Science Report WebSite

The ROIS publishes an online magazine, Science Report, to inform the audience overseas about Japan's latest academic research activities and achievements. Science Report focuses on a specific research topic for six months at a time with monthly feature articles introducing different aspects of the field. The magazine is intended to provide insights into some of the major ongoing research projects and how the country uses the Team Japan approach to bring together all the expertise and resources it has to offer

to advance studies in certain areas. The site offers links to the news releases and publications of various universities and other academic institutions from across Japan.



https://sr.rois.ac.jp/en/

Activities for Gender Equality

The ROIS has the Office for Gender Equality set up at each of its research centers to promote a fair and equal work environment where both men and women researchers can thrive and access the support they need. As part of the initiative, the ROIS also publishes on its website a directory of female researchers who can be found through the ROIS researchmap search engine.

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

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2 National Institute of Polar Research

10-3, Midori-cho, Tachikawa-shi, Tokyo 190-8518, Japan Phone: +81-42-512-0647 https://www.nipr.ac.jp/english/

3 National Institute of Informatics

2-1-2 Hitotsubashi, Chiyoda-ku, Tokyo 101-8430, Japan Phone: +81-3-4212-2000(Exchange) https://www.nii.ac.ip/en/

4 The Institute of Statistical Mathematics

10-3 Midori-cho Tachikawa Tokyo 190-8562 Japan Phone: +81-50-5533-8500 https://www.ism.ac.jp/index e.htm

() National Institute of Genetics

111 Yata. Mishima, Shizuoka 411-8540, Japan Phone: +81-55-981-6707(Administration Office) https://www.nig.ac.jp/nig/

() Joint Support-Center for Data Science Research(DS)

Data Science Building, 10-3 Midori-cho, Tachikawa, Tokyo 190-0014, Japan Phone: +81-42-512-9254 https://ds.rois.ac.jp/en/

Akaike Guest House

The ISM opened Akaike Guest House in June 2010 in the suburban city of Tachikawa in Tokyo to offer researchers visiting from out of the region/country a place to stay that has easy access to their



research sites. The facility was named after the late Dr. Hirotugu Akaike, a renowned statistician, to pay tribute to his wide-reaching and influential achievements in the field of Statistical Science. We hope Dr. Akaike is watching us over as we strive to advance science and try to carry on his legacy. http://www.ism.ac.jp/akaikememorial/guesthouse-e.html

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Inter-University Research Institute Corporation

Research Organization of Information and Systems

2019/2020



https://www.rois.ac.jp/en/ Contact Phone: +81-3-6402-6200 brochure 201912

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

Pioneering Research Frontiers in the Data Age to Solve Modern Society Problems

President's Message

Today, big data and creative use of it hold the key to innovations as it provides new lenses through which to look at our society. The ROIS has worked to build a strong foundation for data and analytics by promoting collaborations among Japanese universities. As an organization that has been on the forefront of "data science" from day one, I believe the Research Organization of Information and Systems (ROIS) will play an increasingly important role within the research community in solving the world' s problems.

We intend to become a main resource for data science for universities through our efforts in the following areas:

- Consolidating and sorting data that are useful to society as well as research universities
- Revolutionizing methodologies for gleaning meaningful knowledge from big data
- Developing real-time technologies for aggregating and processing a large volume of scattered data
- Developing visualization technologies to help people grasp astronomical amount of high-dimensional data

The ROIS opened in 2004 as an inter-university research institute, which is a system unique to Japan. Serving as the umbrella institution for four other inter-university organizations that came together to form the ROIS, we are well-positioned to leverage the expansive network of expertise to promote open science and exploration of new research areas among all national and private universities in Japan.

In 2016, the ROIS created the Office of Strategic Planning to strengthen alliances between the ROIS and the research institutes that it oversees. The ROIS has also founded the Joint Support-Center for Data Science Research(ROIS-DS) to boost partnerships among academic and other types of organizations. The Center works to promote the use and analysis of data in all fields and provides fellowship opportunities for all those interested in joint research projects.

About Inter-University Research Institute

An inter-university research institute helps promote research collaborations and resource sharing among universities across Japan It provides universities with access to cutting-edge equipment, voluminous academic data and hard-to-find research materials that would be difficult for them to obtain and maintain individually. It also offers them support for analysis of such data.

Ur	niversitie		Universit tute Cor					
	Research Centers	Shared Use	NIHU	-	Private Research Institutions			
	Affiliate	Joint Research Postgraduate	NIN	SJoint	Corporate Research Institutions			
	Research Centers	Education Fostering Researcher	KFK	Research	Overseas Universities and Research Institutions			
	Academic	with Specialized Knowledge		_	National Reseach and Development			
De	spartmente		ROIS	5	Agency			

In these productive research environments, the ROIS and the four research institutes strive to foster the next generations of data scientists at Sokendai, for which they serve as some of the core operating organizations.

At the ROIS, we are determined to do our best to advance data science that can be

applied to tackle issues facing modern society. As we take on the 21st Century challenge, it is critical for us to ensure a free flow of ideas and knowledge. For this reason, we intend to encourage Japanese universities and research institutions to pursue collaborative relationships with their counterparts from around the world, as well.

At the ROIS, we are committed to serving as the hub of research related to information and systems in Japan. We hope you will join us in our effort to advance data science through the power of academic partnership.

Sincerely.

Ryoichi Fujii

President of Research Organization of Information and Systems

Research Hub for Academic Institutions

The four research institutes that comprise the Research Organization of Information and Systems have researchers- in-residence from respective fields from various national and private universities in Japan. A total of 2,882 researchers from 530 institutions participated in the residency programs during 2018.

lumber	of	Institutions	and	Joint	Res	earchers	Enrolled i	n
		Inint Roses	arch	Droio	cts	EV2018		

	Joint Research Trojects, T12010										
			Breakdown of organizations to which joint researchers belong								
	Number of Institutions	Total	National Universities	Inter- University Research Institutes	Public Universities	Private Universities	Public Institutions	Private Institutions	Foreign Organizations	Others	
Headquarter	75	144	59	5	8	19	28	11	13	1	
NIPR	147	872	415	5	31	43	255	67	32	24	
NII	154	453	264	20	9	62	29	38	26	5	
ISM	304	827	367	17	52	234	113	32	10	2	
NIG	119	586	334	17	33	120	37	8	37	0	
Total	530	2,882	1,439	64	133	478	462	156	118	32	



Joint Support-Center for Data Science Research (ROIS-DS) Better Future through Academic Partnerships and Collaborations —

The Joint Support-Center for Data Science Research (DS-Center) is an institution that was founded in April 2016 to promote activities of "data science (or Data-drive type research)", those currently being conducted at academics as well as industries. The center contributes to the development and growth of those activities through maximizing the abilities and the activities of data science in the Research Organization of Information and Systems. Our "data sharing initiative" focuses on a variety of

DS Centers and Project

Data Sharing Support Groups

- Database Center for Life Science: Promoting developments of open science and database integrations in life science fields.
- Polar Environment Data Science Center: Promoting various research collaboration with a synthetic database and analysis-support-tools for long-term variation of polar environment in global earth system.
- Center for Social Data Structuring: Building a platform for managing social data, including social survey data, public opinion data, official micro data and social big data. for providing empirical data that solve various social issues.
- Center for Open Data in the Humanities: Sharing data for and from humanities to develop novel approaches for data science-driven humanities, or digital humanities, on an integrated platform that goes beyond organizational and disciplinary barriers.

Data Analysis Support Groups

- Center for Genome Informatics: Supporting computational analysis of genomic/proteomic data (e.g. next-generation sequencing data) based on the state-of-the-art bioinformatics artifices.
- Support Project for Data Fusion Computation: Supporting simulation and modeling studies based on statistical methodologies such as data assimilation and statistical emulation, aiming at solving practical problems in science and industry.

Postgraduate Education

The research institutes provide critical support for The Graduate University for Advanced Studies (SOKENDAI) by bringing together cutting-edge research and education to develop human resource of the next generation

Students in SOKENDAI, The Graduate University for Advanced Studies

NIPR

NII

NIG

25(2)

20(0)

35(11)

158(66)

ISM 65(39)

5

2

7

12

26

Audit Office Office

The number of students is as of May 1, 2018. ※ The number of the bracket is the number of foreigned

Polar Science

Informatics

Statistical Sciene

Genetics

Total





research fields, including life science, polar environments, social science, and humanities. Our "data analysis support movement" provides cutting-edge support for data analysis or data mining that focuses on specialized field such as genome science, and develops and supports cross-disciplinary high-level mathematical methods.DS facility invites publicly-offered joint research every year.

Four Research Institutes in Pursuit of Scientific **Principles and Cutting-edge Research**

National Institute of NIPR Polar Research

Polar regions around the South and North Poles are sensitive to global environmental changes, including global warming, with results that will affect the future of human beings. Focusing on how the global environment forms and how it will change in the future, based on field observations, analysis of materials and samples, parsing of data, and modeling, the institute promotes advanced, integrated, and multi-discipline earth systems science, including geoscience and the environmental, biological, space and planetary sciences. Furthermore, the institute, having observation bases in the Arctic and Antarctic, plays a core role in the Japanese Antarctic Research Expedition (JARE) and Arctic Challenge for Sustainability (ArCS).



- Silica crystallized in the vicinity of the center of the primordial solar disk was discovered for the first time.
- Data from Antarctic ice cores confirmed two pathways through which climatic change propagates from Arctic to Antarctic
- Typhoon track forecasts have been improved by meteorological observations in the North Pole region
- A new species of fungus was discovered on the world's northernmost manned island.
- When auroras burst, electrons from the Van Allen belt intrude down to 65 km above the ground.



(a) Yellow (Si) part on the

ement map, and (b) silicate iineral from which qz on the





In-course prediction of Typhoon #10; the case with (left) and without (right) special



sea" and "mobile phone of tograph of h



manufacturing, and maintenance.

after the burst (right).

The state of aurora burst around 22:20 on 30 June 201 UT. Five minutes before the burst (left) and

NII National Institute of Informatics

NII promotes research in all areas of informatics – from theoretical computer science to such cutting-edge topics as artificial intelligence, big data, IoT (Internet of Things) and cybersecurity – to build the way for "future value creation" in this new study field as Japan's only academic informatics research center. In addition to building and operating networks, such as the Science Information NETwork 5 (SINET5), and offering academic online content and services, NII develops research data infrastructures for open science and information security platforms based on interinstitutional cooperation. NII also focuses on collaboration with universities, research institutions and corporations both inside Japan and overseas.

 New support for medical care using information technology (IT): NII is working on developing a cloud platform of medical image big data using "SINET5" ; further, NII is also studying and developing a medical image analytics technology based on artificial intelligence (AI) technology. • Extending formal methods to manufacturing: NII is applying knowledge from software engineering that can be referred to as "formal methods" for product development, with an objective to support the creation of suitable specifications, designs.



 New method for high-speed synthesis of natural voices : Neural source-filte model uses neural networks to update classical speech-synthesis methods



Figure Overview of cloud platform, Medical institutions, universities, and other organizations use the cloud platform via a high-performance virtual private network (VPN) provided by the Science Information Network, SINET5



Results of evaluated synthesized sounds using MOS method.

Overviews of the four institutes that are on the cutting-edge of polar science, informatics, statistical mathematics and genetics with some highlights of their recent research work

The Institute of Statistical Mathematics

"Statistical mathematics" refers to a science aimed at extracting meaningful information from data in order to gain and develop knowledge that is useful for decision-making. As the only research institute for "statistical mathematics" in Japan, ISM works on both cutting-edge and basic researches and accelerates solutions to academic, societal and industrial problems through the "NOE (Network Of Excellence) Project" in collaboration with other organizations in different sectors. At the same time, ISM conducts the "Project for Fostering and Promoting Statistical Thinking" to develop professional data scientists who lead various research activities.





National Institute of Genetics NIG

"The activity of biological organisms is based on the genetic information.'

Genetics is a science that reveals the mystery of life from the viewpoint of genetic information. NIG conducts state-of-the-art research on cell function, generation/ differentiation, evolution/biodiversity, and genome/bio information; simultaneously, it pioneers new research in the life sciences. Furthermore, NIG, as an international hub for life science research, operates three research infrastructure projects: BioResource Project, Advanced Genomics Project, and Bioinfomation and DNA Data Bank of Japan (DDBJ) Project.



The LEA global map make it easy to explore

patterns in microbial community structures.

(http://leamicrobe.ip/)

DNA polymerase ε (Pol ε) impedes the



 Leading DAT program : We offer an advanced intense course on data science made of lectures and data analysis tasks. Participants will be certified if they attend all the lectures and their submitted report makes the passing mark. It is possible to enroll only in a lecture separately.

 ISM develops the software for materials informatics which equips various APIs including descriptor library, pre-trained models database, algorithms for material exploration by machine learning.

 ISM singed an MOU with the Research Institute for Humanity and Nature (RIHN) to promote the joint research for the evaluation of research capabilities including the humanities and social science, which is, one of the strategies for strengthening initiative in Institutional Research (IR)





 To link environment and microorganism through big data. NIG developed a web tool, "LEA", which searches microorganisms from the "environment" and also predicts the "environment" from microorganisms

• DNA polymerase ε modulates replicative helicase activity at the obstacle: NIG revealed that DNA polymerase ϵ impedes the unwinding of the protein-bound double-stranded DNA by the replicative belicase in the fork-pausing reaction Protocadherin links the brain and eve muscle: NIG revealed that brainstem motor neurons necesarry for eye movements develop using protocadherin 17 protein.

replicative helicase at the obstacle and eventually DNA replication fork pauses



Succeeded in visualizing the abducens motor neurons (green) innervating eye muscles (magenta) in live young fish (zebrafish).

Resource Sharing and Joint Research to Meet the Needs of Universities

We take advantage of the academic research bases as well as global partnerships to make a wide range of research and educational support programs available to universities.



Research Collaborations for Antarctic Observation The 60th party that departed in November 2018 comprised 31 persons from the winter group, 40 persons from the summer group, and 29 fellow travelers, totaling 100 persons. which was the largest contingent even



Resource-sharing in the Artic Region

Joint research projects are projected to be conducted at the Nv-alesund observation base in Svalbard Islands, Norway, including observations of aerosols in the Arctic atmosphere (University of Tokyo, Nagoya University, Fukuoka University) and atmospheric observations by cloud radar (Chiba University). The base was newly built in Fiscal Year 2018 and will be active this fiscal year (2019).



Polar Science Sample Data

The Ice Core Research Center at the NIPR provides assistance for ice-coring and makes coring equipment available. The Institute also offers ice cores collected at the Antarctic Dome Fuji Station and analytic data of the samples. In addition, the NIPR provides samples of meteorites, rocks and minerals to researchers and analyses conducted on the samples with the use of the Sensitive High Resolution Ion Micro Probe(SHRIMP) through the Polar Science Resource Center. The NIPR is the only institution in Japan that uses large-scale computing machine system for polar science and calibrates an optical instrument that uses a large scale integrating sphere



Science Information NETwork (SINET5)

As an inter-university research institute, NII coordinates with academic institutions and the research community to construct and operate the Science Information NETwork (SINETS), the world's most-advanced, high-speed network linked to domestic and international sites. It utilizes this ultra high-speed, high reliability and high performance SINFT5 network to develop and provide cloud infrastructure, an academic content and online services, and promote open science.

Security Systems Grounded on Inter-University Collaboration

NII collaborates with national university corporations to build systems that observe, detect, and analyze cyber attacks waged against SINET. Based on data sharing with related foreign and domestic organizations, NII also provides helpful information to national universities depending on the urgency level and risk of attack. Beyond that, NII trains people in charge of cybersecurity, working to advance their ability to cope with cyber attacks. In this way, we contribute to the construction of systems that enable our national universities to respond promptly to security incidents and accidents.



NiPR



Bioresource and Genetic Modification

The Genetic Resource Center provides various model organisms, including zebrafish, Drosophila, and rice. The center also provides a bioresource database containing information on 6.5 million genetic strains. The division for development of genetic-engineered mouse resource assists in the production of genetically modified mice using advanced genome engineering techniques.



NOE (Network Of Excellence) Project

ISM promotes establishing networks based on MOUs with domestic and foreign research institutions and serving as a hub in the NOE Project in order to advance interdisciplinary research or Statistical A create new research fields for solving complicated problems in Institute modern society.





mematics



Genetic Information Sequencing The Advanced Genomics Center offers the latest sequencing technology and genomic research tools to the research community. To date, the center has produced genome information on more than 450 organisms along with 60 collaborative research projects and implemented human and environmental metagenomics projects

GakuNin RDM

(Research Data Management Service) This service allows researchers to manage research data and related files in their daily research activity. In addition to the basic file management functionality, a variety of external research tools and storages can be connected and utilized from this single platform. Managed files in GakuNin RDM can be deposited to the JAIRO Cloud by means of simple and easy operation, so as to facilitate researcher's Open Science activity in Japan.





Supercomputer System and the Information resource

ISM provides the "Supercomputer system for statistical science" for joint use. The information resource includes various kinds of magazines and books in statistical science. ISM also provides databases of academic citations for enhancing IR



Project for Fostering and Promoting Statistical Thinking

The institute also provides advice on statistical analysis for industries, government, and academia. It provides various programs, such as "research collaboration startup" that educates young scientists via OJT and the "data science research plaza" that welcomes researchers from companies, for fostering the human resources that are required in the era of big data.



Support for the Usage of Genomic Information

The Bioinformation and DDBJ center is the only repository that contains nucleic acid sequencing data in Japan, and provides genome sequences. next-generation sequencer data, and personal genome information. The center provides supercomputer optimized for bio-application such as next-generation genome sequencing analyses and human genome analyses. Every year, it is used by more than 600 users in 120 research institutions.