digital age, sometimes also called the Fourth Industrial Revolution, is said to fundamentally change the human society by unleashing the time and space constraints of information distribution and by enabling automatic information linkages and data analysis. However, such digitization also incurs the danger of over-standardization. Nowadays, the quantitative indices such as the publication and citation number control the researcher’s evaluation rather than qualitative assessment. On the other hand side, careful data analysis also can extract the characteristics of the phenomena. She believes that “university’s strategies need to be based on and extrapolate the individual university’s characteristics.” Based on this idea, she is working on the idea of Institutional Research Support System for Japanese Universities (IRSSJU) which will extract and visualize the characteristics of the individual Japanese universities.

"Part of the appeal of working at NII is that you can transform your idea into practice."

She grew up in Germany in her childhood. Growing up with parents who loved music, she studied violin and piano from a young age, and it was always assumed that one day she would become a musician. She won music competitions and showed talent, but doubts set in just before she took the entrance exams for a music school. "I was not sure anymore if I liked making music or if I just enjoyed the praises I received." After careful deliberation, she decided she would attend a regular university.

At university, she majored in earth and planetary physics and sought to unravel the mystery of the geomagnetic reversals which occur every several hundred thousand years. She worked on the idea that the glacial – interglacial period would trigger the geomagnetic reversals. This idea was praised in the academic community. Still, the truth will never be unveiled in her life time as the next geomagnetic reversal would only occur after another several hundred thousand years. She decided she wanted to do something more tangible meeting the needs of the society and took a job with a private think tank. From there, she was seconded to MEXT (the Ministry of Education, Culture, Sports, Science and Technology) and became involved in university management problem-solving. Part of her work in university institutional research became more than 1,200 pages reports such as "Internationalization of the World's Leading Universities" and a "White Paper on Internationalization of Todai."

“Aside from eating and sleeping, virtually all of my time today is taken up with work.” She continues to play the violin to be relaxed. She also works tirelessly to arrange concerts for her great violin teacher Hirokazu Hasegawa who brings the mellow tones of his genuine Gasparo da Salò violin (fecit anno 1600) to the greatest possible audiences. She desires to devote most of her energy for the benefit of others.

Research

Promoting Comprehensive Informatics Research

Informatics is a new academic discipline concerning all aspects of society, including economics and culture. The National Institute of Informatics (NII) engages in research from the perspective of creating future value through informatics, generating innovation through collaboration between industry, government, and academia, and promoting international research and operation. NII also promotes integration with a wide variety of other academic disciplines, including information and communication engineering, computer science, and other fields of science and engineering, as well as the humanities, social sciences, and life sciences.

NII advances research in the wide-ranging discipline of informatics around four core research divisions, which are the Principles of Informatics Research Division, Information Systems Architecture Science Research Division, Digital Content and Media Sciences Research Division, and Information and Society Research Division. NII also establishes research centers that give particular attention to specific fields of research to overcome the bounds of research divisions and respond to changes in society. In FY2017, we established the new Open Science Infrastructure Research Center, working to build and operate ICT infrastructure supporting Open Science activities in universities and other research facilities. This brings the number of research centers set up by NII to thirteen.

NII is also advancing several large scale projects aimed at making contributions to society, including research on quantum artificial brains connected using quantum networks, development of high-speed algorithm, construction of software and tools to support manufacturing technologies, and creation of next generation information infrastructure.

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 applied in its particular area.

Principles of Informatics Research Division

Senior Researcher: Takeaki Uno

Explores new principles and theories relevant to informatics, including algorithms and complexity theory, artificial intelligence, robotics, and quantum computing, and conducts 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: Zhenjiang Hu

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: Isao Echizen

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, sharing economy, 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 13 research centers, building a system that enables focused research in specific fields with collaboration across fields.

Services and Operations

Research and Development Center for Academic Networks http://www.nii.ac.jp/nwcenter/

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 850 universities and research institutes in Japan.

Director: Shigeo Urushidani, Professor, Information Systems Architecture Science Research Division

Center for Global Research in Advanced Software Science and Engineering

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 Deputy Director General/Professor, Information Systems Architecture Science Research

Center for Cloud Research and Development

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

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, NII Deputy Director General/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

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 (est. Apr. 2017)

This center conducts R&D on infrastructure to manage, publish and search research data based on international collaboration, and promotes its use together with universities and research facilities in Japan, to promote Open Science, a paradigm shift in research styles.

Director: Kazutsuna Yamaji, Associate Professor, Digital Content and Media Sciences Research Division

Big Research Projects

Global Research Center for Quantum Information Science

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 Big Data Mathematics

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, 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 the cyber world.

Director: Jun Adachi, NII Deputy Director General/Professor, Digital Content and Media Sciences Research Division

Industry–Academia Collaborations

Research Center for Financial Smart Data

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

Cognitive Innovation Center

This center strives to generate innovations to tie state-of-the-art cognitive technologies incorporating artificial intelligence techniques to new businesses and services in society and industry. It also works at raising awareness to promote social implementation of such technology.

Director: Mitsuru Ishizuka, Project Professor, NII

List of Researchers

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: Developing algorithms to solve least squares problems using iterative methods. In test computations, results were shown to be found in dramatically fewer iterations than earlier iterative methods. Beyond mathematical interest, these results have applications in engineering as well.

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

Associate Professor:
Makoto Kanazawa
Ph.D.

Specialties: Lambda calculus and formal grammar; Logical semantics of natural language and implementations
Research themes: Mathematical treatment of human languages. Abstract formulation of problems humans face when acquiring and using language, and by presenting effective algorithms, finding new language systems using mathematical methods.

Quantum Information

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.

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: Knowledge processing technology combining various types of information to discover useful knowledge within it. 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: Robots that can make appropriate decisions even with ambiguous information, such as the request "Can you hand me that thick book?" To realize this, we make robots accumulate various experiences, such as moving around in a building while avoiding obstacles.

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.

Associate Professor:
Nobutaka Ono
Ph.D. (Engineering)
Moved to Tokyo Metropolitan University in October 2017

Specialties: Blind signal separation; Microphone arrays; Acoustic signal processing
Research themes: Varied acoustic signal processing techniques, mainly using microphone array systems with multiple microphones for tasks including separating mixed sounds, noise suppression, estimating location of sound sources, estimating microphone locations, synchronizing asynchronous signals and scene recognition.

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.

List of Researchers

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 a 1/f law. Searching for possible overall control of the Internet by understanding this mechanism.

Associate Professor:
Megumi Kaneko
Ph.D. (Engineering)

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 NVF, 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 fast, 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 increase 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

Professor:
Zhenjiang Hu
Ph.D. (Engineering)

Specialties: Principles of programming: Functional programming and programming algebras; Software engineering: Dependable software construction and bidirectional model-driven software development; Parallel programming: Skeletal parallel programming and automatic parallelization
Research themes: Building a theory of program computation (operation) to facilitate efficient creation of highly reliable, safe programs. In collaboration with industry, our goal is to implement parallel programming able to simultaneously control multiple computers and make them cooperate with each other.

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

Assistant Professor:
Kazunori Sakamoto
Ph.D. (Engineering)

Specialties: Software testing; Source code analysis and transformation; Programming languages; Programming education
Research themes: AI technology for recommending optimum settings suited to psychological tendencies of students and developing a smartphone applet incorporating this technology to encourage learning behaviors. Increasing effects of learning promotion and establishing methods to decrease the number of people with learning impediments.

Associate Professor:
Kenji Tei
Ph.D. (Engineering)

Specialties: Software architecture; Self-adaptive systems; Models@run.time
Research themes: Supporting development of self-adapting software able to handle environmental change with flexibility. Using models at run time that are normally only used during development, such as model generation and verification technologies, to realize self-adaptation that is guaranteed to be correct.

Professor:
Shinichi Honiden
Ph.D. (Engineering)

Specialties: Agents; IoT; Software engineering
Research themes: For many years, self-adapting systems in which the software is able to reform itself autonomously in response to environmental change. Nurturing next generation software technologists through the Top SE education program.

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.

List of Researchers

Digital Content and Media Sciences Research Division

Foundations of Content Management

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

Specialties: Description and verification of functions and quality in the integration of Web and real world services; Description and verification of requirements and specifications in software development
Research themes: Pursuing next-generation software characteristics and technologies for software development, operation and advancement. Particular interest in modeling agreements such as specifications, contracts, laws and regulations, used by people and software itself during development and execution.

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:
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:
Yusuke Komiyama
Ph.D. (Agriculture)

Specialties: Open science; Research data management infrastructure; Semantic Web; Linked Data; Bioinformatics
Research themes: Consolidation of the open science platform for long-term storage and sharing of research data from universities and research facilities, as an urgent issue in the academic information field. Provision of a safe, convenient data management infrastructure service using SINET, Gakunin, the Cloud and other sources.

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.

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.

Text and Language Media

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.

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:
Jun Adachi
Ph.D. (Engineering)

Specialties: Information retrieval and integration of heterogeneous data; Modeling and implementation of high-performance information retrieval systems; Text mining
Research themes: Development of search technology to identify and extract useful and reliable knowledge and intelligence from within the chaotic sea of information. Implementation of search technology able to infer objectives and conditions of the user to find the information that they are really looking for.

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.

Associate Professor:
Yusuke Miyao
Ph.D. (Information Science and Technology)

Specialties: Syntactic parsing and semantic parsing; Information extraction; Information retrieval
Research themes: Natural language processing, focusing on syntactic analysis and its applications. To identify the complex structure, semantics and intelligence mechanisms in language requires breakthrough discoveries from statistical modeling. Also developing syntactic analyzers and applications.

Pattern Media

Associate 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.

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 dynamics to implement beautiful computer graphics. Producing new algorithms that can handle spray and swirls efficiently and building mathematical models for describing such natural phenomena with simple mathematical formulas. Particularly interested in visual and mathematical beauty.

Assistant Professor:
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.

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:
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.

Associate Professor:
Gene Cheung
Ph.D. (Science)

Specialties: 3D imaging; Graph signal processing; Sleep monitoring and analysis
Research themes: Optimization, design and development of free viewpoint television and related systems from a total process perspective. Developing the potential of TV and other movie and imaging systems with systems that excel at interactive compression and transmission.

Assistant 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.

List of Researchers

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)

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.

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.

Professor:
Seiji Yamada
Ph.D. (Engineering)

Specialties: 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: Multimedia analysis of videos, photographs, music and comments uploaded to the Web from users' devices. Finding and recommending content suitable for individuals' preferences. Mining social trends through participatory sensing.

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.

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:
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.

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.

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.

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.

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.

Professor:
Noriko Kando
Ph.D. (Bibliology/Informatics)

Specialties: Evaluation of information access technologies; Exploratory search and user interface; Cognitive research for exploratory search; Extracting attitudes and relations from text; Cross-lingual information access
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.

Science Information

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 processes and learning behavior data, and developing algorithms for adaptively scheduling learning and teaching. Contributing to realizing optimal personalized learning.

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.

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.

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.

Large-scale Project Involvement

JST ERATO

Japan Science and Technology Agency (JST), Exploratory Research for Advanced Technology (ERATO) project. The objectives of this program are to promote seminal and exploratory research through excellent leaders, to produce scientific and technical innovation that will bring reform to society and the economy, and to produce the seeds of innovative technologies based on new scientific knowledge.

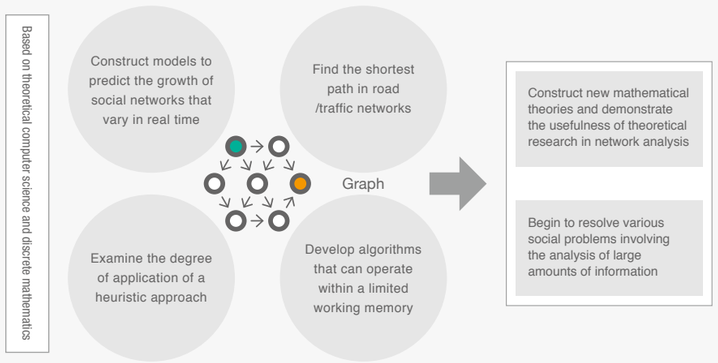
● KAWARABAYASHI Large Graph Project

Research Director: Professor Ken-ichi Kawarabayashi, Principles of Informatics Research Division

Large networks, such as the Internet web structure, and social network services like Facebook and Twitter, are used by more than a billion people every day, and the volume of information is growing faster than the hardware is evolving. There is therefore an urgent need to develop algorithms capable of analyzing at practical speeds the vast amount of information that swirls around in ever-expanding large networks.

The objective of this project is to build the mathematical infrastructure to begin to unravel solutions to various social issues accompanying analysis of this vast amount of information. Considering ever-expanding networks as large graphs (data structures) consisting of nodes connected by edges, the project makes use of advanced mathematical theories in areas such as theoretical computer science, discrete mathematics, optimization, and machine learning, to develop high-speed algorithms useful for solving various problems, while also adapting to the rapidly increasing amount of information. This research activity brings the usefulness of fundamental research in mathematics to the attention of society and the project gathers together excellent young researchers from all over Japan, developing them into personnel with the basic skills to allow them to play active roles in various fields. As part of this, on-going combined "Informatics Winter Festa" workshops are held with the approval of several large projects in fundamental informatics fields, providing a venue where researchers can motivate and encourage each another.

Gathering of the leaders of the large informatics research projects (Dec. 2016 Informatics Winter Festa Episode 2. Prof. Kawarabayashi is fourth from the left in the photograph).



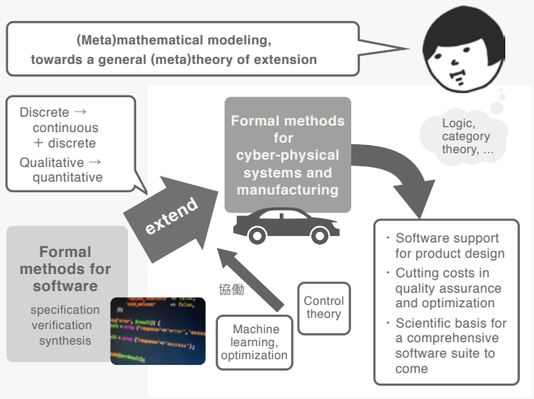
● HASUO Metamathematics for Systems Design Project

Research Director: Associate Professor Ichiro Hasuo, Information Systems Architecture Science Research Division

ICT is changing the landscape of manufacturing with pervasive automation and computer support in design and production processes. Our project aims to leverage techniques from software science—specifically the body of mathematical techniques called formal methods—in manufacturing, eventually leading to software tools that support various stages of design processes.

In doing so we face the challenge of extending formal methods so that they encompass features of industry products like continuous dynamics and quantitative concerns (probability, time, etc.). We take a unique meta-theoretical approach in which we formulate and study, in mathematically rigorous terms, the process of extending (object-level theories of) formal methods to new areas of concern. This way we achieve rapid and comprehensive extension of formal methods from software to industry products. Our results will be applied to real-world problems, especially in the automotive industry.

Associate Professor Hasuo (front row center) and project members (April, 2017)



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.

● Advanced Core Technologies for Big Data Integration

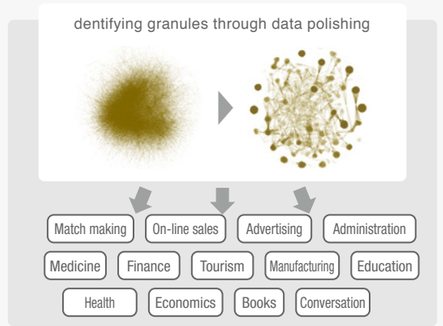
Research Supervisor: Masaru Kitsuregawa, NII Director General, Research Area Advisors: Specially Appointed Professor Mitsuru Ishizuka

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, and Domain Advisor, Specially Appointed Professor Mitsuru Ishizuka.

Data Particlization for Next Generation Data Mining

Research Director: Professor Takeaki Uno, 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.

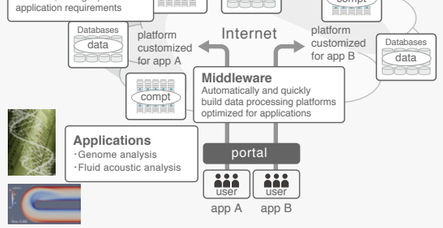


Research on Application-centric overlay cloud technology utilizing inter-cloud

Research Director: Professor Kento Aida, 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.

Application-centric overlay cloud technology utilizing inter-cloud

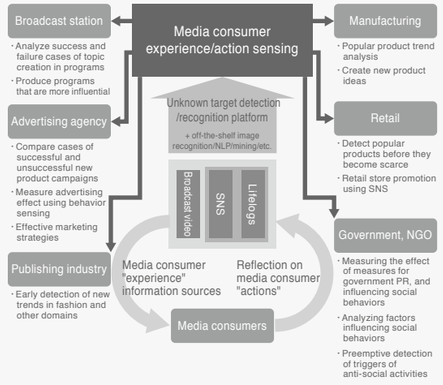


● Development and Integration of Artificial Intelligence Technologies for Innovation Acceleration

Experience and Action Sensing of Media Consumers based on Unknown Target Retrieval and Recognition Framework

Research Director: Shin'ich Satoh, Professor, Digital Content and Media Sciences Research Division

The ways that people access information have changed in recent years, with SNS such as Twitter and Instagram becoming major sources of information in addition to broadcast television and other conventional media. These are being used by an increasing number of people when forming opinions and purchasing behavior. Many people are also recording and publishing their own activities using SNS and lifelogs. It has thus become possible to observe the experience and behavior of these media consumers through appropriate analysis of media such as broadcast video, SNS, and lifelogs. This research will first establish an unknown target retrieval and recognition platform to detect significant changes and major trends in dynamically changing media such as broadcast television, SNS, and lifelogs. Based on the technology suite, we will build a framework to sense how people obtain information from broadcast videos and SNS and how people react following the obtained information. The framework will enable early detection of new trends such as brand new products, analysis of effective marketing strategies raising buying behavior, analysis of mechanism driving people for humanitarian behavior, and so on.



Large-scale Project Involvement

ImPACT

Impulsing Paradigm Change through Disruptive Technologies Program (ImPACT) is a program from the Cabinet Office Council for Science, Technology and Innovation (CSTI). It promotes high-risk, high-impact, challenging R&D that will produce revolutionary scientific and technological innovation that, if realized, will bring major changes to industry and society.

● Advanced Information Society Infrastructure Linking Quantum Artificial Brains in Quantum Network

Program Manager: NII Professor Emeritus Yoshihisa Yamamoto

Project with NII researchers participating: Quantum Artificial Brains

Project Leader: Professor Kenichi Kawarabayashi, Principles of Informatics Research Division

Influential enterprises around the world are actively working to develop so called "non-Neumann" computers which specialize in solving combinatorial optimization problems in the NP-Hard and NP-Complete classes, which are difficult to solve for conventional computers. Neural computers and quantum computers are at the center of these R&D efforts. The goal of this program is to develop a quantum computer specialized to solve these combinatorial optimization problems, and it is advancing research on a quantum artificial brain connected to a quantum network (a quantum neural network).
NII is developing a quantum model that simulates the hardware of a quantum neural network and developing algorithms for mapping real problems onto it. The hardware is being developed by NTT and Stanford University, and NII is collaborating with them. In FY2016, collaborating with the groups from NTT and Stanford, we demonstrated the first quantum neural network able to solve the NP Hard Ising problem, and two papers describing the results of this research appeared in theAmerican scientific journal "Science." The development state of this quantum computer as of April, 2017, has shown that this approach can be applied to large-scale systems. We are considering implementing a cloud service by which we will be able to make the machine we develop available to researchers around the world through the Internet.

Comparing performance of three quantum computers (as of April 2017)

	Gate type	Annealing type	Neural network type
R&D Institutions	IBM, Google, Microsoft, Intel	D-WAVE, MIT, MIT Lincoln Laboratory	ImPACT (NII, NTT, Stanford)
Hardware	Superconducting quantum circuit	Superconducting quantum circuit	Optical parametric oscillator
Memory	Spin-1/2 particle (quantum bit)	Spin-1/2 particle (quantum bit)	Coherent light wave (quantum oscillator)
Operating principle	Quantum (multi-particle) interference	Quantum (adiabatic) tunneling	Quantum (OPO) phase transition
Operating environment	10 mK,Ultra-high vacuum	10 mK, Ultra-high vacuum	Room temperature,atmospheric pressure
Power consumption	-	25 kW	1 kW
System scale	5-9 bits, 4-8 connections	2000 bits, 6000 connections	2000 bits 4 x 10^6 connections

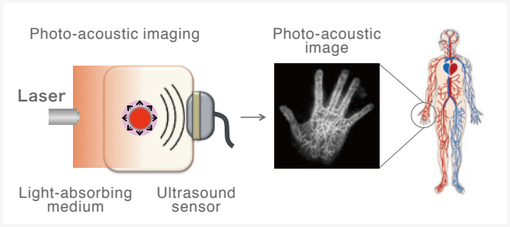
Program members. Front-row center is Emeritus Professor Yamamoto

● Innovative Visualization Technology to Lead to Creation of a New Growth Industry

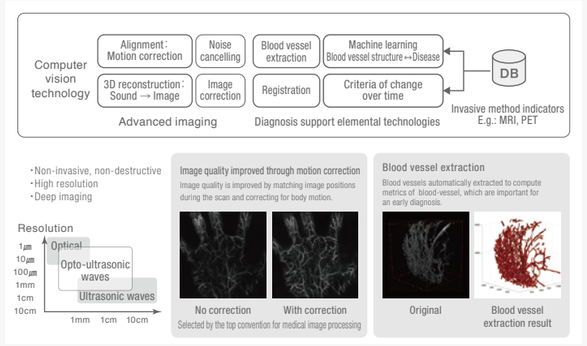
Project with NII researchers participating: Demonstration of value

Participating NII researcher: Professor Imari Sato, Digital Content and Media Sciences Research Division

With the arrival of super-aging society, there is increasing demand for technical support to enable people to continue working while preserving their health and beauty. NII has participated in ImPACT to realize an early diagnosis of disease, and inspection of the internal structure, with advances in photo-acoustic imaging, which performs real-time 3D visualization of changes in properties and functions inside human bodies and substances, non-invasively and non-destructively.
The photo-acoustic system is a promising new technology that integrates state-of-the-art laser and ultrasound technologies, where 3D structures of objects can be reconstructed by sensing emitted ultrasound from the objects that absorb near-infrared irradiation. It enables to image the state of the human body and objects whose insides are not visible, non-invasively and non-destructively.
In this research, we develop computer-vision technologies to obtain clear images and extract bio-image features to support a diagnosis. For example, we proposed a registration method to generate high-quality 3D volumes in which vessels become clearly visible by aligning shot-volumes that are misaligned by body motions. We are also developing a technology that automatically models vascular structures, which helps in understanding blood vessel conditions strongly related to illnesses.



Opto-ultrasonic-wave imaging



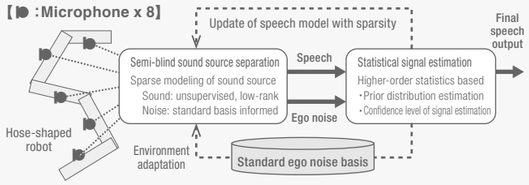
Visualization and image analysis for medical imaging

● Tough robotics challenge

Project with NII researchers participating: Increasing precision of blind sound source separation in flexible robot acoustic sensing

Participating NII researcher: Associate Professor Nobutaka Ono, Principles of Informatics Research Division

The goal of the tough robotics challenge (TRC) is to realize "tough" robots that will persevere and be effective in disasters and other extreme environments by making current robots more robust and flexible. This research is being conducted as an extreme acoustics project of TRC in collaboration with Professor Hiroshi Saruwatari (University of Tokyo) and Professor Shoji Makino (University of Tsukuba). Considering a specific situation in which a flexible hose robot finds disaster victims buried in debris, we aim to establish extreme acoustic sensing technology that will enable their faint calls for help to be detected by suppressing ego noise caused by the robot's own movements and background noise by using the robot's multi-channel microphones.



Various research challenges, from basic to applied research

Grants-in-Aid for Scientific Research (Kakenhi)

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 (FY2016)

	No. of Applications Accepted	Amount (Thousands of yen)
Principal Investigator	93	353,591
Co-Investigator (Other institution > NII)	48	72,276

SIP

The Cross-ministerial Strategic Innovation Promotion Program (SIP) is a national project for science, technology and innovation (ST&I), spearheaded by the Council for Science, Technology and Innovation as it excercises a leading role in promoting ST&I beyond the framework of government ministries and traditional disciplines.

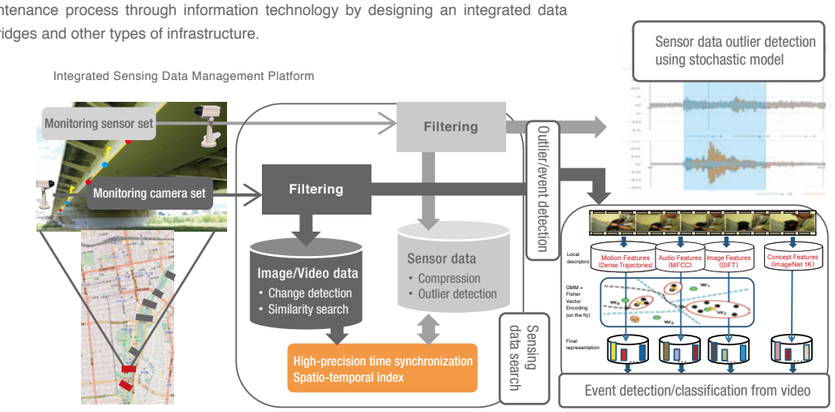
● Infrastructure Maintenance, Renovation and Management

Research Topic for NII: R&D of Integrated Data Management Platform for Civil Infrastructure Sensing

Principal Investigator: Jun Adachi, Deputy Director General/Professor, Digital Content and Media Sciences Research Division

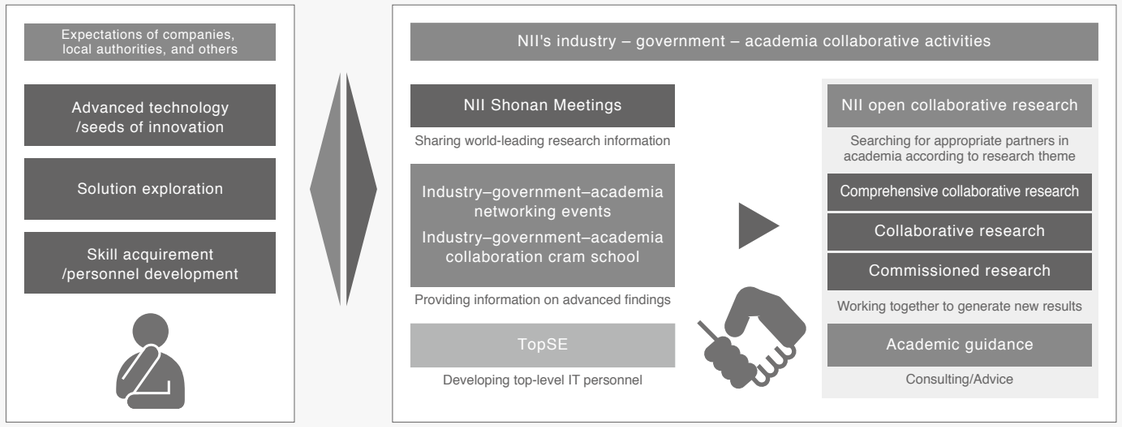
NII has been working in collaboration with universities and industry to conduct researches on Cyber-Physical Systems (CPS) on a societal scale since 2011. CPS link and integrate physical systems functioning in the real world with information (cyber) systems that collect and analyze data obtained from the real world through various sensors. Based on the analysis, a decision will be made to resolve various issues in the real world. By this active cycle of data collection, analysis and intelligent feedback, CPS is expected to contribute to create new value as well as to the efficiency of social systems. With this CPS concept, NII has been working since 2014 in a SIP program titled "Infrastructure Maintenance, Renovation and Management." Our aim is to improve existing infrastructure maintenance process through information technology by designing an integrated data management platform for sensing bridges and other types of infrastructure.

Integrated Sensing Data Management Platform



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

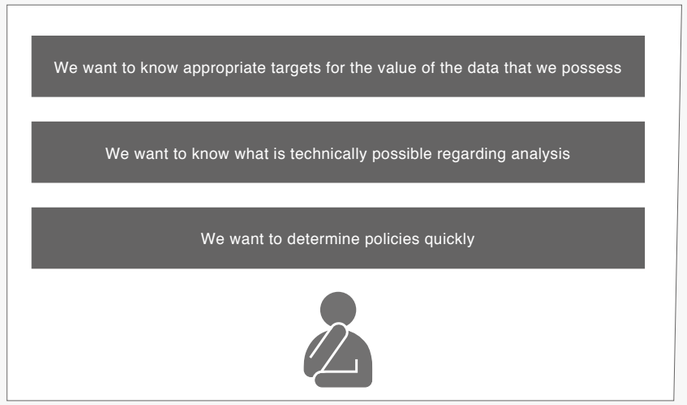
NII conducts research in the field of informatics and engages in information infrastructure projects with the aim of furthering practical R&D that will help solve various problems facing society. Collaborations between industry, government, and academia are vital in achieving these goals. In order to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



Action program for industry–government–academia collaboration

Information on Academic Guidance (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.



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

Examples of Academic Guidance

Case 1

Professor Seiji Yamada (NII Digital Content and Media Sciences Research Division) × Advertising planning /production company

Advice on setting development policy to expand services through artificial intelligence, as a plan for initiating content business projects.

Case 2

Professor Shin'ichi Satoh (NII Digital Content and Media Sciences Research Division) × IT system development enterprise

Advice on technical issues with object recognition systems using video.

Contact Information for Academic Guidance

We will ask you about the business issues on which you seek guidance, or discuss researchers whose research subjects relate to those issues, and coordinate the consulting. For details, please direct inquiries to the address below.

National Institute of Informatics, Planning Division,
Office for Social Collaboration, Collaboration Support Team **E-mail:kaken@nii.ac.jp**

Collaborative Research Promotion

NII is actively conducting research in collaboration with private facilities and utilizing external funding 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 academic fields.

Various joint research performed with enterprises of different types

Joint research with private facilities

http://www.nii.ac.jp/research/collaboration/

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 **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.

② **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 our research costs up to a certain limit.

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

Projects performed (FY2016)

	No. of projects accepted	Funding received (thousands of yen)
FY2014	49	108,391
FY2015	53	109,525
FY2016	54	141,939

Taking on engineers and researchers from private institutions and other external bodies, and providing graduate level instruction

Cooperative researchers

http://www.nii.ac.jp/research/kenkyou/jyutakukenkyuin/

We take on engineers and researchers currently working for private institutions and other external bodies, providing that they have graduated from university or are deemed to have reached an equivalent academic level. Essential overheads are covered under our research costs up to a certain limit.
Research periods up to one year, but can be extended to the following fiscal year and beyond if deemed necessary.

Projects performed (FY2016)

	No. of projects accepted
FY2014	46
FY2015	39
FY2016	39

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

NII open collaborative research

http://www.nii.ac.jp/research/collaboration/

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 (FY2016)

	No. of proposals accepted
Strategic research applications	22
Research planning meeting applications	13
Open subject applications	36
Total	71

International Exchange (Contributing to Internationalization of Informatics)

Overview

NII established its Global Liaison Office (GLO) in order to actively promote international exchange activities with prominent overseas institutes. The GLO concludes International Exchange Agreements (MOU) and implements a variety of measures to promote the exchange of researchers and students, including the NII International Internship Program and MOU Grants/Non-MOU Grants.

Research exchange with universities and institutions

(FY 2016)

NII International Internship Program	125 students from 23 countries
MOU Grants/Non-MOU Grants	5 people to 5 countries
	39 people from 18 countries

Acceptance of foreign researchers

(as of April 1, 2017)

Program		No. of researchers
Japan Society for the Promotion of Science (JSPS)	Postdoctoral fellowships for foreign researchers	2
	Postdoctoral fellowships for foreign researchers (Short-term; western countries)	2
	Invitation fellowships for researcher in Japan	1
Other researchers (visiting researchers and full-time visiting professors)		8

International Exchange Agreements (MOU)

(as of October 1, 2017)

Country / Region	Affiliation	
People's Republic of China	School of Information Science and Technology, Department of Automation, Tsinghua University	●
	Institute of Computational Mathematics and Scientific/Engineering Computing, Academy of Mathematics and System Sciences, Chinese Academy of Sciences	●
	Tongji University	●
	School of Electronics Engineering and Computer Science, Peking University	●
	The Hong Kong University of Science and Technology (HKUST)	●
	The School of Electronic Information and Electrical Engineering of Shanghai Jiao Tong University	●
	University of Science and Technology of China (USTC)	●
	Institute of Computing Technology, Chinese Academy of Sciences	●
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	●
Socialist Republic of 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	●
Republic of Korea	Department of Computer Science and Engineering, Seoul National University	●
	Korea Institute of Science and Technology Information (KISTI)	●
	Korea Education & Research Information Service (KERIS)	◎
Republic of Singapore	School of Computing, National University of Singapore (NUS)	●
	INSTITUTE FOR INFOCOMM RESEARCH	●
Commonwealth of Australia	Data61	●
	The UNIVERSITY OF QUEENSLAND (UQ)	●
	The Faculty of Engineering and Information Technologies,The University of Sydney	●
	Department of Computing & Information Systems, Melbourne School of Engineering, The University of Melbourne	●
United States of America	University of Michigan-Dearborn, College of Engineering and Computer Science	●
	College of Engineering, University of Washington, Seattle	●
	New Jersey Institute of Technology	●
	International Computer Science Institute	●
	University of Southern California	●
	North American Coordinating Council on Japanese Library Resources (NCC)	◎
	The New Venture Fund (NVF) on behalf of the Scholarly Publishing & Academic Resources Coalition (SPARC)	◎
Canada	Faculty of Mathematics, University of Waterloo	●
	Faculty of Science, Department of Computing Science, the Alberta Machine Intelligence Institute, University of Alberta (Amii)	●
	School of Computer Science, McGill University	●
	Simon Fraser University	●
	Polytechnique Montréal	●
Brazil	Pontifical Catholic University of Campinas	●
Republic of Argentina	The Faculty of Exact and Natural Sciences of Buenos Aires University	●
Ireland	Lero - the Irish Software Research Centre (The University of Limerick)	●
French Republic	University of Nantes (Atlanstic 2020)	●
	Institut National de Recherche en Informatique et en Automatique (INRIA)	●
	Institut National Polytechnique de Grenoble	●
	Université Grenoble Alpes (Université Joseph Fourier-Grenoble 1)	●
	Pierre and Marie Curie University (UPMC), Computer Science Laboratory of Paris 6(LIP6)	●
	Institut INP-ENSEEIHT	●
	National Center for Scientific Research (CNRS)	●
	Université Toulouse III - Paul Sabatier	●
	Claude Bernard University Lyon 1	●
	Université Paris Sud	●
	The Electronics and Information Technology Laboratory (LETI)	●
French Republic	University of Nice Sophia Antipolis	●
	Centre de Recherche en Informatique de Lens (CRIL)	●
	The Blaise Pascal University of Clermont-Ferrand (School of Engineering ISIMA, Faculty of Sciences, LIMOS Laboratory)	●
	The French National Audiovisual Institute (INA)	●
United Kingdom of Great Britain and Northern Ireland	Department of Computer Science, Faculty of Engineering Science, University College London	●
	Faculty of Mathematics and Computing, The Open University	●
	Department of Computer Science, University of Bristol	●
	University of Bath	●
	Department of Computing at Imperial College London	●
	The Computing Laboratory, 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 (BDI)	●
Federal Republic of Germany	Faculty of Applied Informatics, 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 Mathmatics, 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 Universitaet Braunschweig (TU Braunschweig)	●
	Technische Universität München (TUM)	●
	Georg-August-Universität Göttingen	●
	The Information Science Group in the 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	●
	Hochschulbibliothekszentrum des Landes Nordrhein-Westfalen	◎
	German National Library of Science and Technology (TIB)	◎
	German National Library of Medicine (ZB MED)	◎
Republic of Austria	Vienna University of Technology	●
Italian Republic	Dipartimento di Informatica, Università degli Studi di Torino	●
	Politecnico di Milano, Dipartimento di Elettronica, Informazione e Bioingegneria	●
	UNIVERSTÀ DEGLI STUDI DI FERRARA (UNIFE)	●
	Dipartimento di Informatica - Scienza e Ingegneria (DISI), Università di Bologna	●
Swiss Confederation	Institute of Electrical Engineering in Ecole Polytechnique Federale de Lausanne	●
Finland	Aalto University, School of Electrical Engineering	●
The Kingdom of 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	●
Nederland	Faculty of Civil Engineering and Geosciences of Delft University of Technology (TU Delft)	●
Portuguese republic	Instituto de Engenharia de Sistemas e Computadores, Investigação e Desenvolvimento em Lisboa (INESC-ID)	●
	INESC Technology and Science (INESC TEC)	●
Arab Republic of Egypt	Egypt Japan University of Science and Technology (E-JUST)	●
EU	GÉANT	◎

● Research cooperation: 98 Institutes ◎ Development and operational cooperation: 7 Institutes

International Exchange (Contributing to Internationalization of Informatics)

NII Shonan Meetings

http://www.nii.ac.jp/shonan/

In February 2011, NII launched the NII Shonan Meetings, the first Dagstuhl-style seminars* held in Asia. The purpose of the NII Shonan Meetings is to attack various challenges in the field of informatics by assembling the very best researchers from around the world to engage in intensive discussions in a retreat-style atmosphere. The meeting is hosted in collaboration with Kanagawa Prefecture based on a partnership agreement. The meeting's venue, the Shonan Village Center, offers an environment in which participants can focus on research activities in a setting that provides both spectacular natural beauty and easy access from Narita Airport.
Eighty-seven seminars have been held to data, and August 2014 saw the launch of the NII Shonan School, intended primarily for top-level students and young researchers in the field of informatics.

* Dagstuhl Seminar: A key seminar series in the field of informatics, held roughly every week in Dagstuhl, Germany. The series is based on a structure whereby participants live in close quarters for one week for intensive discussions on various topics under a specified theme for each seminar.

Shonan Village Center, located in beautiful natural surroundings

NII Shonan School

NII Shonan School participants

■ Support system

The NII Shonan Meeting Administrative Office and Shonan Village Center staff handle various activities on behalf of the seminar management team, including dispatching invitations, providing information on lodging and accommodations, and preparing venues on meeting days. The program also includes various activities intended to promote interaction between participants, including hikes in nearby natural areas and historical walking tours of Kamakura.

The Recent Topics of the NII Shonan Meetings

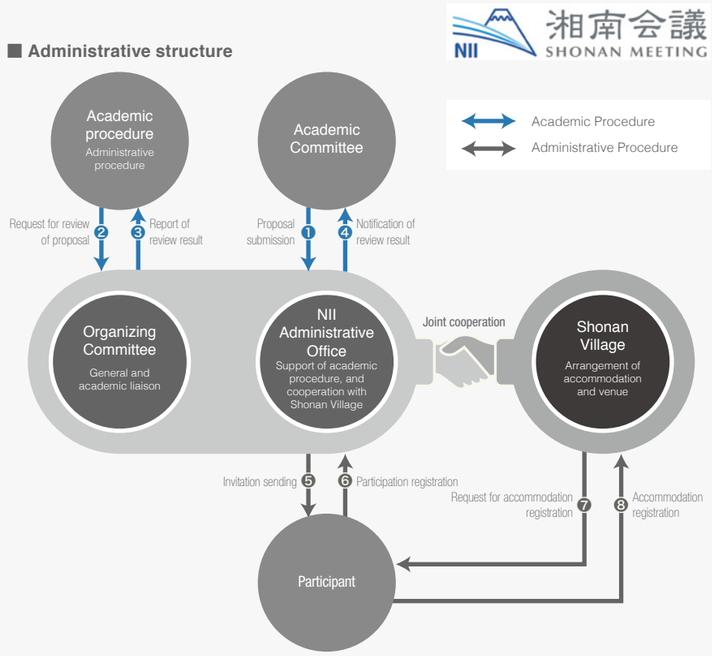
1. Current Trends in Combinatorial Optimization, April 11 - 14, 2016, 35 participants
2. Controlled Adaptation of Self-adaptive Systems (CASaS), April 25 - 28, 2016, 31 participants
3. Theory and Applications of Geometric Optimization, May 30 - June 2, 2016, 32 participants
4. Recent Advances in Randomized Numerical Linear Algebra, July 25 - 28, 2016, 23 participants
5. Dynamic Networks Visual Analytics: Approaches to facilitate visual analysis of complex and dynamic network data., August 1 - 4, 2016, 28 participants
6. Web-based Molecular Graphics, September 5 - 8, 2016, 28 participants
7. Bidirectional Transformations, September 26 - 29, 2016, 26 participants
8. Cognitive Development and Symbol Emergence in Humans and Robots, October 3 - 7, 2016, 20 participants
9. Perception in Augmented Reality, November 14 - 18, 2016, 31 participants
10. Implicit and Explicit Semantics Integration in Proof Based Developments of Discrete Systems, November 22 - 25, 2016, 30 participants
11. Algorithmics for Beyond Planar Graphs, November 28 - December 1, 2016, 26 participants
12. Microfluidic Biochips: Bridging Biochemistry with Computer Science and Engineering, February 27 - March 2, 2017, 19 participants
13. Mining Software Repositories: Accomplishments, Challenges and Future Trends, March 6 - 10, 2017, 29 participants
14. Computational Metabolomics, March 20 - 23, 2017, 27 participants

■ NII Shonan Meeting Memorial Lectures

In partnership with Kanagawa Prefecture and the Shonan Village Program Promotion Committee, and with assistance from Village Shonan, Inc., we have organized NII Shonan Meeting Memorial Lectures on six occasions to date as part of our NII Shonan Meeting outreach activities. We invite researchers with links to NII Shonan Meetings or NII itself to serve as guest speakers, delivering public lectures on the very latest research in the field of informatics.

NII Shonan Meeting Memorial Lectures

■ Administrative structure



Call for proposals

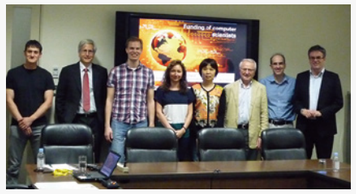
We welcome proposals throughout the year. There are three annual deadlines for submission: June 15, September 15, and December 15. Individuals submitting proposals will be notified as to whether their proposal has been accepted following a review by the Academic Committee.

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

Agreement with German Academic Exchange Service (DAAD)

http://glo.nii.ac.jp/

The special agreement between NII and German Academic Exchange Service (DAAD) allowing German postdoctoral researchers to conduct research under the guidance of NII faculty was reached in 2008.
Under the framework of the agreement, German postdoctoral researchers are able to stay at NII with support from DAAD for a minimum of three months (six months is recommended), up to a maximum of two years. During this time, they will carry out an independent project that has relevance to their mentor at NII. Postdoctoral researchers are also able to take in master's and doctoral students to help them carry out an independent project. NII is an inter-university research institute, and postdoctoral researchers can visit NII's partner universities and research institutions in Japan to strengthen their network in the country.



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

The Japanese-French Laboratory for Informatics (JFLI) was created in 2009 as a hub for collaboration on informatics research between Japan and France, comprising five organizations: the French National Center for Scientific Research (CNRS), Pierre and Marie Curie University (UPMC, Paris 6), The University of Tokyo (Graduate School of Information Science and Technology), NII, and Keio University. The laboratory became an International Joint Unit (UMI) operated by CNRS in 2012, and in October 2012, INRIA and University of Paris-Sud joined as new partners on the French side.
The partners' main research topics are (1) next-generation networks, (2) grid computing and high performance computing, (3) software, programming models, and formal methods, (4) virtual reality and multimedia, and (5) quantum computing.

Signing ceremony for the agreement establishing UMI-JFLI (December 2011)

Education Services for Developing Top-Level IT Personnel

TopSE

The GRACE Center offers the TopSE education program for working adults in order to develop world-class IT personnel capable of contributing to the field with specialized IT knowledge, the ability to put their knowledge into practice, and the foresight to deal with a changing society.
Built on the idea of “intellectual manufacturing education based on science”, TopSE is a practical education program for young engineers and researchers in industry, composed mainly of hands-on education to acquire advanced development techniques.


TopSE completion award

The educational program provides:

- The TopSE course, specialized to provide software engineering fundamental technologies and to acquire technologies that will survive into the future.
- The Advanced TopSE course, which trains in the latest advanced technologies that will lead industry, specialized in analyzing and solving real-world problems.
- Advanced programming seminars in topics such as IoT, artificial intelligence, and cloud technologies.

For practical education, (1) lecture and practice environments suitable for group work, (2) an education cloud, and (3) archived lecture videos are available.

Lecture/seminar environment suitable for group exercises

The lecture room is equipped with numerous projectors and a whiteboard wall for group exercises. There is also a terminal pre-installed with the software required for the lecture, as well as a server for recording and distributing lectures. Students can watch lecture videos at home or at work, and can remotely access the same terminal environment as the lecture room.


edubase Space classroom, equipped with the latest IT

Educational Cloud

Facilitates building cloud-based systems and study of operations using NII's cloud built using open source software.


Cloud server room

Lecture video distribution

TopSE lectures and software technology-related seminars are distributed using the "devshin-chi.jp" website. Lecture content, with synchronized lecture slides and lecture can be viewed free-of-charge by anyone.

Dev-shinchi website (http://devshinchi.jp)

TopSE aims to develop skills that can be used in international projects. Every year since FY2011, joint training sessions have been held with University College London (UCL). In the sixth instance held Oct. 31 to Nov. 4, 2016 in London, we provided project management and development leadership in a practical course attended by four UCL students, a five-person team and eight technologists from the sponsoring company, in which participants built an application on a virtual machine (VM) and automatically deployed it on Amazon Web Services (AWS).


Joint training with University College London


Skills development through practical courses

Service

Establishing Academic Information Infrastructure

As an inter-university research institute, NII is working with universities and research institutes to realize Science Information NETwork (SINET5), a communication network with high-speed performance that rivals that of networks worldwide. It is also developing cloud infrastructure and establishing academic information infrastructure to contribute to the advancement of open access and open science, as well as improving the sophistication of its utilization. In addition, NII is working to improve the early detection and response capabilities of all universities against cyberattacks of ever-growing sophistication while jointly training human resources in cybersecurity with universities and companies. It is striving to contribute to improving the international competitiveness of universities' education and research, accelerating leading-edge research, expanding academic research and increasing research efficiency, and strengthening functions in universities.

SINET5 (Science Information NETwork) : Providing Ultrahigh-Speed and Low Latency Throughout Japan

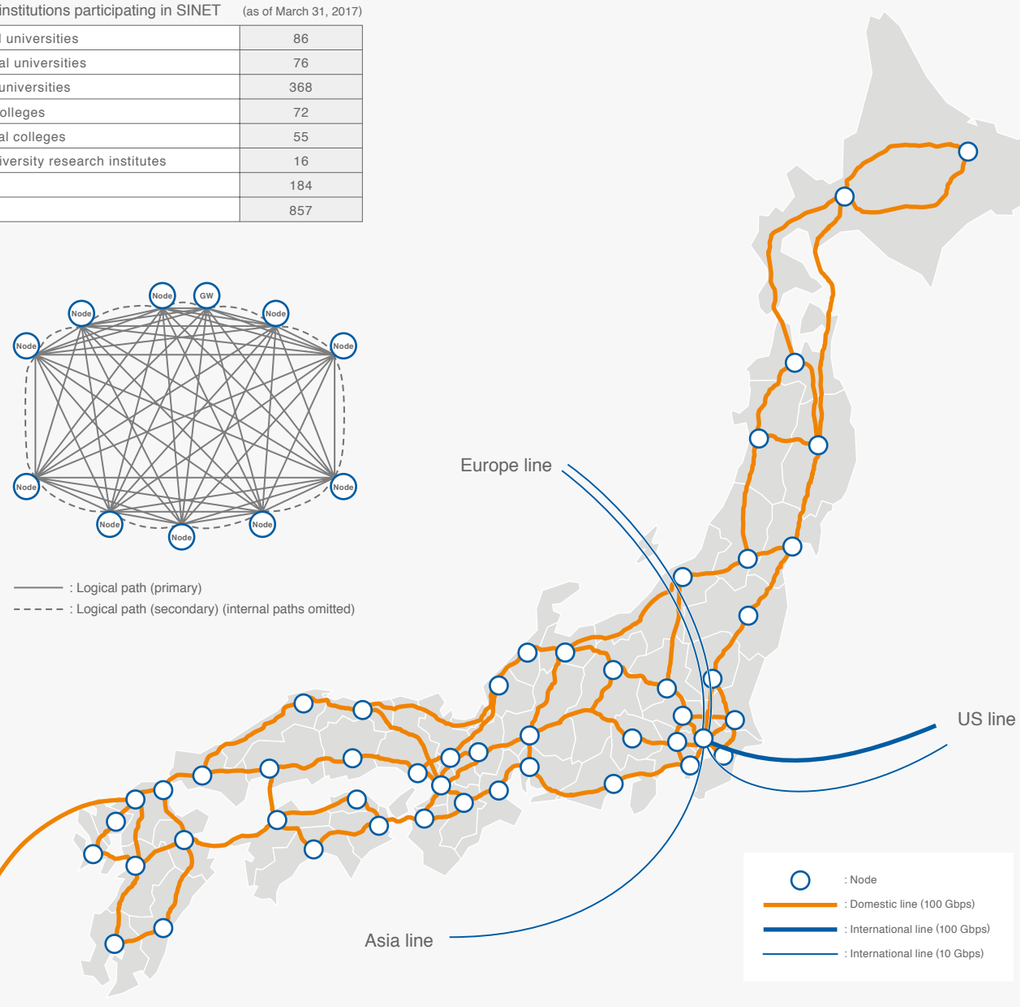
https://www.sinet.ad.jp/

100Gbps, full-mesh network opens up new possibilities

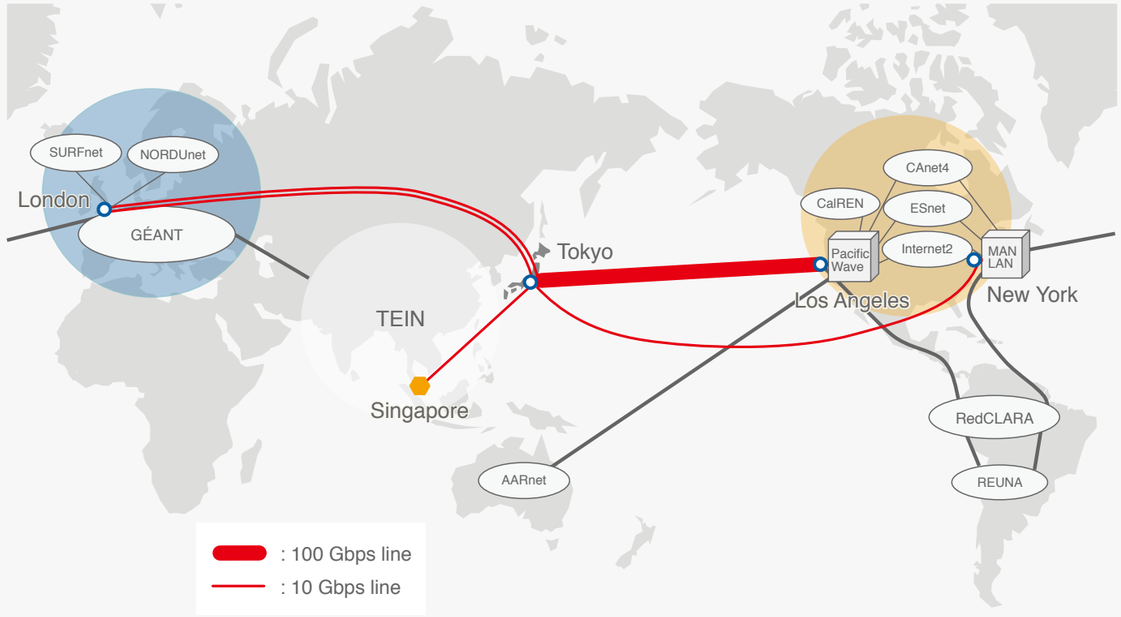
The Science Information NETwork (SINET) is an information communication network built and operated by NII as academic information infrastructure for universities and research institutions throughout Japan. The network has nodes (network connection points) nationwide, and it provides universities and research institutions with an advanced network that supports the formation of communities among the many people involved in education/research and encourages the circulation of a wide range of academic information.
SINET is also interconnected with many overseas research networks, such as Internet2 in the U.S. and GÉANT in Europe, to facilitate the circulation of research information across borders, which is essential in advanced international research projects.
The previous SINET4 was upgraded to SINET5, and full-scale operation of the upgraded network began in April 2016.
SINET5 connects all areas of Japan in an organic way at 100 Gbps, and provides more than 800 universities and research institutions with high-level academic information infrastructure, including cloud computing, security, and academic content.

Number of institutions participating in SINET (as of March 31, 2017)

National universities	86
Municipal universities	76
Private universities	368
Junior colleges	72
Technical colleges	55
Inter-university research institutes	16
Others	184
Total	857



Interconnection with overseas research networks



SINET5 Services

SINET5 provides ultrahigh-speed interfaces, such as 100GE and 40GE. Along with expanding the network service features, more user-focused services such as virtual university LAN and L2 on-demand are being added to the service menu to allow secure, advanced research environments to be built in universities and research institutions.

Service menu		
L3 service	Internet Access (IPv4 & IPv6)	○
	[Option] QoS	○
	[Option] Full Routes	○
	[Option] Multihoming	○
	[Option] IPv6 Tunnel	△
	IP Multicast (IPv4 & IPv6)	○
	[Option] QoS	○
	L3VPN	○
	[Option] QoS	○
	[Option] VXLAN Access [New]	Planned
L2 service	L2VPN／VPLS	○
	[Option] QoS	○
	[Option] VXLAN Access [New]	Planned
	L2 On-demand	○
	Virtual University LAN [New]	○
L1 service	Lambda Leased Line [New]	○

SINET5: Features and Services

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

Features of SINET5

① Maximum communication performance

SINET5 utilizes 100 Gbps technology throughout Japan. It is an ultrahigh-speed network capable of supporting Japan's academic pursuits and accommodating the nation's increasingly sophisticated supercomputers and large experimental facilities.

② Full international connectivity

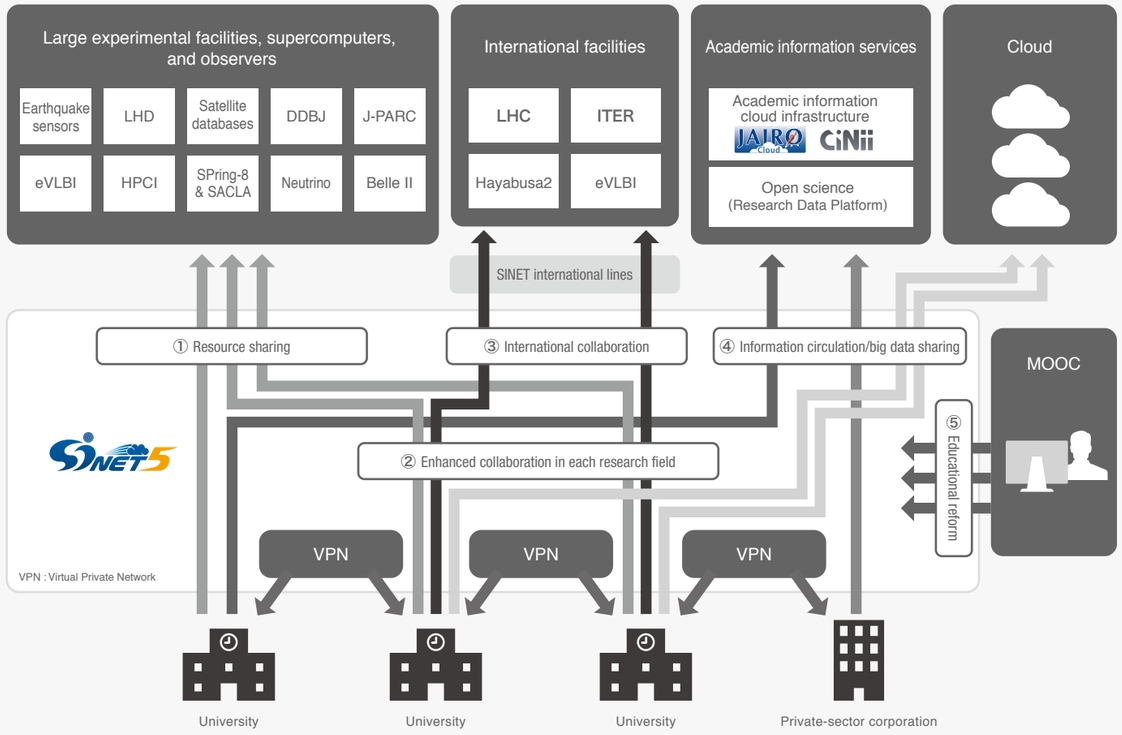
To accommodate Japan's increasing telecommunication needs and to enable the nation to maintain its prominence in international joint research projects, SINET5 not only enhances connections with the U.S. and Asia but newly establishes a high-speed international connection with Europe.

③ Cloud infrastructure provision

With the aim of addressing the urgent issue of offering a cloud usage environment, SINET5 provides and supports the development/application of a cloud infrastructure that takes full advantage of the characteristics of the ultrahigh-speed network.

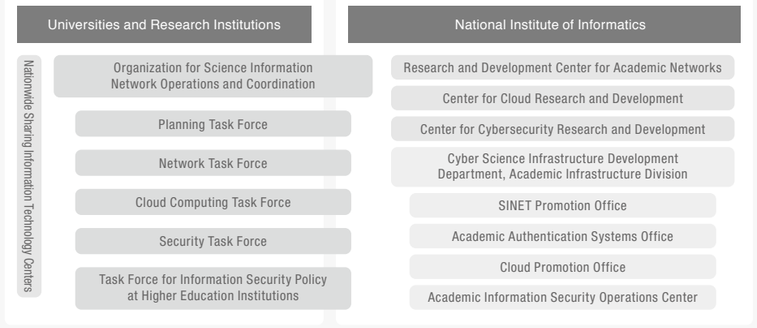
④ Secure, advanced research environment

As part of the provision of cloud infrastructure, security and authentication are enhanced for safe and convenient use of the cloud on SINET. SINET5 also establishes, in conjunction with advanced IT R&D, infrastructure for retrieving and utilizing academic information, which has traditionally been provided by universities and other institutions and which will rapidly increase and diversify in the future.



Organization for Science Network Operations and Coordination

The Science Information Network is operated by the Organization for Science Information Network Operations and Coordination, a joint organization between universities, research institutions, and NII. Three of NII's research and development centers and entities such as the IT centers of university and research institutions collaborate together under this organization to operate the network.



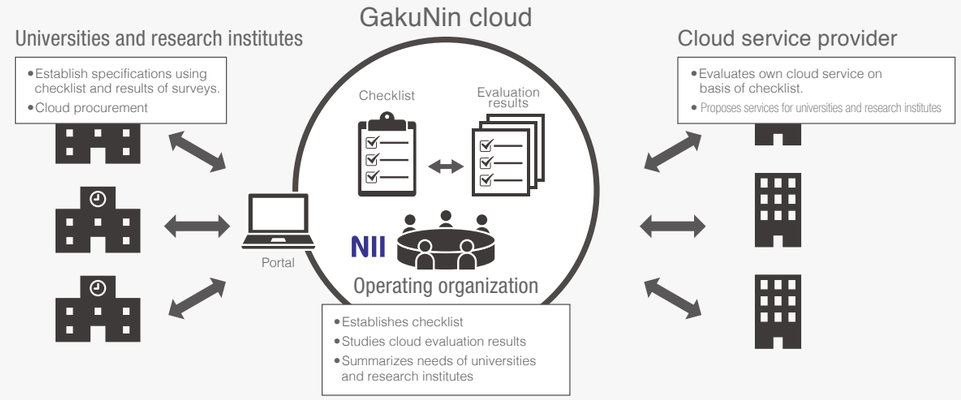
Support for Cloud Utilization by Universities and Research Institutes

With the aim of establishing an academic information infrastructure, NII supports cloud use for a variety of applications. This support includes a service to support adoption and procurement of cloud services (GakuNin cloud adoption support), services to support cloud use (SINET cloud connection service, Cloud gateway, and On-demand cloud configuration).

GakuNin Cloud Adoption Support

GakuNin Cloud http://cloud.gakunin.jp/

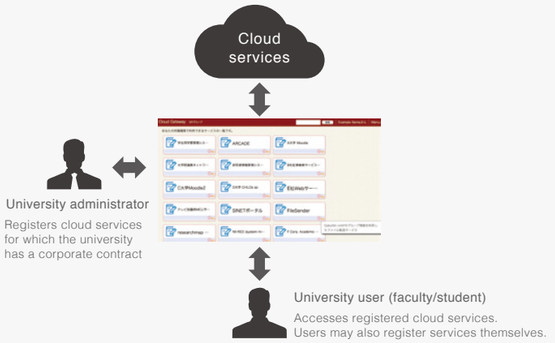
NII's GakuNin Cloud Adoption Support is a service for preparing, distributing, and sharing information about the required standards when a university or research institute adopts cloud services. Its main contribution is supporting cloud service adoption by organizing a checklist of items that must be addressed when a university or research institute introduces the cloud, analyzing the results of the responses by cloud service providers to this checklist, and providing the results to universities and research institutes. For universities and research institutes, they can not only understand the areas they should focus on when introducing the cloud, but also compare multiple cloud services using the same indicators. This makes it possible for them to choose the cloud service that meets their needs. In addition, NII conducts individual consultations of cloud adoption, hosts seminar series on cloud services for universities and research institutes, and provides cloud start-up guides.



Cloud Gateway

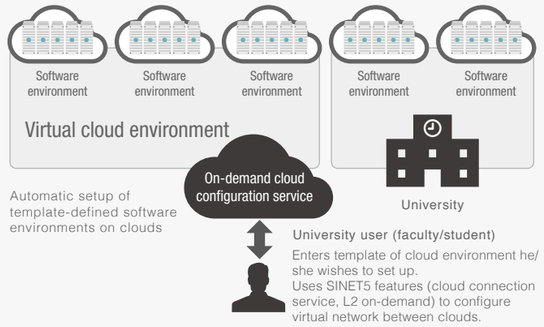
NII provides Cloud Gateway, a portal for one-stop access to cloud services needed for research and education. Users at universities and research institutes easily and quickly access the services contracted by the organizations by simply logging into Cloud Gateway.

Universities and research institutes can customize the displayed list of services to guide users to services provided through the contract and recommended services. Also, research groups can add specific services for members.



On-Demand Cloud Configuration (trial)

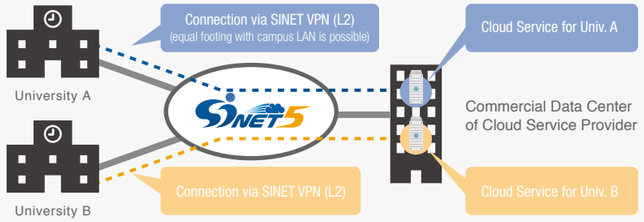
NII is preparing to provide functions to configure cloud environments that are connected to the high-speed and secure network provided by SINET5. These functions will make it easier for university and research institute users to install and configure software on clouds. In addition, an intercloud environment consisting of a cloud environment and multiple computers connected to SINET5 can be built on-demand and used for research, education, and IT system operation.



SINET Cloud Connection Service

NII has prepared a framework in which providers offering cloud services (e-mail, storage, remote access, etc.) can directly connect to SINET. SINET users can build private clouds and use these services.

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



Establishment of Authentication Infrastructure

Academic Access Management Federation in Japan "GakuNin"

https://www.gakunin.jp

Aiming to improve usability and to cut the operation cost of internal systems, many universities are now switching to cloud services. The Academic Access Management Federation "GakuNin" is a structure that allows the use of a university's authentication infrastructure not only for internal services but also for other collaborating universities and commercial services including the cloud, thus facilitating the safe and secure use of academic services on the Internet by identifying individuals and organizations. 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 compatible with GakuNin raises the baseline of security measures and reduces the cost of ID management.

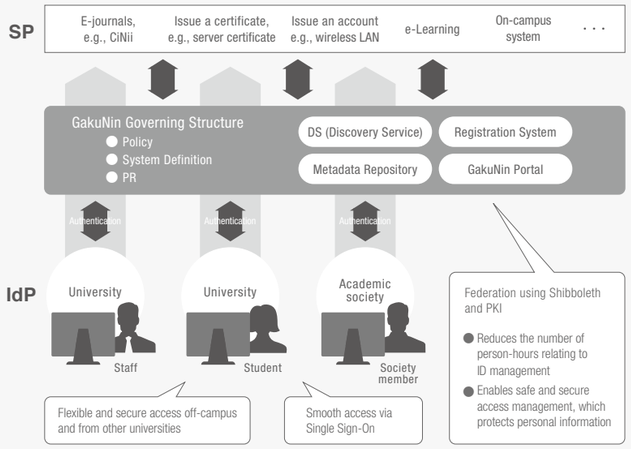
Participants (as of the end of March 2017)

User organization (IdP: Identity Provider)	188
Service provider (SP: Service Provider)	155

【 Features 】

- Only one ID/password to remember
- Single Sign-On (SSO)
- Accessible from anywhere in the world (remote access)
- Need no other software than a web browser
- Supports client certificate authentication and multi-factor authentication (Integrated management of security level)

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 services specified in the trust framework of the Federal Identity, Credential, and Access Management (FICAM) in the United States. Universities that have been certified for this high level of authentication infrastructure are able to use the US government services, including the databases of the National Institutes of Health (NIH).



Digital certificates: UPKI Digital Certificate Issuance Service

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

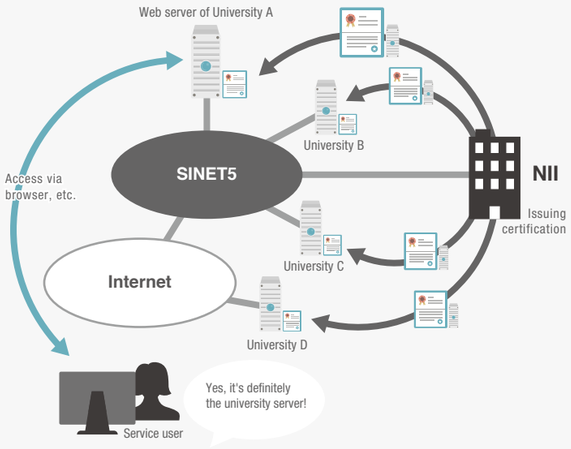
NII started the UPKI Digital Certificate Issuance Service, a business issuing digital certificates aimed at universities and research institutions, in January 2015. In addition to the server certificates issued before, NII now also issues client certificates and code signing certificates. As before, 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 proving 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 signing emails, and these can be used for purposes such as multi-factor authentication and preventing identity theft. Additionally, signing software using 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 at a low price and having them put into use, the UPKI Digital Certificate Issuance Service will improve the security of universities and research institutions across the board.

Institutions using UPKI Digital Certificate Issuance Service (as of the end of March 2017)

Number of target institutions for issuance	300
Number of target domains	400



eduroam: International Academic Wireless LAN Roaming Platform

https://www.eduroam.jp/

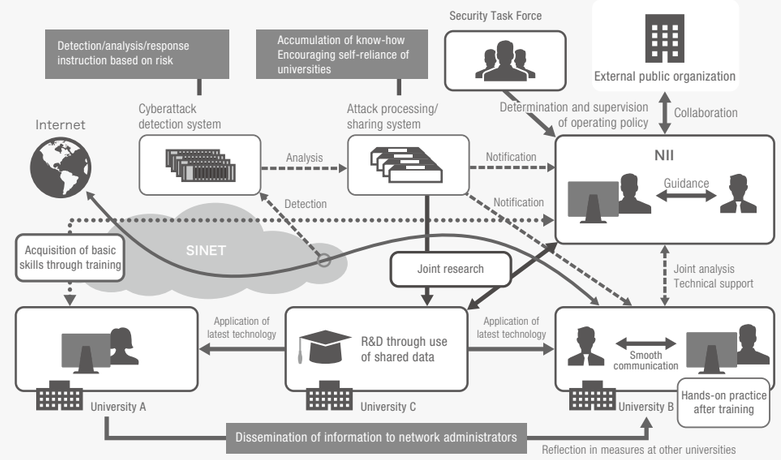
eduroam is an academic wireless LAN roaming platform developed by Europe's GÉANT (formerly TERENA). It realizes wireless LAN than is mutually interoperable between the campuses of universities and research institutes. In 2006, eduroam was introduced in Japan as part of NII's nationwide Common University 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 participating institutions (As of end of March 2017)

Organizations in Japan	178

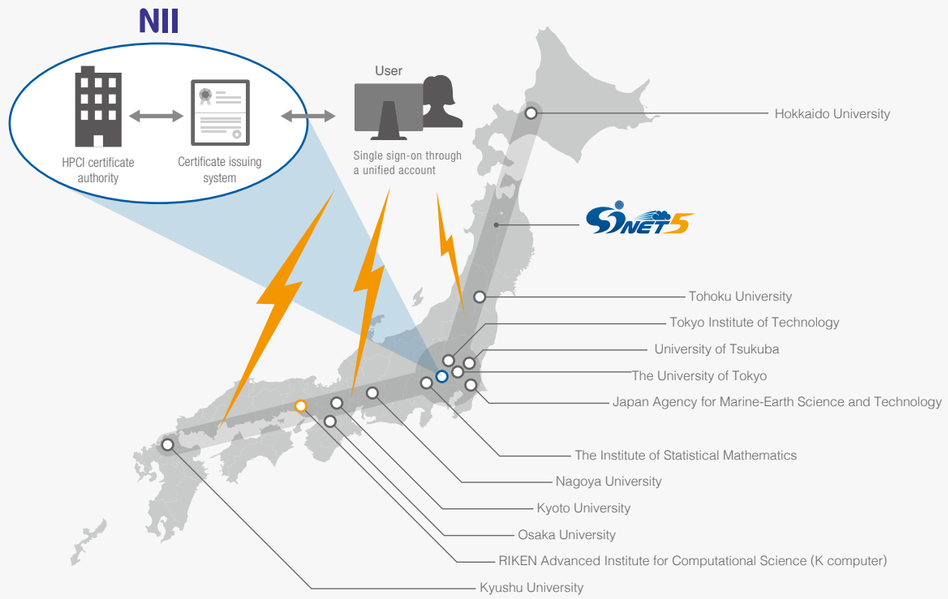
Support of Inter-University Collaboration-based Information Security Framework

NII is building a framework in collaboration with national universities that increases resistance against cyberattacks and can respond quickly to damages in case of a cyberattack. The framework uses information obtained by a system installed on SINET that monitors, detects, and analyzes cyberattacks and information shared by institutions inside and outside Japan. At the same time, NII is supporting the training of personnel in national universities who act as intermediaries through practical training to respond to cyberattacks. Furthermore, it is moving forward with preparations to provide an environment that promotes cybersecurity research.



Operation of HPCI Authentication Infrastructure and Network Infrastructure

High Performance Computing Infrastructure (HPCI) implements a computing environment that meets the needs of various users, including the industrial sector, by linking the K computer in Kobe and other supercomputers installed at universities and research institutes in Japan. It began service in the second term of fiscal year 2017. HPCI has a single sign-on authentication mechanism that allows users to gain access to any computing resources by using a common login account to improve usability. As the first-stage project, NII is continuing to construct and operate 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 uses a highly secure framework of 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 HPCI's computing resources.



Publishing and Communicating Academic Information

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

CiNii

http://ci.nii.ac.jp/

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

http://ci.nii.ac.jp/

Contains more than 19 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 February 2017)

Number of article information items
19.73 million

CiNii Books: Searching for books in university libraries

http://ci.nii.ac.jp/books/

This service allows searching of information on books and journals held by university libraries in Japan. Contains more than approximately 11 million bibliographic records of books and authors held by university libraries nationwide and accumulated through the Catalog Information Service (NACSIS-CAT) operated by NII. Available to anyone free of charge.

Collection status (as of the end of March 2017)

Number of bibliographic records	Number of holding records	Number of participating libraries
11.53 million	137.03 million	1,321

CiNii Dissertations: Searching for Japanese doctoral dissertations

http://ci.nii.ac.jp/d/

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. Available to anyone free of charge.

Collection status (as of the end of March 2017)

Total number of doctoral dissertations	Number of full texts
620,000	220,000

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

http://www.nii.ac.jp/irp/

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 680 institutions.

JAIRO Cloud (shared repository service)

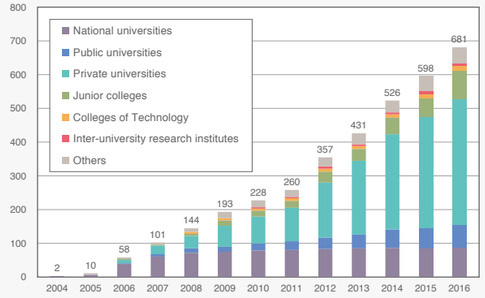
https://community.repo.nii.ac.jp/

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 on our institutional repository software WEKO (http://weko.at.nii.ac.jp/).

Collection status (as of the end of March 2017)

Number of institutions using the service
499

■ Numbers of institutional repositories in Japan



Crossover Searches of Academic Information Accumulated in Institutional Repositories in Japan

JAIRO (Institutional Repositories Portal)

http://jairo.nii.ac.jp/

This portal enables crossover searches 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.

Collection status (as of the end of March 2017)

Number of institutional repositories	Number of contents
605	2.50 million

■ Number of contents collected by JAIRO

Education and Training Programs

http://www.nii.ac.jp/hrd/

NII provides the following range of education and training programs to develop human resources at universities supporting Japan's academic information infrastructure.

- Training sessions (NACSIS-CAT/ILL self-learning)
- Advanced training (for staff responsible for cataloging and staff responsible for institutional repositories)
- Comprehensive training (comprehensive themes involving academic information infrastructure for developing core human resources)

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/

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 2017)

Number of adopted projects
790,000

Catalog Information Service

http://www.nii.ac.jp/CAT-ILL/

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

NACSIS-CAT NACSIS-ILL

Cataloging System (NACSIS-CAT)

NACSIS-CAT is a system for building comprehensive catalog databases 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 2017, * indicates FY2016 (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*
1,321	132,370,000	1,095	526,000,	89,000

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 OCLC in the US and KERIS in South Korea, NACSIS-ILL promotes the efficiency of library work through an offsetting service for ILL document copying and other charges.

Electronic Resources Data Sharing Service

ERDB-JP (Electronic Resources Database-JAPAN)

https://erdb-jp.nii.ac.jp/

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.

Partner participation

(as of end of March 2017)

	Universities (national)	Universities (municipal)	Universities (private)	Inter-university research institutes	Publishing companies	Others	Total
Partner A	19	2	8	3	3	2	37
Partner B	2	0	6	0	0	2	10
Total	21	2	14	3	3	4	47

Data registrations

(As of end of March 2017)

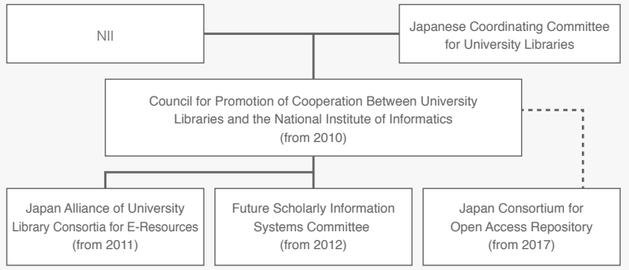
Number registered	Number of new registrations (FY2016)	Number of updates (FY2016)
12,262	1,460	5,664

Collaboration with University Libraries

http://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 committees 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 institutional repositories.



Japan Alliance of University Library Consortia for E-Resources

http://www.nii.ac.jp/content/justice/

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.
To support the activities of JUSTICE, NII has established the Library Liaison Office, which functions as the JUSTICE secretariat and is staffed from university libraries.

Open Access Repository Promotion Association

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

JPCOAR: Japan Consortium for Open Access Repository

JPCOAR is a community of institutional repositories formed as a place for Japanese universities and research institutes to work to more effectively advance efforts to spread research results and increase the meaning of building and operating institutional repositories.
JPCOAR is engaged in improving distribution of academic information, including open science, and jointly operating the institutional repository system platform (JAIRO Cloud). NII and university libraries support this activity.

JPCOAR founding general meeting (July 27, 2016)

International Scholarly Communication Initiative

http://www.nii.ac.jp/sparc/

SPARC Japan

SPARC Japan was launched in FY2003 based on cooperation with academic societies and university libraries, and in collaboration with SPARC (USA) and SPARC Europe. The aim is to promote further dissemination of the results of Japanese research, as well as to promote the digitization and international distribution of academic journals published by Japanese academic societies and to contribute to improvements in the international infrastructure for the distribution of academic information. The SPARC Japan Seminars provide an opportunity for interaction between stakeholders in academic information, and the latest topics in information distribution are discussed.

The basic policy in phase 5 (FY2016–2018) is to "implement open access under a framework of international collaboration, to promote the distribution of academic information, and to strengthen the ability to disseminate information." As well as promoting collaboration with university libraries and researchers, the project aims to understand the issues around open access and to study the measures that universities should adopt.

Electronic Archives

http://reo.nii.ac.jp/

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. 3.9 million records) and an electronic collection of humanities and social science materials (approx. 490,000 items) are stored on NII servers and provided to universities in Japan. Electronic resources archived in NII-REO are maintained in collaboration with JUSTICE.

Archived contents

(as of the end of March 2017)

OJA e-journal archive	Archived Years	Number of items
Springer Online Journal Archive	1854-1999	Titles: Approx. 1,100 Number of records: Approx. 2 million
Springer Lecture Note in Computer Science	1973-1999	Titles:1,501
Oxford Journal Archive Collection	1849-2003	Titles: 311 Number of records: Approx. 640,000
Kluwer Online	1997-2005	Titles: Approx. 800 Number of records: Approx. 350,000
IEEE Computer Society Digital Library (CSDL)	1988-2011	Titles: 30 Number of records: Approx. 350,000
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. 186,000
Eighteenth Century House of Commons Parliamentary Papers(18c HCPP)	1660-1834	Number of records: Approx. 58,000
The Making of the Modern World: Goldsmiths'-Kress Library of Economic Literature(MOMW)	1450-1850	Number of records: 61,000 books, 445 journals
The Making of the Modern World, Part II(MOMW II)	1851-1914	Number of records: Approx. 5,000
Eighteenth Century Collections Online	1701-1800	Number of records: Approx. 180,000

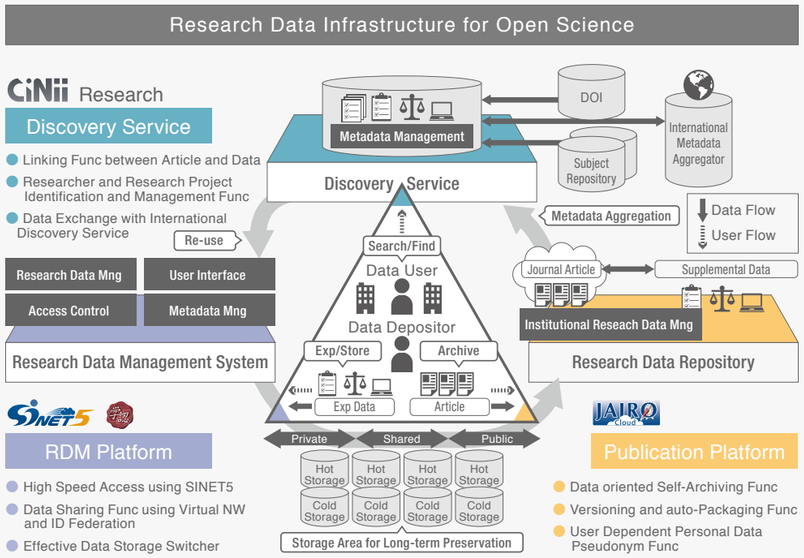
Open Science

Development of Research Data Platform

Open Science, which promotes open access and sharing of research outputs over the Internet with the general public, is gaining traction as a new way to conduct research. It is expected that Open Science will lead to enhanced research efficiency and productivity as well as research quality and transparency.

NII will provide an e-infrastructure for sharing research data by expanding the functionality of the existing cloud-based institutional repository system named “JAIRO Cloud,” which is a research publication platform. In addition, NII will provide “CiNii Resesarch,” a discovery service platform, enabling researchers to search scholarly contents stored in various databases including institutional repositories across Japanese universities. In order to make research discovery more efficient, CiNii Research automatically creates in its backend a large-scale knowledge base by connecting element of scholarly contents. The research data generated by individual researchers will be stored right from the beginning of a research project on the “GakuNin RDM,” a research data management platform provided also by NII. The system allows researchers to transfer their research data and any other related materials into the repository by swift one-click action, facilitating them to join to the Open Science world.

These three platforms supporting the researcher throughout the research cycle will contribute to the research strength of Japanese academic institutions and promote Open Science in Japan.



Education

Graduate Education

The National Institute of Informatics makes use of its unique, comprehensive informatics research structure and its practical environments in which academic information services and research and development are combined to provide graduate education. Aiming to develop researchers equipped with a broad outlook, a high level of expertise, leadership abilities, and real problem-solving abilities, the National Institute of Informatics provides education to graduate students in three ways: (1) participation in SOKENDAI (The Graduate University for Advanced Studies), (2) cooperation with other graduate schools, and (3) special collaboration with research students.

http://www.nii.ac.jp/graduate/

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

Greetings from Chair of Department

Zhenjiang Hu, Chair, Department of Informatics
(Professor, Information Systems Architecture Science Research Division)

The Department of Informatics consists of six fields: Foundations of Informatics, Information Infrastructure Science, Software Science, Multimedia Information Science, Intelligent Systems Science, and Information Environment Science. These are new disciplines that are based on the traditional fields of computer science and information engineering, while covering a wide range of the social sciences, humanities, and life sciences. Our department carries out various phases of research and education: basic, applied, and practical. As well as training researchers, we aim to develop highly skilled professionals and 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 the 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. In the five-year doctoral program, graduates can tackle specific topics thoroughly; while in the three-year doctoral program, master's graduates can concentrate on a topic that they were researching before entering the department. As well as being SOKENDAI students, students of the Department of Informatics are members of the National Institute of Informatics, and as such are able to study in an international collaborative environment, participate in various research projects, and gain experience as international researchers through exchange programs with overseas partner universities and research institutions. Roughly half of our Japanese student population are company employees who wish to systematically reorganize the job that they have been doing and learn about the latest technology. The fact that we have a high percentage of foreign students is also an important feature of our department. Many of the lectures are in English, as are many seminars. 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.

About the Department of Informatics

Establishment of graduate school

The 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 five-year doctoral 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 70 subjects, including major subjects and common foundational 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 30% of all the department's students.

Number of students in Department of Informatics (as of April 2017) *( ) indicates foreign students

Five-year program	Three-year program	Research students	Total
10 (7)	55 (32)	1 (0)	66 (39)

Lecture on Applied Linear Algebra

Discussion at lounge

Degree conferring ceremony (March 2017)

Message from a Current Student

WANG, Xin

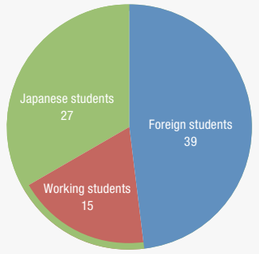
2015: Graduated from a master's course at the University of Science and Technology of China
2015: Enrolled in the three-year doctoral program, Department of Informatics, SOKENDAI Main supervisor: Associate Professor Junichi Yamagishi

My research topic is on text-to-speech synthesis, a technology that enables the machine to read aloud in human-like voices. One approach of text-to-speech is to use various machine learning methods to figure out the mapping from the text to speech. Although the synthesized speech from this approach is natural sounding, its quality is still imperfect. Possible reasons may be the various inappropriate assumptions researchers made on the statistical models. My work is to find better statistical models and revise those assumptions. With the improved model and thus synthetic speech, I hope that text-to-speech technology can better serve the society, particularly during the next Olympic Games in Tokyo.

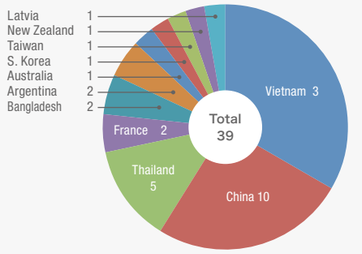
Student data

(as of April 2017)

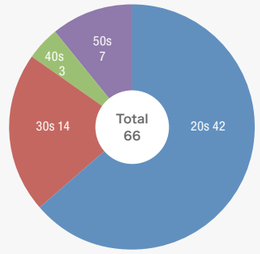
Numbers of current students



Numbers of foreign students by country



Age distribution of students



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 2017)

Document type	Book	Bound journal	Journal (title)
Japanese	16,521	10,035	191
Foreign	13,681	8,313	10
Total	30,202	18,348	201

Facilities and equipment

Service	Reading room	Stack room
Area	140㎡	271㎡
Seats	8	3
Other equipment	Automatic lending and returning machine	
	Microreader printer	
	Copier	

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
Springer Link	Springer
Science Direct	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

Reading room

Curriculum

The Department of Informatics provides research instruction and guidance by top-level researchers within the advanced environment and international atmosphere of the 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 three-year doctoral program and 40 for the five-year doctoral program. The duration of the program is flexible and may be shortened for students with excellent research results. Also, if a student enrolled in the five-year doctoral program has to withdraw before graduation, they may be awarded a master's degree as long as certain requirements are met.

Special Subjects of the Department of Informatics	
Foundations of Informatics	Logic in Computer Science (TATSUTA Makoto) / Theory of Numerical Methods (HAYAMI Ken) / Basis of Information Processing in Life Systems / Algorithm (UNO Takeaki) / Mathematical Linguistics (KANAZAWA Makoto) / Discrete Mathematics (KAWARABAYASHI Ken'ichi) / Mathematical Logic / Quantum information systems (NEMOTO Kae) / Quantum Computation (MATSUMOTO Keiji) / Modern Cryptography / Computational Neuroscience (KOBAYASHI Ryota) / Sublinear Algorithms (YOSHIDA Yuichi) / Optimization Theory (KISHIDA Masako) / Graph Algorithms (IWATA Yoichi) Algorithmic Market Design (YOKOI Yu)
Information Infrastructure Science	Computer System Design (YONEDA Tomohiro, GOSHIMA Masahiro) / Information and Communication Systems (JI Yusheng, ABE Shunji, FUKUDA Kensuke, KANEKO Megumi)
Software Science	Distributed Systems (SATOH Ichiro) / Data Engineering (TAKASU Atsuhiro) / Software Engineering (NAKAJIMA Shin) / Signal processor (HASHIZUME Hiromichi) / Probabilistic Models in Informatics (KITAMOTO Asanobu) / Constraint Programming / Service-Oriented Computing (ISHIKAWA Fuyuki) / XML Databases (KATO Hiroyuki) / Database Programming Languages / Mathematical Structures in Programming (HU Zhenjiang) / Software Development Process (TEI Kenji) / Fundamentals of Web Application Development (SAKAMOTO Kazunori) / Programming Languages and theory (TSUSHIMA Kanae)
Multimedia Information Science	Digital media infrastructure (ECHIZEN Isao, KATAYAMA Norio, ANDO Ryoichi, TAKAYAMA Kenshi, AIZAWA Akiko) / Fundamentals of Media Processing (SATOH Shin'ichi, KODAMA Kazuya, MO Hiroshi, IKEHATA Satoshi) / Applications of Multimedia Processing (SUGIMOTO Akihiro, SATO Imari, GOTODA Hironobu, CHEUNG Gene, ZHENG Yinqiang) / Interactive Media (ARAI Noriko, AIHARA Kenro, YAMAGISHI Junichi, YU Yi)
Intelligent Systems Science	Logical Foundations for Artificial Intelligence (INOUE Katsumi) / Reasoning Science (SATOH Ken) / Knowledge Sharing System (TAKEDA Hideaki) / Human-Agent Interaction (YAMADA Seiji) / Cluster Analysis (HOULE Michael E) / Machine Learning (ICHISE Ryutaro) / Intelligent Robotics (INAMURA Tetsunari) / Natural Language Processing / Psycholinguistics / Intelligent User Interfaces (PRENDINGER Helmut) / Intelligent Web Systems (OHMUKAI Ikki) / Communication Environments (BONO Mayumi) / Syntactic/semantic parsing (MIYAO Yusuke) / Econophysics (MIZUNO Takayuki) / Data mining (SUGIYAMA Mahito)
Information Environment Science	Digital Publications (OYAMA Keizo) / Information Retrieval (KANDO Noriko) / Governance among humans, technology and social system in the ICT society / Scholarly Information Databases / Academic Information Environments / Information Society / Methodology of Scientmetrics (NISHIZAWA Masaki) / ICT-enabled Business (OKADA Hitoshi) / Information Economics / Record Management / Introduction to Statistical Methods in Bibliometrics (SUN Yuan) / Terminology
Common Specialized Subjects of the School of Multidisciplinary Sciences	
Introduction to Mathematical Logic (TATSUTA Makoto) / Introduction to Algorithms (UNO Takeaki) / Quantum information and computing (NEMOTO Kae, MATSUMOTO Keiji) / High-Performance Computing (AIDA Kento, KOIBUCHI Michihiro, TAKEFUSA Atsuko) / Information Sharing System Architecture (URUSHIDANI Shigeo, TAKAKURA Hiroki, KURIMOTO Takashi) / Introduction to Software Science I (All professors in Software Science) / Introduction to Software Science II (All professors in Software Science) / Introduction to Multimedia Information Science (All professors in Multimedia Information Science) / Introduction to Intelligent Systems Science I (INOUE Katsumi, YAMADA Seiji, INAMURA Tetsunari, ICHISE Ryutaro, MIYAO Yusuke, HOULE Michael E) / Introduction to Intelligent Systems Science II (SATOH Ken, TAKEDA Hideaki, PRENDINGER Helmut, OHMUKAI Ikki, MIZUNO Takayuki, BONO Mayumi, SUGIYAMA, Mahito) / Introduction to Information Environment Science I (All professors in Information Environment Science) / Introduction to Information Environment Science II (All professors in Information Environment Science) / #Academic Communication / #Intellectual property rights / #Research, Development and International collaboration in a changing world (ANGELINO Henri) / #Presentation in English I (HAYAMI Ken, HOULE Michael, CHEUNG Gene, JONES Caryn) / #Presentation in English II (HAYAMI Ken, HOULE Michael, CHEUNG Gene, JONES Caryn) / Introduction to information security infrastructure (ECHIZEN Isao, OKADA Hitoshi, TAKAKURA Hiroki) / Applied Linear Algebra (HAYAMI Ken, SATOH Shin'ichi, GOTODA Hironobu) / Introduction to Big Data Science (Professors related to Big Data)	

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
FY2016	9 (6)	6 (4)	3 (3)	18 (13)
FY2015	9 (6)	5 (3)	0 (0)	14 (9)
FY2014	5 (3)	4 (3)	2 (2)	11 (8)

Cooperation with Graduate Schools

The 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 lectures in partnership with these institutions and accepts graduate students for research guidance.

Cooperation with Graduate Schools

University	Graduate 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 Engineering	Since FY2002
	Interdisciplinary Graduate School of Science and Engineering	Since FY2003
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	
Japan Advanced Institute of Science and Technology (JAIST)	Graduate School of Advanced Science and Technology	Since FY2008
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
Tokyo University of Science	Graduate School of Science	Since FY2015

Special Collaboration with Research Students

As an inter-university research institute, the National Institute of Informatics accepts graduate students from other universities in Japan and overseas as research students in special collaborative projects. These students benefit from research guidance using the National Institute of Informatics's academic information databases and communications infrastructure and from instruction by our staff appropriate to their research subject.

Universities to which research students for special collaboration belong

(2016 results)

Chiba University	Ecole Normale Superieure (E.N.S) Rennes	Universite Paris-Est
University of Tsukuba	Ecole Polytechnique	University of Konstanz
The University of Tokyo	University of Novi Sad	University of Lisbon
Keio University	Hanoi University of Science and Technology	University of Pisa
Tokyo University of Science	KTH (Royal Institute of Technology)	University of Science and Technology of China
Waseda University	National Institute of Applied Sciences of Rouen	University of Southern California
Aalto University	National Taiwan University	University of Victoria
Basque Country University	Shanghai Jiao Tong University	
Ecole normale Superieure de Cachan	The Hong Kong University of Science and Technology	

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

(FY2016)

Master's program	Doctoral program	Total
59	46	105

Executives

Director General Masaru Kitsuregawa

Deputy Director General Jun Adachi

Deputy Director General Akiko Aizawa

Deputy Director General Shinichi Honiden

Deputy Director General Ichiro Satoh

Advisor to the Director General Isao Echizen

Advisor to the Director General Ken-ichi Kawarabayashi

■Academic Infrastructure Promotion
Director Shigeo Urushidani

Deputy Director Kazuko Egawa

■Academic Infrastructure Division
Director Koji Kamei

■Scholarly and Academic Information Division
Director Wataru Ono

■Library Liaison Cooperation Office
Head Sawako Kojin

■Advanced ICT Center
Director Shunji Abe

■General Affairs Department
Director Hiromi Iwata

■Planning Division
Director Masako Suzuki

Head of Office for Social Collaboration Haruo Asoshina

■General Affairs Division
Director Yukio Yanagihashi

■Budget and Accounts Division
Director Niro Kanomata

■NII Library
Head Ikki Ohmukai

Staff Numbers

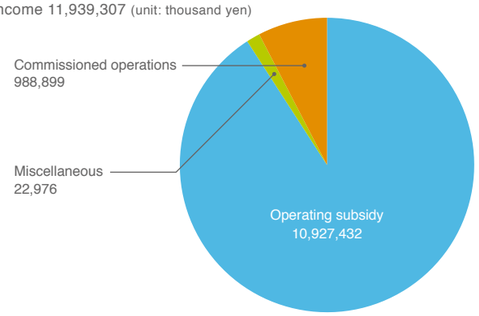
(as of April 2017)

Category	Director	Deputy Director	Professor	Associate Professor	Lecturer	Assistant Professor	Subtotal	Administrative staff	Total
Full-time employees	1	4	32	32		8	72	62	134
Adjunct professors, etc.			11	11		18	40		40
Special term/fixed-term/short-term staff									298

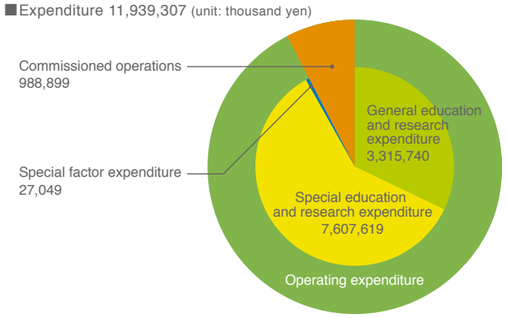
Budget

(FY2017)

■Income 11,939,307 (unit: thousand yen)



■Expenditure 11,939,307 (unit: thousand yen)



Administrative Council

(as of April 1, 2017)

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
Kimio Ohno	25 June 1992
Atsunobu Ichikawa	25 June 1992
Hitoshi Inoue	23 June 1999

National Institute of Informatics (NII)

Name	Award date
Takamitsu Sawa	1 April 2002
Eisuke Nito	2 July 2002
Mitsutoshi Hatori	19 November 2004
Kinji Ono	19 November 2004
Takeo Yamamoto	1 April 2005
Yasuharu Suematsu	1 April 2005
Haruki Ueno	1 April 2007
Katsumi Maruyama	1 April 2010
Masamitsu Negishi	1 April 2010

Name	Award date
Kenichi Miura	1 April 2011
Masao Sakauchi	1 April 2013
Shoichiro Asano	1 April 2013
Teruo Koyama	1 April 2015
Akira Miyazawa	1 April 2015
Shigeki Yamada	1 April 2015
Yoshihisa Yamamoto	1 April 2015
Noboru Sonehara	1 April 2017

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 end of March 2017)

■Number of Reports

230	Attribution: Organization Attribution	217
	Attribution: Individual Attribution	13

■Number of Applications

260	Domestic	213
	Foreign	47

■Number of Registrations

86	Domestic	71
	Foreign	15

List of Japanese patents owned

(as of March 2017)

Title of invention	Registration no.	Joint application
Image information apparatus, and method and program for retrieving and displaying image information	4441685	
Quantum key delivering method and communication apparatus	4231926	
Time-series data analysis device, and time-series data analysis program	4734559	
Information-Sharing System, Information-Sharing Server, Information-Sharing Method, and Information-Sharing Program	4799001	●
Ultrasonic distance measurement system and method	4041899	
Sequential content delivery device, sequential content receiving device, and method therefor	4734563	
Contents presentation apparatus, contents presenting method and contents presentation program	4403276	
Text content presentation apparatus, text content presentation method and text content presentation program	4143628	●
Method and apparatus for evaluating communication traffic that uses fragmentary self-similarity process	4081552	
Imaging device and imaging method using out-of-focus structure	4437228	
Information resource retrieval device, information resource retrieval method and information resource retrieval program	4324650	
Active content distribution system, active content distribution program and active content distribution method	4392503	
Device and method for generating traffic congestion prediction information, and route search system	4729411	●
Content selling device and method	4304278	
Document indexing device, document retrieval device, document classifying device, and method and program thereof	4362492	●
Video provision device and method	4359685	
Projection image correction system and correction information generation program	4982844	
Digital content registration distribution apparatus, system and method	4956742	
Communication path apparatus for data driven processor having tree type diversion path and merging path, and packet transfer mode for data driven processor	5115922	●
Airing structure of three dimensional integrated electrical circuit and layout method therefor	5024530	
Quantum key distribution method, communication system, and communication service	4862159	
Time reference point information transmitting system and receiver	4621924	
Quantum repeater	5082039	●
Method and device for searching ambiguous frequent itemset	5267847	
Collection/delivery route selection system	4374457	
Device and method for learning data management, and vehicle air-conditioning device and equipment control device	5224280	●
Air conditioner for vehicle and its control method	5177667	●
Route Switching method, server apparatus, boundary node apparatus, rout switching system, and switching program	5062845	●
Direct path establishing method, server device, sender network node device, direct path establishment network, and program thereof	4999112	●
Virtual stereoscopic image display device and method of displaying virtual stereoscopic image	5263960	●
Path management control method, path management control program, path management controller and path management control system	4806466	●
Intramemory data structure of finite automaton, memory storing data with the structure, and finite automation executing apparatus using the memory	5063780	●
Emission allowance trading system and emission allowance trading method	5207195	

Title of invention	Registration no.	Joint application
Quantum repeater, and system and method for generating extended entanglement	5296924	●
Distance measuring method, distance measuring receiving station equipment, and position measurement system	5305324	
Quantum computing device and method for Ising model	5354233	
Video display device	5373662	
Method and device for accelerating speed of successfully generating entanglement, and quantum repeater that uses the method and device	5414006	●
Quantum repeater, and system and method for generating extended entanglement	5414007	●
Information processing device, method, program, and recording media	5424306	●
Spoken language estimating device, method, and program	5544575	●
LSI arithmetic device and failure detection method for the same	5582472	
Measurement device, measurement system, and measurement method	5593062	
Information retrieval display device, method, and information retrieval display program	5599068	
Information retrieval display device, method, and information retrieval display program	5608950	
Information retrieval display device, method, and information search display program	5608951	
Information providing device, method, and program	5614655	●
Control server, control method, and control program	5682932	●
Doppler radar system, Doppler radar transmission device, and method for optimizing transmission wave	5704695	
Image collation device, image collation method and computer program	5713398	
Speed/distance detection system, speed/distance detection device, and speed/distance detection method	5739822	
Information processing device, schedule determining method, and computer program	5733722	
Search tree drawing device and search tree drawing method and program	5754676	●
Encoding device, method, program, and recording media	5789816	●
Word reordering device, translation device, translation model learning device, method, and program	5800206	●
Acoustic signal analysis device, method, and program	5807914	●
Data delivery system and data delivery device and method	5818262	●
Distributed data management system and device, method, and program	5818263	●
Acoustic signal analysis device, method, and program	5911101	●
Image search device, method, and program	5979444	●
Signal processing device, method, and program	6005443	●
Semiconductor chip, semiconductor chip connection system	6029010	
Distance measuring method and radar device	6029287	
Superconducting quantum bit state detection using light	6029070	●
Optical parametric oscillator and random signal generating device and Ising model using the oscillator	6029072	●
Word order sorting device, translation device, method, and program	6040946	●
Spoken language evaluation device, parameter estimation device, method, and program	6057170	●
Word order sorting device, translation device, translation model learning device, method, and program	6083645	●
Signal processing device, signal processing method, and computer program	6099032	
Interactive information search device using eye gaze interface	6099342	
Face detection prevention tool	6408562	

List of registered trademarks

(as of end of March 2017)

Trademark mode	Registration number
NII	4811291
Net Commons	4832775
Picture+SINET	4934163
NAREGI	4952143
トップエスイー	4943324
WebELS	4980388
Net Commons	5182361

Trademark mode	Registration number
n c net commons	5152641
Commons Partners	5208443
neXt commons	5191260
researchmap	5261160
GRACE+Picture	5275386
Picture(grace)	5261216
Picture(トップエスイー/NPO)	5279082

Trademark mode	Registration number
edubase	5296963
学認/GAKUNIN	5341899
NetCommons Ready	5369242
Picture(パレット)	5498318
Picture(学認/GakuNin)	5498319
情報犬	5538785
Picture(情報犬)	5538784

Trademark mode	Registration number
Picture(サイニィ/CiNii)	5580217
Picture(ミカエル)	5600802
meQuanics	5622078
Picture(GeoNLP)	5645544
SIGVerse ※	5649553
PrivacyVisor ※	5653596
WillingRing	5789533

※SIGVerse (International Registration No. 1203063) and PrivacyVisor (International Registration No. 1208262) are also registered trademarks in Europe, the United States, and China.

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.

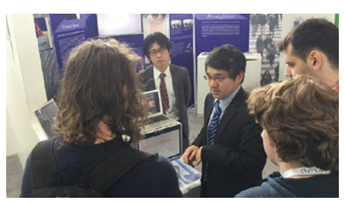
Ten researchers introduce a total of 100 research presentations at "NII Research 100."

Easy-to-understand explanations with poster exhibits and demonstrations (May 2016)

Exhibitions

NII participates in various exhibitions to introduce its research findings, operations, and services. In FY2016, NII had exhibitions at CEATEC JAPAN 2016. It also made its debut exhibition at the international telecommunications trade fair CeBIT 2017 held in Hannover, Germany.

Introducing Social Cyber-Physical Society (CPS) with main sponsor special exhibition "IoT Town" at CEATEC JAPAN 2016 (October 2016 at Makuhari Messe conventional hall)



"BiometricJammer," world's first method for preventing surreptitious photography of fingerprints, introduced at CeBIT 2017 (March 2017)

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"

http://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. There are generally six lectures per year held at the National Center of Sciences (Hitotsubashi, Chiyoda Ward, Tokyo). Images, materials, and Q&As from past lectures are available on the Institute's website.

Fourth 2016 National Institute of Informatics Public Lecture: Professor Seiji Yamada gives talk on AI (November 2016)

●Karuizawa Saturday Salon

http://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 Beauty) (Volumes 1–6), and are available on the Institute's website.

First FY2016 Karuizawa Saturday Salon: Music scholar Bin Ebisawa gives talk "Mozart coming to Japan ?!" (July 2016)

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, *Infrastructure That Reflect the Times: Networks and the Future,* was released in October 2016.

● 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 with Info Dog "Bit-kun"

NII Today is published four times a year.

Digital Media

● NII website: http://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 http://www.nii.ac.jp/mail/

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

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

News Release List

(FY2016)

Date issued	Title
April 1, 2016	The Launch of Center for Cybersecurity Research and Development
April 26	"KAKEN" Database of Grants-in-Aid for Scientific Research Renovated / Enhanced Search Functions and Redesigned Interface
May 9	"National Institute of Informatics Open House 2016" to be Held on May 27 - 28
May 17	National Institute of Informatics' First Free Public Online Programming Course to be Offered on Official JMOOC Platform "gacco"
May 17	"National Institute of Informatics Academic Information Infrastructure Open Forum 2016" to be Held on May 25 – 26 / With SINET5 Official Launch Ceremony on May 25
May 24	370Gbps Data Transfer Test Successful / Toward Practical Application of 400Gbps Technology
May 25	SINET5 Official Launch Ceremony Held / 100 Gbps High-Speed Science Information NETwork Begins Operation
May 25	Dataset for Research of "Dissatisfaction" Released / Partnership with Insight Tech Ltd.
May 25	"GakuNin Cloud," Supporting the Introduction of Cloud Computing at Universities and Research Institutes, Partners with Microsoft Japan
June 1	Listening Capability of "Active Scope Camera" Dramatically Improves / Advances in Rescue of Earthquake Victims
June 9	Competition for Discovering Graph Representing Efficient Network Configuration to be Held Again This Year
June 21	NII, Hokkaido University, Osaka University, and Kyushu University to Exhibit at "CEATEC JAPAN 2016" / Joint Research on Social Cyber-Physical Society
July 11	Joint Research on Drones Begins in Partnership with Okutama Town / Toward Development of Integrated Air Traffic Control System for a Fleet of Drones Using Deep Learning for Situational Awareness and AI
July 26	Development of Test Scientifically Measuring Ability to Understand Contents of Text / Accelerating Research to Improve "Reading Comprehension Ability" with Industry-Academia Collaboration
July 27	Japan Consortium for Open Access Repository (JPCOAR) Established / 376 Institutions Including NII and University Libraries Nationwide Participate
Aug. 31	New Version of NetCommons Released / Responsive Design and Enhanced Security Measures Added
Sept. 7	BIGCHA, Programming Contest for University and Graduate School Student to be Held / Analyzing Big Data for "Dissatisfaction" and "Real Estate Information" Provided by Partner Companies
Sept. 20	Official Launch of the GakuNin Cloud Support Service / Encouraging the Spread of Cloud Use at Universities and Research Institutions
Sept. 21	Team Led by Associate Professor Iwata Wins ICFP Programming Contest for Second Straight Year
Sept. 26	Social Cyber-Physical Systems: Creating Future Social System Platform / Joint Exhibition with Hokkaido University, Osaka University, and Kyushu University at CEATEC JAPAN
Sept. 27	Large Volumes of Data from ITER Successfully Transferred to Japan at Unprecedented Speeds
Sept. 29	Development of New Acoustic Signal Processing Technology that Simultaneously Recognizes the Voices of Multiple Speakers / Making It Possible to Convert Conversations into Text Using Speech Recognition
Oct. 3	NII Director General Masaru Kitsuregawa Receives French National Order of the Legion of Honour
Oct. 5	Joint Research on Voice Clone Generation Begins / Partnership between Digital Content and Media Sciences Research Division Associate Professor Junichi Yamagishi and alt Inc.
Oct. 21	Realization of New Quantum Computing Principle Solving Difficult Problems with Light – Development of Quantum Neural Networks
Oct. 31	"Infrastructure That Reflects the Times: Networks and the Future," the Latest Edition of the NII Series (Maruzen Library) / On Sale from October 31
Nov. 2	CiNii Books Gains New Functions / Connection to U.S. HathiTrust Digital Library / Direct Access to e-Books Text Data Now Possible
Nov. 10	"Dataset of Pre-modern Japanese Texts (PMJT)" Released with Cooperation of National Institute of Japanese Literature / Supporting and Promoting Movement toward Open Data by Japanese Research Institutes
Nov. 11	Top SE: Education Program for IT Engineers to Start New Advanced Course to Learn Leading Edge Technology
Nov. 14	NII Artificial Intelligent Project "Todai Robot Project: Can an AI Pass the Entrance Exam for the University of Tokyo?" / AI Scores Deviation Score of Above 50 in Six Subjects of National Center Test Mock Exam
Nov. 14	AI Scores 76.2 in Math (University of Tokyo's 2nd-Stage Mock Exam) and 59.0 in Physics (National Center Test Mock Exam) / Vast Improvement in Deviation Scores / Todai Robot Project
Nov. 14	AI Scores Deviation Score of 76.2 on University of Tokyo's 2nd-Stage Math Mock Exam / Todai Robot Project
Nov. 17	PMJT Character Shape Dataset Released as Open Data for Machine and Human Learning / With Cooperation of National Institute of Japanese Literature
Nov. 21	Certificate Presented to SINET Award-Receiving Team / SINET 100Gbps Commemoration Ideathon "How to Use SINET5"
Nov. 22	Award Presented to Three Teams and One Individual for Outstanding Graph Discovery / Graph Discovery Competition "Graph Golf" Aimed at Achieving Efficient Supercomputer Design
Nov. 24	Dataset of Pre-Modern Japanese Cooking Recipes Released / Turning Cookbook from Edo Period into Modern Recipes to Incorporate Edo Culture into Modern Era – Also available on "Cookpad"
Nov. 29	"North China Transportation Company Archive" Released / Conveying Conditions of North China Before and During World War II / Research Database Linking Company's Propaganda Photos and Its Transportation Network Data
Nov. 30	CiNii Books Gains New Function / Connection to National Diet Library Digital Collections / Direct Access to e-Books Text Data Now Possible
Dec. 6	World's Fastest Long-Distance Data Transmission Achieved / New Record of 150Gbps Transmission Rate with MMCFTP, the File Transfer Protocol Developed by NII
Dec. 27	Associate Professor Junichi Yamagishi (Digital Content and Media Sciences Research Division) Receives JSPS Prize
Jan. 19, 2017	National Institute of Polar Research Launches "Polar Data Journal" Using "JAIRO Cloud" / Shared Repository Service Developed by NII
Jan. 24	NII to Exhibit at "CeBIT2017" for the First Time / In Japan Pavilion Hosted by JETRO
Feb. 08	Implementing Research Results in Society with Industry-Academia Partnership / Information Systems Architecture Science Research Division Assistant Professor Kazunori Sakamoto's Web Information Extraction Technology
Feb. 21	Report on Appropriate Processing Methods for Anonymous Processed Information Released / NII Anonymous Processed Information Technology Study Workgroup
Feb. 27	Dissatisfaction Category Dictionary Data Released / Created from Massive Amounts of Dissatisfaction Posts
Feb. 27	Long-Term Testing of "Submerged Computer" for Practical Application Begins / PC Cluster Constructed with High-Performance Motherboards, Goal of More than 2 Years of Stable Operation
Mar. 06	Competition to Discover Graphs Presenting Efficient Network Configuration Starts – "How Would You Connect the CPUs Inside a Supercomputer?"
Mar. 14	Support for Evidence-Based Policy Decision-Making / High-speed Processing with Structuralization of Diverse Data / Decision-Making Support Platform Driven by Social Big Data
Mar. 16	Cloud Service Providers Enabling Use of SINET Cloud Connection Service Reaches Over 20 / Supporting Effective Use of Cloud by Universities and Research Institutes
Mar. 17	Protection of Biometric Information Against Threats Arising at Border Between Cyber and Physical Worlds / BiometricJammer: A Method for Preventing Photographic Capture of Fingerprint Information, Shown at CeBIT 2017
Mar. 30	Ideathon on Use of SINET5 to be Held / Competetive Ideas Leveraging the Features of "Broadband" and "Low Latency"

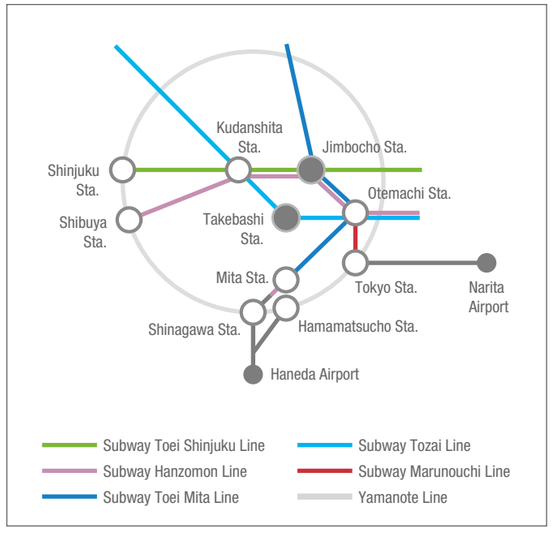
Facilities / Locations

National Center of Sciences (Chiyoda Ward, Tokyo)

http://www.nii.ac.jp/

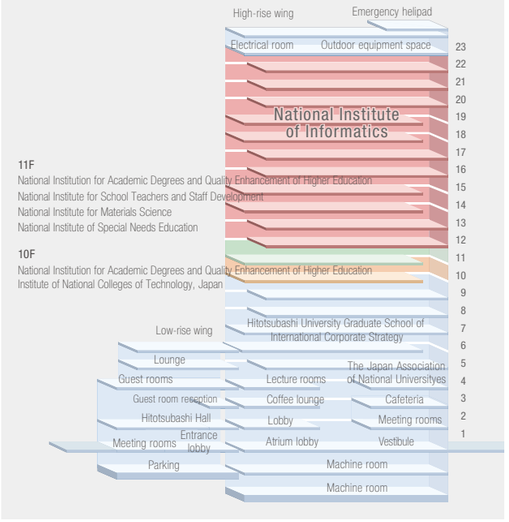
The National Center of Sciences was established as a center for research in fields such as informatics, academic exchange, dissemination of scientific information, and social collaboration, with the aim of improving and strengthening Japan's academic research infrastructure. Construction was completed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



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

Chiba Annex (Inage-ward, Chiba City)

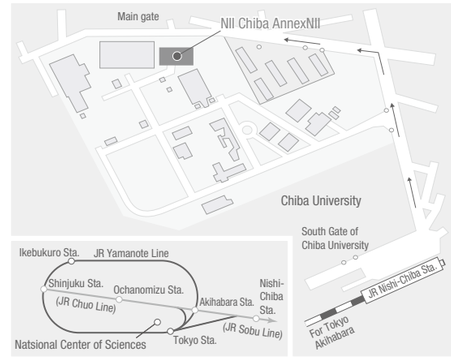
Chiba Annex is a building that houses the computer systems and networking equipment used to operate academic information systems and provide academic information services. It was built in November 1994.

Exterior of Chiba Annex

Chiba Annex

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

Guide Map



Site area (rented) : 1,782㎡
Floor space : 3,943㎡

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

http://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.

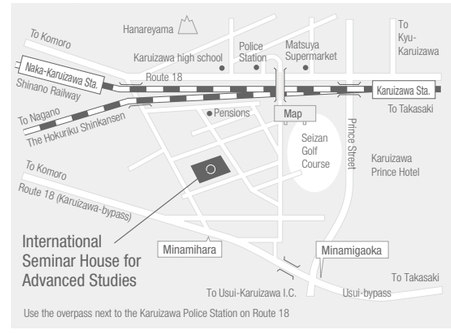
Exterior of Seminar House

Exterior of Seminar House

Exterior of Seminar House

1052-471 Okan Minamihara Nagakura,
Karuizawa, Karuizawa-cho, Kita Saku-gun,
Nagano 389-0111
Tel. +81-267-41-1083 Fax. +81-267-41-1075

Guide Map



Site area : 3,339㎡
Floor space: 667㎡

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 the UK (British Library: BL)
April 1992	The Inter-Library Loan (ILL) System is launched.
April	The Internet backbone (SINET) is launched.
November 1993	Start of mutual access to databases through gateways with the Japan Information Center of Science and Technology (JICST)
April 1994	Start of ILL service with the British Library Document Supply Centre (BLDSC)
November	Chiba Annex (Inage-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 Field issues its report.
April	Coordination Office is established for the Core Institution for Scientific Research in the Information Field; committee is formed in May.
March 1999	Coordinating Committee of the Core Institution for Scientific Research in the Information Field issues its report.
April	Preparatory Office is established for the Core Institution for Scientific Research in the Information Field; committee is formed in May.
July	Preparatory Committee of the Core Institution for Scientific Research in the Information Field issues its interim report.
February 2000	Operations move to the National Center of Sciences (Hitotsubashi, Chiyoda-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 2010	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.