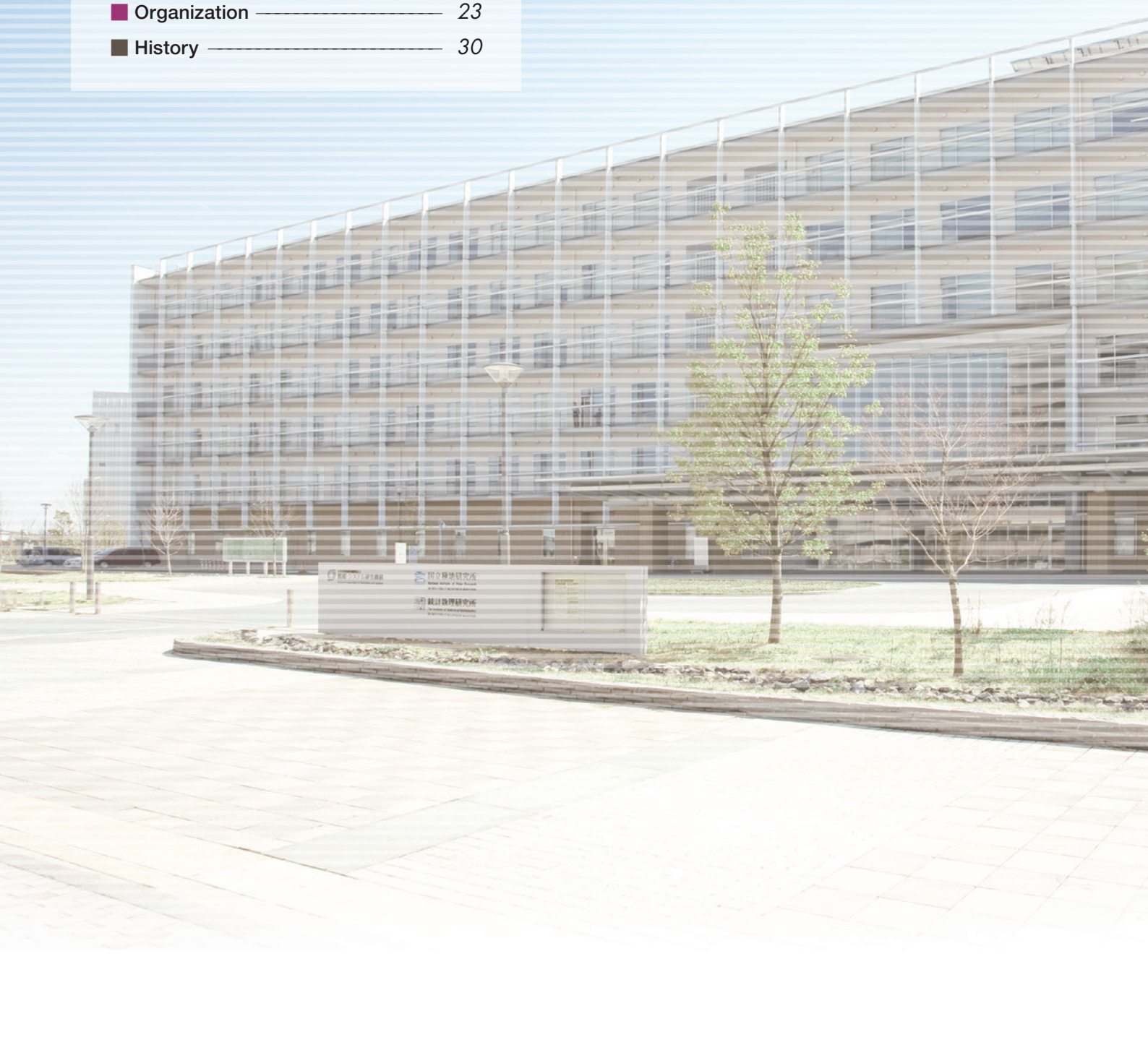
Research Organization of Information and Systems

The Institute of Statistical Mathematics

2024
-2025

CONTENTS

- Message from Director-General — 1
- Institute Overview — 2
- Research Topics — 4
- ISM Projects — 10
  - NOE (Network Of Excellence) Project
  - Project for Fostering and Promoting Statistical Thinking
  - Project for Training Experts in Statistical Sciences
- Research Cooperation — 16
- Graduate School Program — 18
- Facilities and Equipment — 21
- Finance and Buildings — 22
- Organization — 23
- History — 30



Message from Director-General

Since the Institute of Statistical Mathematics (ISM) was established under the management of the Ministry of Education in June 1944, ISM has pursued distinctive activities to meet the needs of the times and environment. This year marks its 80th anniversary. ISM has consistently focused on developing novel mathematical methods for data acquisition, interpretation, modeling, and decision-making to serve a wide range of disciplines. Statistical and mathematical sciences do not exist in a vacuum. Building on the efforts of generations of researchers, ISM has embraced the belief that a "mathematical understanding of reality and facts paves the way to discovering the truth." Our primary mission is to create new outstanding mathematical models and approaches that help reconstruct the reality and facts and consequently, contribute to the progress of fundamental science.

Based on discussions to advance our primary mission, we made a strategic decision to reorganize our three departments in March 2024, looking ahead to ISM's 100th anniversary. Specifically, this reorganization aims to (i) establish a framework that enhances ISM's research potential and social applications of research findings, (ii) shape and enrich the academic societies and associations of statistical and mathematical sciences, and (iii) support and maintain ISM's research activities in scientific arenas that require collaboration with us.

The main feature of this reorganization is the creation of the Department of Advanced Data Science, which is directly supervised by the Director-General. This department hosts two centers for advanced research: the Research Center for Statistical Machine Learning and the Research Center for Materials Informatics. The former promotes cross-disciplinary activities, while the latter is dedicated to research in specific areas. We are also planning to launch the Virtual Laboratory, which will facilitate dynamic collaborations between the two centers and their networks of partnering institutions. In addition, it will not only support leading theoretical and methodological studies of ISM and other institutes but will also advance applications to specific research fields. Thus, the Virtual Laboratory will function as a leading research hub and catalyze synergistic research endeavors.

Statistical and mathematical sciences connect researchers from diverse backgrounds as it naturally lends itself to interdisciplinary applications. Thus, another aspect of our mission is to develop and apply powerful statistical and mathematical methodologies to overcome social challenges through various multidisciplinary and industry-government-academia collaborations. Utilizing the networks established through the Network Of Excellence (NOE) Project, we will continue to advance national and international joint activities as the hub with an emphasis on multidisciplinary integration and creation of new disciplines.

Quite different from other countries, Japan's higher education system did not provide postgraduate statistics programs until recently. To meet the academic demands of Japan, ISM has offered various programs to develop and train statisticians as part of its core activities. Initiatives include the Project for Fostering and Promoting Statistical Thinking and the Project for Training Experts in Statistical Sciences. The former covers a wide array of advanced audiences. The latter focuses on faculty and staff development. These activities to expand statistical literacy and expertise will gain momentum as another facet of ISM's mission. The first-term enrollment in the Project for Training Experts in Statistical Sciences was comprised of junior researchers with various specialties from 29 institutions. They received their certificate of completion diplomas in September 2023. Now, we are formulating the graduate curriculum and statistical education systems for the 29 institutions participating in the project. We have high expectations for the continuation and expansion of this time-limited project.

In May 2023, the coronavirus disease 2019 (COVID-19) was legally recategorized as a Class 5 Infectious Disease. This reclassification has lifted the ban on domestic and international travel and visits, allowing us to resume in-person academic interactions and meetings. We strive to make social contributions through the research and education activities that take advantage of ISM's features.

We sincerely ask for your continued understanding and support.

Hiroe Tsubaki
Director-General
The Institute of Statistical Mathematics

Basic Research

Department of Advanced Data Science

We established Department of Advanced Data Science with two centers for cross-disciplinary research in advanced academic fields and for collaborative research in specific fields. Through collaboration between the centers, we will form a world-class research base that will generate synergistic development of theory, methods, and practice in statistical and mathematical sciences. The base will bring together researchers in statistical and mathematical sciences and other sciences to promote academic fusion, the development of new fields, and open innovation, transcending the boundaries of disciplines, organizations, and national borders.

Research Center for Statistical Machine Learning

We promote fundamental research on statistical machine learning, and advance research on various topics ranging from deep learning and next-generation foundational models as core technologies of artificial intelligence to the theories and methods of mathematical optimization as a basis for machine learning technology. Furthermore, we will drive cooperative projects forward in scientific and industrial fields, where advanced statistical machine learning can be distinctively demonstrated, including astronomical data science in collaboration with the National Astronomical Observatory.

Research Center for Materials Informatics

We are establishing a globally unique research hub that integrates advanced statistical machine learning technologies, researchers from academia and industry in the field of materials science, and a world-class materials database. The research goals include the creation of innovative technologies in materials informatics and the development of new materials that contribute to solving environmental and energy issues and promoting sustainable development in society. Additionally, we are forming an industry-academia consortium to develop the world's largest polymer property database using RadonPy, an open-source software that fully automates computational experiments on polymer materials.

Department of Fundamental Statistical Mathematics

We conduct research activities on the development and utilization of statistical models, and on the theory and applications of statistical inference and underlying optimization. We also aim to contribute to the development of statistical mathematical science by constructing its mathematical foundations, aiming at the fusion of these research fields and the pioneering of new research fields.

Statistical Modeling Group

A variety of statistical models have been proposed for diverse types of data. Especially in recent years, there is a growing need to extract detailed insights by taking advantage of the increasing size and complexity of data, and therefore, it is required to develop statistical models that are more flexible and more versatile, and to establish computational methods to use such models. This research group conducts research activities on the development and utilization of such statistical models.

Statistical Decision-Making Group

In order to make rational decisions from data, it is important to make reasonable statistical inferences, such as estimation, testing, and model selection, based on appropriate statistical models. In addition, for statistical inference, the optimization of minimizing the loss associated with the inference is important. This research group conducts research activities on the theory and applications of such statistical inference and optimization.

Department of Interdisciplinary Statistical Mathematics

The Interdisciplinary Research Division in Statistical Mathematics focuses on complex phenomena using advanced statistical and mathematical techniques. Aiming to bridge theoretical advances in mathematical statistics with practical applications, the division strives to uncover new insights and address real-world challenges in three key areas: humanities and social sciences, biological and medical sciences, and engineering and information sciences. Each area has its own specialized group.

Humanities and Social Sciences Group

The Humanities and Social Sciences Group develops statistical and mathematical methods to transform humanities and social sciences. This group not only advances economic, financial, and social survey statistics but also explores language, psychology, and education. By analyzing data from diverse sources, modeling for information extraction, and studying decision-making, the group seeks to elucidate hidden structures in social phenomena, augment society's understanding of such phenomena, and enhance predictive accuracy.

Life Sciences and Environmental Sciences Group

The Life Sciences and Environmental Sciences Group applies statistical mathematics to tackle complex problems in biology, medicine, and environmental sciences. Techniques such as probability theory, mathematical modeling, and statistical optimization are utilized to address vital issues, including biodiversity conservation, ecosystem sustainability, environmental management, disease mechanisms, and medical technology development. This group creates new theories and practical solutions that contribute to society.

Information Sciences and Engineering Group

Department of Interdisciplinary Statistical Mathematics

The Sciences/Engineering/Informatics Group employs advanced statistical mathematical methods in applied research in physical science, engineering, and information science. To advance the theories and methodologies of statistical mathematics to solve engineering problems and foster technological innovation, this group investigates key scientific issues in these fields through data assimilation, statistical machine learning, spatiotemporal data analysis, and differential privacy.

NOE-type Research

Risk Analysis Research Center

We are conducting research projects to scientifically mitigate the risks that modern society is facing. Our project activities include the following: data analysis related to seismology, finance, environmental science and resource management; research on the theoretical and practical aspects of analyzing spatiotemporal data; development of general statistical methods for risk analysis; and data collection and linkage. Additionally, we operate a research network organization on risk analysis to facilitate interdisciplinary research with the shared objective of establishing a safe and resilient society.

Research Center for Medical and Health Data Science

Research Center for Medical and Health Data Science aims to facilitate statistical data science research that covers medical studies, drug developments, health care, and public health. Our research projects involve fundamental mathematics and computational science for medical applications, applied methodology for basic, clinical and social medicine, and modern technology such as artificial intelligence, machine learning, and big data analyses. Furthermore, our research center aims at constructing a research network of the academic community of this field, as well as offering advanced statistical education programs.

Professional Development

School of Statistical Thinking

The mission of the School of Statistical Thinking is to plan and implement various programs for statistical thinking, from extension courses to a professional development program. The researchers affiliated with the school are often involved with specific data analysis projects, which help them to gain hands-on knowledge of data science. We expect such an researcher will play an active role as a leading researcher in various area with expertise in data science.

Center for Training Professors in Statistics

The Center has established the nationwide consortium of universities and promotes the Project for Training Experts in Statistical Sciences to address the critical shortage of professors in statistics, which form the core of data science. Within 5 years from the start of the project, the Center will develop at least 30 university professors in statistics, who will train experts in statistical sciences at member universities of the consortium. The Center aims to establish a virtuous cycle of professional development.

Research Support

Center for Engineering and Technical Support

The Center for Engineering and Technical Support assists academics and their collaborators in many ways: managing computer systems and networks, editing and publishing journals, maintaining the library, and managing tutorial programs.

Computing Facilities Office The Computing Facilities Office is in charge of managing computer facilities and scientific software.

Computer Networking Office The Computer Networking Office is responsible for computer networking and its infrastructure, and network security.

Information Resources Office The Information Resources Office is responsible for maintaining a library and an electronic repository, and is in charge of planning statistical tutorial programs open to the public.

Media Development Office The Media Development Office is in charge of publishing and editing of research results and PR brochures.

Fusion of Deep Learning and Kernel Methods

■ Representation of probability distributions through kernel mean embeddings

Kernel methods, which analyze data by embedding data into a feature space to utilize higher-order statistic, were developed around the year of 2000. Subsequently, a method known as kernel mean embedding was developed to represent not just data but probability distributions, advancing kernel methods to various probabilistic inferences (Reference).

In probabilistic inference, conditional distributions are often handled, and an extension called "conditional mean embedding" is used. When input and output variables are given, conditional mean embedding maps these variables into a high-dimensional (often infinite-dimensional) feature space via kernels, providing a nonparametric and flexible representation of the conditional distribution. This method has been proven effective in probabilistic inference tasks and causal inference tasks.

However, there are several issues with conditional embedding. Firstly, the computation of the Gram matrix inversion required by standard estimation methods becomes impractical with large data sets. Secondly, the performance in applications depends on the choice of hyperparameters, such as the smoothness of the kernel, and inappropriate settings can degrade performance. Additionally, applying standard methods for selecting hyperparameters, such as cross-validation, is challenging in this case.

■ Conditional mean embedding combined with deep learning

To address these issues, we propose an effective integration of conditional mean embedding with deep learning. The core idea is based on viewing the computationally intensive inverse matrix calculation as a regression problem that can be solved with neural networks (Figure 1). This approach not only avoids the inverse matrix computation but also leverages the superior feature learning capabilities of deep learning. Our method can be implemented simply by modifying the error function to use a kernel function, compared to standard neural network training procedures. Additionally, we provide a method for appropriately selecting kernel parameters for the output variables.

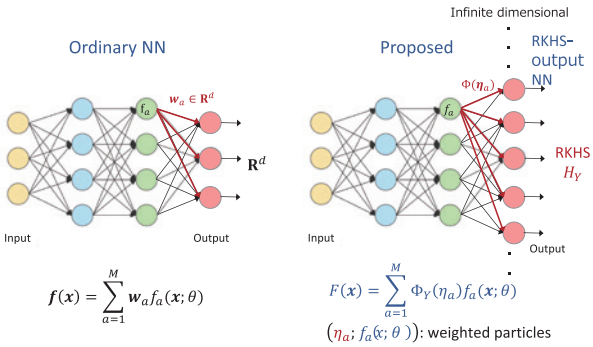


Figure 1: (Left) Ordinary neural network. (Right) Feature-space-valued neural network.

■ Application to distributional reinforcement learning

We not only demonstrate that our proposed method yields results comparable to other methods in standard conditional density estimation tasks but also apply it to distributional deep reinforcement learning. While the traditional reinforcement learning uses the expected sum of rewards as the evaluation, the distributional reinforcement learning estimates the distribution of the sum of rewards to learn policies, showing high effectiveness in literature. Our method, when applied to estimating the distribution of reward sums, enables learning more suitable policies than conventional methods like CDQN and MMDQN in experimental benchmarks of simple control problems (Figure 2).

Reference: K. Muandet, K. Fukumizu, B. Sriperumbudur. Kernel Mean Embedding of Distributions: A Review and Beyond (Foundations and Trends in Machine Learning), Now Publishers 2017.

Kenji Fukumizu

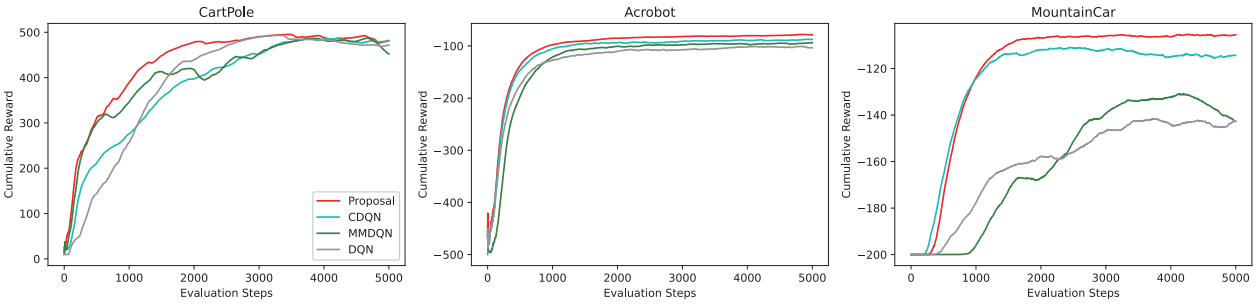


Figure 2: Comparison of the algorithms with three different data sets. The horizontal axis is the number of observations, and the vertical axis is the cumulative reward. The proposed method (red line) performs better than or as well as the compared methods.

Prediction and Discovery of New Materials through Machine Learning

■ Materials Informatics

The parameter space in materials research is vast. For example, it is estimated that there are approximately 10^{60} candidate molecules in the chemical space of organic small molecules. Furthermore, in the development of more advanced materials, their parameter space exponentially increases with the addition of design parameters such as compositional selection, catalyst selection, and process conditions. The goal of Materials Informatics (MI) is to identify design parameters that exhibit desired material properties from such vast exploration spaces.

The basic workflow of MI consists of forward and inverse problems. In the forward problem, material properties are predicted from any given design variables. The objective of the inverse problem is to seek the inverse mapping of the forward predictive model to identify design variables with desired properties. Researchers at the Research Center for Materials Informatics have identified various kinds of forward and inverse problems in materials research from a unique perspective of data science and have discovered various new materials, including polymer materials [1] and quasicrystalline materials [2-4], while building methodologies and technologies of data science [5-9].

■ Shortage of data resources in data-driven materials research

Data on materials research are extremely scarce compared to data from other fields such as image recognition and natural language processing. There are several reasons for this, for example, the high cost of data acquisition in experiments or simulations and the lack of incentives for researchers to share data. Overcoming the latter barrier, in particular, requires a cultural shift, making it difficult to resolve the shortage of data resources in the short to medium term.

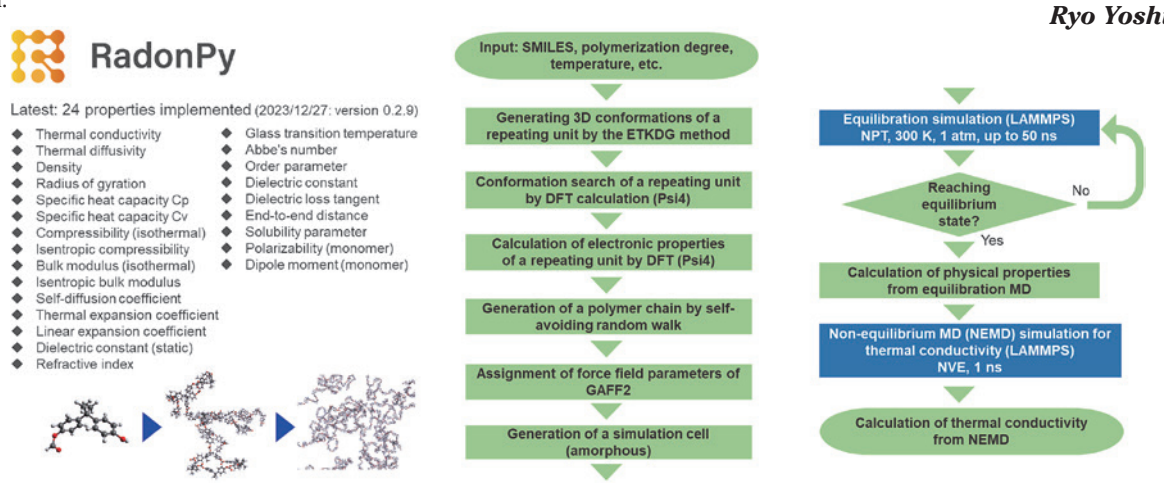
■ Creation of a polymer property database using all-atom molecular dynamics simulations

In MI, integrating a large amount of computational experimental (simulation) data is effective in overcoming the lack of experimental data [2,3,6]. Currently, the development of large-scale computational property databases targeting various material systems is underway. However, for polymer materials, the technical challenges of automating computer experiments and the huge computational costs have hindered the development of comprehensive databases.

Our group is developing the software RadonPy, which fully automates the calculation of polymer properties using all-atom classical molecular dynamics simulations [5]. Currently, led by our group, a consortium comprising approximately 200 participants from 6 universities and 33 companies has been formed to jointly develop the world's largest polymer property databases, using RadonPy and the supercomputer Fugaku, The goal is to create a systematically designed database encompassing various systems and physicochemical properties composed of over 100,000 polymer species. Upon achieving this goal, we will be able to observe the joint distribution of multiple properties in the vast material space. For example, we can comprehensively investigate polymer structures forming the Pareto frontier between different properties, potentially discovering unique materials beyond the Pareto frontier. Through academia and industry collaborations, we will realize this mission.

Reference: [1] Ikebata et al., J Comput Aided Mol Des 31, 379–391 (2017).
[2] Yamada et al., ACS Cent Sci 5, 1717–1730 (2019).
[3] Aoki et al., Macromolecules 56, 5446–5456 (2023).
[4] Minami et al., Adv Neural Inf Process Syst 30 (2023).
[5] Hayashi et al., npj Comput Mater 8, 222 (2022).
[6] Wu et al., npj Comput Mater 5, 66 (2019).
[7] Liu et al., Adv Mater 33, 2102507 (2021).
[8] Liu et al., Phys Rev Mater 7, 093805 (2023).
[9] Uryu et al., Adv Sci 11, 2304546 (2024).

Ryo Yoshida



Fully automated computer experiments for polymeric materials using RadonPy.

From Integral Geometry to the Geometry of Random Fields

■ What is integral geometry?

Integral geometry is a branch of geometry that deals with invariants under congruent transformations. For example, in the figure below, the area ($=\varphi_2(S)$), the perimeter ($=2\varphi_1(S)$), and the Euler number $\chi(S)(=\varphi_0(S))$ of S are invariants.

Fig 1: Euler number
# of connected components = 3
# of holes = 2
$\chi(S) = 3 - 2 = 1$.

Conversely, it is known that under certain conditions, the invariants are written as their weighted sums (Hadwiger's theorem). This fact is so powerful that famous formulas such as Crofton's formula, Poincaré's formula, Steiner's formula, and the kinematic fundamental formula are derived from this theorem. The triplet $(\varphi_2,\ \varphi_1,\ \varphi_0)$ is called the Minkowski functional.

■ Geometry of random fields

When a random variable is defined at each point in a plane (or space), the whole set of the random variables is called a random field. Mathematically, this is a random variable $X(t)$, $t \in T \subset \mathbb{R}^2$ with a vector index $t = (t_1,\ t_2)$. The set of indices T_v such that the value of the random field is greater than or equal to a certain threshold v is called the excursion set. The geometry of random fields deals with the excursion set (Robert Adler).

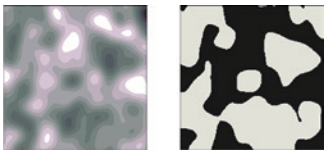


Fig 2:
Isotropic random field (left) and its excursion set (right).

If the random field is isotropic, i.e., its stochastic properties do not change under translations, rotations, or mirror images, then it can be treated within the framework of integral geometry. Specifically, the expected Minkowski functional of the excursion set can be explicitly expressed. In particular, the expectated Euler number is

$$\mathbb{E}[\chi(T_v)] = \sum_{j=0}^{2} \varphi_j(T)\Xi_{2-j}(v), \qquad (*)$$

where $\Xi_j(v)$ is called the Euler number density, and when $X(t)$ is Gaussian, it is expressed by the Hermite polynomial and the density function of the Gaussian distribution.

In [1], [3], when $X(t)$ is isotropic but weakly non-Gaussian, $\Xi_j(v)$ is given in the form of an asymptotic expansion using 3- and 4-point correlation functions.

■ An application in astrophysics

Equation $(*)$ has various applications in statistical inference. Here, we explain its application in astro- physics.

In Fig. 3, the upper panels show the Gaussian (left) and non-Gaussian (right) random fields generated by random numbers, and the lower panels show the sample Euler number (blue) of the excursion set for a threshold $v \in (-4,\ 4)$ and its theoretical value (orange) under the assumption of Gaussianity. The discrepancy between the two curves on the right side is due to the wrong Gaussianity assumption. By comparing the sample curve and the theoretical curve, we can determine (test) whether the distribution is Gaussian or non-Gaussian.

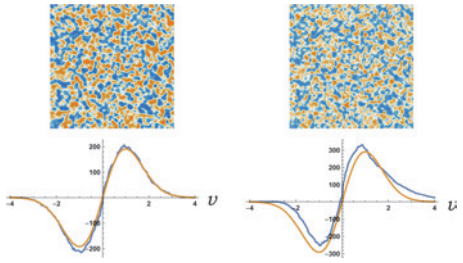


Fig 3: Gaussian random field (left) and Non-Gaussian random field (right).

The cosmic microwave background (CMB) displayed in Fig. 4 reflects the temperature fluctuation of the primitive universe, and is considered to be close to an isotropic Gaussian random field. The exact distribution has the information of the primitive universe. Euler curves (Genus curves) and Minkowski functions are examined to confirm the plausibility of the primitive universe model.

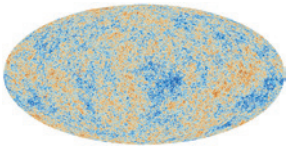


Fig 4:
Cosmic Microwave Background (CMB) (Copyright PLANCK).

For this purpose, cosmological simulators were conventionally used to estimate the curves, but these were computationally very expensive. The asymptotic expansion formulas ([1], [3]) using 3- and 4-point correlation functions now can replace such calculations ([2], Fig. 5).

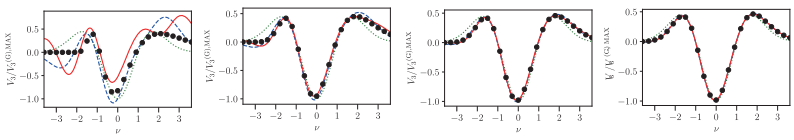


Fig 5: Euler curves by Simulations (dot) and asymptotic expansion (solid line)
Radius of smoothing kernel R = 10, 20, 30, 40h^{-1}Mpc.

References: [1] Satoshi Kuriki and Takahiko Matsubara. Asymptotic expansion of the expected minkowski functional for isotropic central limit random fields. *Advances in Applied Probability*, pp. 1–25, 2023.

[2] Takahiko Matsubara, Chiaki Hikage, and Satoshi Kuriki. Minkowski functionals and the nonlinear perturbation theory in the large-scale structure: Second-order effects. *Phys. Rev. D*, Vol. 105, p. 023527, Jan 2022.

[3] Takahiko Matsubara and Satoshi Kuriki. Weakly non-gaussian formula for the minkowski functionals in general dimensions. *Phys. Rev. D*, Vol. 104, p. 103522, Nov 2021.

Satoshi Kuriki

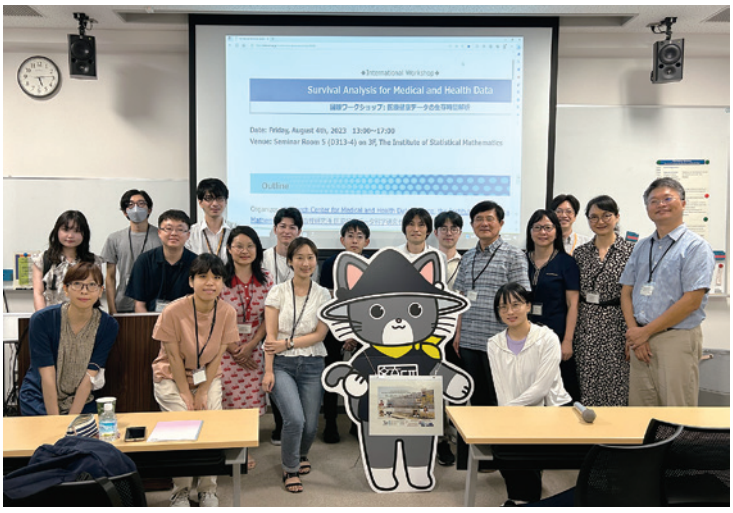
Research Center for Medical and Health Data Science

Pursuing the Advancement of Medical and Health Data Science

■ Medical and health data science and the center's mission

In recent years, expectations regarding data science have been growing in various fields, including medical and health sciences. These days, the application of deep learning and other cutting-edge AI technologies to the analysis of molecular/medical big data is widely expected to sharply accelerate the elucidation of biological and disease mechanisms, the development of medical technologies, including drug discovery, and the realization of precision medicine. In the meantime, we should not forget the critical role of obtaining solid evidence on medical technology from high-quality small data derived through careful study design and statistical inference. While it is considered that expectations regarding medical and health data science will continue to grow, the framework of data science has yet to be established to fully meet such expectations; hence there is a big gap to be filled. That is to say, the enhancement of education and research in medical and health data science is our great challenge for the future.

e-learning website.



International Workshop: Survival Analysis for Medical and Health Data (2023.8).

The Research Center for Medical and Health Data Science was established in April 2018 based on research and researcher education in data science and on the network of Japanese and foreign researchers that the Institute of Statistical Mathematics has established over many years. The Center's mission is to promote projects that enhance education and research in medical and health data science in Japan. Since its establishment, the Center has been involved in a variety of educational and research activities thus far.

■ Educational and research activities

In the area of education, the Center has been promoting the development of various educational programs, such as systematic education courses, intensive training courses, consulting from practitioners of statistics, and so forth, on theories and methods of statistical mathematics, biostatistics, theoretical epidemiology, and machine learning, topics that form the basis of medical and health data science. In addition, the Center has developed e-learning materials to be shared with the research community.

In the research sector, the Center has been actively working on a variety of projects, such as those involving statistical methodologies pertaining to advances in medical technology and healthcare, as well as research in public health and social medicine. Additionally, the Center is involved in big data analysis using cutting-edge machine learning and AI algorithms, and is performing studies on foundational mathematics and computer technologies.

■ Medical and Health Data Science Research Network

All of the above projects are linked with the activities of the newly launched "Medical and Health Data Science Research Network." This unique network comprises 104 organizations (as of March 2024), including related academic societies, universities, and research institutions in all parts of Japan, as well as hospitals and companies. The substantial advancement of medical and health data science depends on the organic collaboration of researchers in the fields of statistical mathematics and information science and those in the fields of medical and health science. The Center intends to make every possible effort to play an important part in bridging these fields.

Shigeyuki Matsui

Space Weather Reanalysis Data Project

■ Space weather

Radiation and magnetic fields in space, which are disturbed due to solar activity, have an impact on satellites, aviation, and ground power transmission networks. These disturbances in space are referred to as Space Weather. Predicting Space Weather is one of the important disaster prevention challenges in modern society. Today, under the leadership of the World Meteorological Organization (WMO), Space Weather forecasting is conducted by meteorological agencies in various countries. In Japan, the National Institute of Information and Communications Technology (NICT) is responsible for this forecasting task.

■ Space weather numerical models

Numerical models have been developed for Space Weather forecasting as well. The numerical models deal with the behavior of ionized gases (solar wind) emitted from the sun, which affect the ionized gases and electromagnetic fields around the Earth.

Space Weather numerical models were developed in the 1990s to study the physical processes of Space Weather phenomena. These models are now used for forecasting. However, the precision of Space Weather numerical models remains insufficient compared to meteorological numerical models. One reason for this is the substitution of several physical mechanisms causing Space Weather phenomena with empirical parameters.

■ Space weather reanalysis

We have endeavored to determine these empirical parameters through data assimilation. The application of data assimilation to Space Weather numerical models has not yet been widely practiced worldwide. Figure 1 illustrates the result (distribution of ionospheric electrical conductivity). This result produces the highest reproducibility of ionospheric observations by numerical models.

The calculations we performed, optimizing and recalculating the model, are referred to as Space Weather reanalysis data. This data is indispensable for studying the physical processes of Space Weather phenomena, where observational data is extremely limited. However, a challenge remains in overcoming the time-consuming nature of Space Weather numerical model calculations, especially for the practical implementation of iterative data assimilation.

■ New developments

As a solution to the computational time issue in Space Weather numerical models, Kataoka of National Institute of Polar Research (NIPR) and others developed the emulator that estimates ionospheric variations from the solar wind parameters for these models using machine learning techniques based on multiple Space Weather reanalysis data. Additionally, leveraging Space Weather forecasting data stored at NICT, more advanced emulators have been created. This development was announced in a press release by NIPR (https://www.nipr.ac.jp/english/info/notice/20240227.html). Through this emulator, it becomes possible to estimate the characteristics of space weather phenomena inductively and provide instantaneous numerical forecasts. Leveraging the advantages of both global reanalysis data and local, inductive emulators will be crucial for future research and forecasting in Space Weather.

Shigeru Fujita

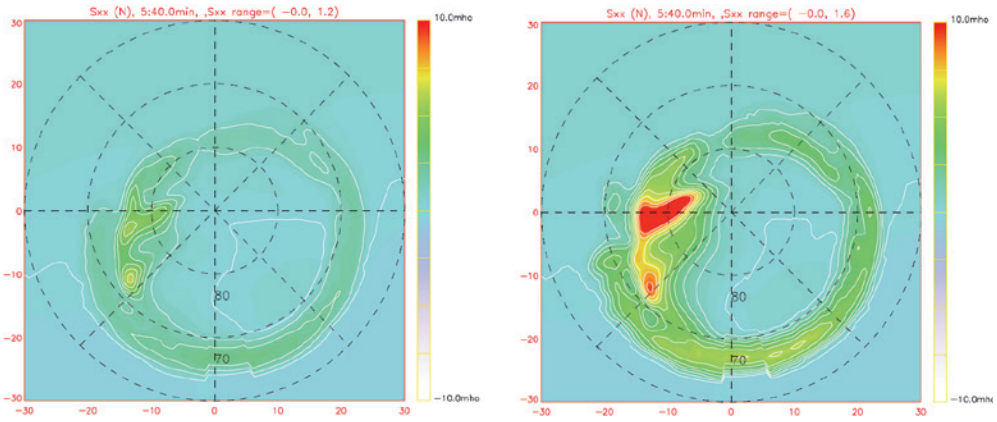


Figure 1: Ionospheric Pedersen conductivity distribution in the northern hemisphere in 2015/09/20 event obtained in the numerical model. The center is the geomagnetic north pole. Bottom, right, top, and left of each figure designate midnight (0H), 05H, noon (12H), and 18H, respectively. Dotted concentric circles denote geomagnetic latitudes of 80, 70, and 60 degrees. (left) before the data assimilation, (right) after assimilation.

Data Lifecycle Management for Social Survey Data

■ Open data and social surveys

Current global and social trends are to widely publish research papers (open science) besides making academic research data publicly available for sharing and utilization (open data). Accordingly, academic research data in the social sciences, such as social surveys, should also be available through their registration in repositories after protecting personal information using the necessary measures. In Japan, the Cabinet Office is taking the lead in steadily promoting converting academic research data into open data based on the findable, accessible, interoperable, and reusable (FAIR) principles— principles of data sharing. Under the initiative, the submission of a data management plan (DMP), stipulating how research data will be shared and made public after completing a research, has become a prerequisite for data release for public research funding.

■ What is a DMP?

A DMP is a document defining “how research data will be managed and operated” during a research and “how data will be made public” after the research.

To realize open access to academic research data, an appropriate DMP-based management throughout the data life cycle (Figure 1) in the research process is considered important, including data collection, management, operation, and dissemination. Hence, DMPs are becoming the global standard, describing not only how data is released, but also requiring quality assurance of the released data, measures to protect personal information, and data curation, among others (Figure 2).

■ Lifecycle management of social survey data

Traditionally, social survey data have been studied within a data life cycle assuming they are used by individual researchers or a limited group of researchers, owing to the possibility of containing personal information. However, to meet society's future demand for an "open access to academic research data," researchers must construct a new data life cycle considering the openness of social survey data and must manage it appropriately.

The Institute of Statistical Mathematics, in cooperation with the Center for Social Data Structuring (ROIS-DS), supports researchers and academic institutions in converting social survey data into open data while studying the reconstruction of the social survey process to promote an open use of social survey data.

Yasuhiro Tanaka

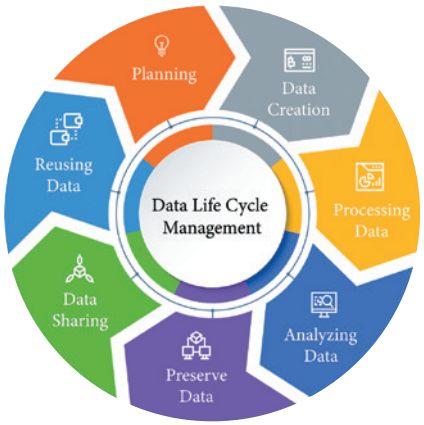


Figure 1: Data Life Cycle Management
(Courtesy Center for Social Data Structuring, ROIS- DS).

Figure 2: Example of a DMP– Economic and Social Research Council (ESRC), UK (Author’s diagram based on ESRC DMP items).

For Promoting Interdisciplinary Research and for Solving Social Problems with Industry-Academia-Government Collaborations

■ Background and History

It was in the 2000s that Japanese academia promoted the Center of Excellence (COE) and related programs in order for Japanese universities and research institutions to compete with world-class universities in education and research activities.

The Institute of Statistical Mathematics (ISM) has taken the COE to the next level by establishing the Network Of Excellence (NOE), a network of professionals and facilities that promotes more advanced research in both individual and cross-disciplinary fields, develops interdisciplinary research and the creation of new research fields. In 2005, ISM launched our first project in the field of risk research.

ISM set the original goal to establish the "NOE in Statistical Mathematics" beyond the field of risk research. It was the earnest beginning of the "NOE Project" in 2010. Initially, NOE focused on research and educational activities in five areas: Risk Research, Next-Generation Simulation, Survey Science, Statistical Machine Learning, and Service Science. At that time, ISM had the biaxial structure, where the horizontal axis were basic research departments and the vertical axis were NOE-type research centers. The basic research departments focused on fundamentals or "tools" in statistical and mathematical sciences, which were then applied in various fields. The latter conducted collaborative activities in fields at the interface between statistical and mathematical sciences and other sciences to solve immediate and concrete social problems.

The structure of the NOE Project has been periodically reviewed against backdrop of social and community's needs. Consequently, NOE-type research centers are reorganized in an evolutionary manner.

Currently, we have established NOE in the fields of Risk Research, Next-Generation Simulation, Survey Science, Statistical Machine Learning, Data Science for Creative Design and Manufacturing, and Medical and Health Data Science, and which promotes research and education activities including cooperation with the Joint Support-Center for Data Science, ROIS (Figure 1).

■ Management Structure and Domestic and International Collaboration

ISM has set the goal for this NOE Project whose importance is to fulfill the goal of the establishment

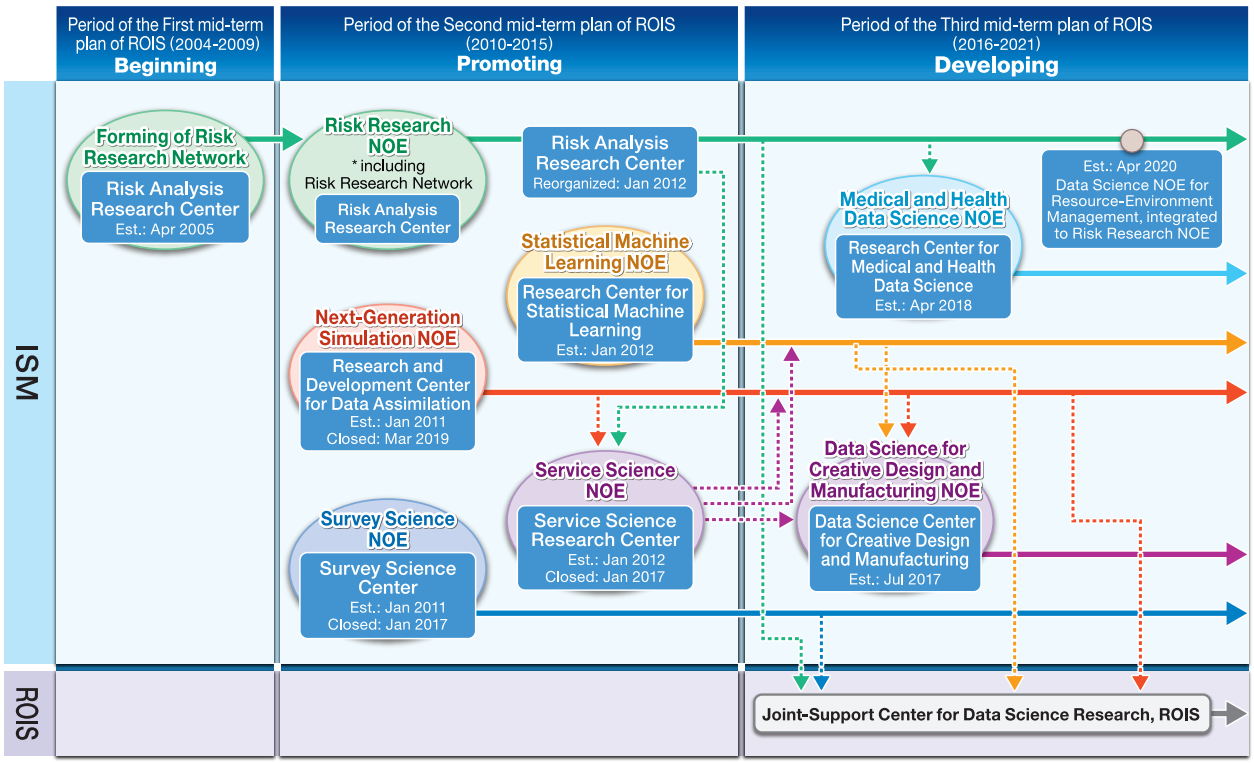


Fig. 1: Brief history of NOE Project (as of February 2024).

of new scientific methodologies ("Fourth Paradigm: Data Science") in a knowledge-based society, where the importance of knowledge goes beyond merely solving individual problems. The NOE activities are being systematically pursued under the unified guidelines formulated by the Managing Committee of NOE Project. We also commission experts from the industrial, academic, and government sectors to be members of the Advisory Board of NOE Project, and their advice helps us to promote the project much more effectively (Fig. 2).

The number of Memoranda of Understanding (MOUs) with research organizations in Japan and overseas is increasing every year. Exchanges with partner institutions, particularly, academic exchanges encompassing multiple NOE domains provide significant opportunities to integrate different research fields and create new ones.

ISM, which aims to conduct "comprehensive research in statistical and mathematical sciences" is required in all fields. Due to the nature of its involvement in diverse fields, ISM's research extends beyond the boundaries of humanities and sciences. ISM also contributes to society by developing its research in a comprehensive and efficient manner while flexibly responding to changing demands.

In March 2024, ISM underwent a significant reorganization, which involved a complete overhaul of the three basic research departments, now collectively known as "Fundamental Research Departments". We also plan to launch a separate initiative, the Virtual Laboratory Project. The Virtual Laboratory Project will establish the world's top collaborative research base that promotes synergistic academic development of theories, methods, and applications in statistical and mathematical sciences, and that aims to be a place for organic collaborations of network research activities that bring together researchers from inside and outside ISM.

Moreover, we have been reflecting on the future management and development of the NOE Project within ISM. Now is the time to plan reforms to further expand the network with each community and refine the structure to focus on supporting priority collaborative research.

The NOE Project website provides an overview of the project, its history, activity reports, and advice from the Advisory Board. New information will be posted. We hope that you are looking forward to the NOE Project of ISM, and are grateful for your continued support.

https://www.ism.ac.jp/noe/project/en/

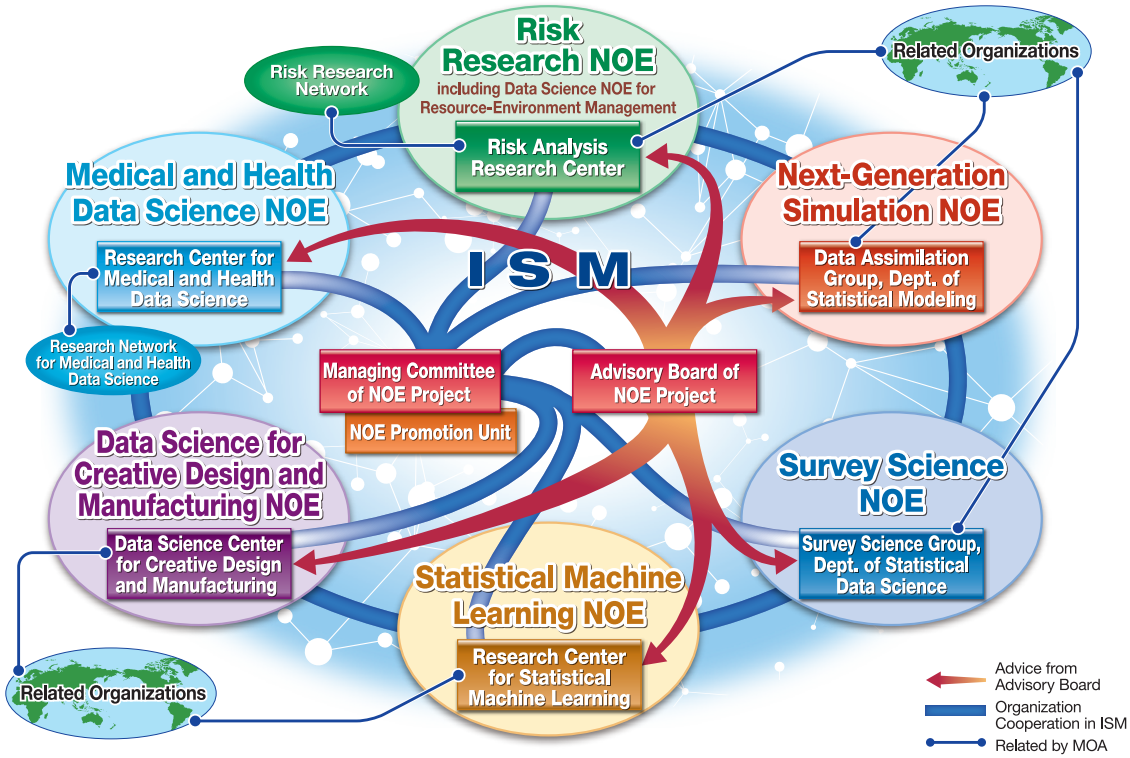


Fig. 2: Outline diagram of the NOE Project (as of February 2024).

Project for Fostering and Promoting Statistical Thinking

Rapid development of information and communication technology has led to the explosion of data. Now surrounded by "Big Data", everybody is expected to "think statistically". More than ever, there is a need for data scientists who can handle such big data and are able to extract useful knowledge from it. Meanwhile, Japanese higher education is exhibiting a deplorable lack of production capacity in terms of data scientists. This can be accounted for by the fact that, until quite recently, no academic institution other than ISM had a Ph. D. course in statistics and the small number of statisticians in academia are isolated from each other, being scattered over various disciplines. Hoping to gain a little traction on this problem, ISM established the School of Statistical Thinking, into which we integrated all of our educational resources. In FY 2016, ISM established the Managing Committee of School of Statistical Thinking, inviting contributions from outside experts, and in FY 2017 we launched the Leading DAT program by adopting the suggestions by the committee. In FY 2020, we launched online courses. The following are the principal projects.

Research Collaboration Startup

The Institute had already been providing a consultation service for statistical science, but along with the launch of the School of Statistical Thinking in November 2011, this service was reorganized as a research collaboration startup. This program, being one of the projects to foster and promote statistical thinking, is mainly aimed at supporting applied scientists and other non-experts. Expert statisticians affiliated with the Institute give them advice on statistical modeling, data analysis, and research. Some cases have developed into official research collaborations, which are our primary duty as an inter-university research institute. The Institute accepts around 25 cases annually, some of which benefit society in diverse ways.

Leading DAT

In FY 2017, the School of Statistical Thinking launched a program called "Leading DAT" aimed at training data scientists with the knowledge and skills in statistical mathematics required by modern society. In FY 2023, we held three Leading DAT lectures and three Leading DAT free lectures online, entitled "L-A. Basics of Modern Statistics", "L-B. An Introduction to Statistical Modeling", "L-S. Spatiotemporal Statistical Models: From the Basics to Recent Developments", and "L-X1. Markov Chain Monte Carlo Methods: Review of Fundamentals and Recent Developments", "L-Y1. Introduction to Combinatorial Optimization — On the Subject of submodular Maximization", "L-Y2. Introduction to Statistical Analysis of Directional Data". Additionally, lecture videos and supporting videos for the first two days of the 2021 L-A course are available on YouTube free of charge.

Open-type Professional Development Program

This is a spin-out program from ISM cooperative research projects. Establishing a goal is an indispensable element of the proposal of a cooperative research project. On the other hand, such goal setting is irrelevant for a summer school program, study session, or retreat. Since the launch of the School of Statistical Thinking, organizers of such group-oriented study programs can apply to the Open-type Professional Development Program. There are two categories under this program: one is 'workshop' and the other is 'intensive training for young researchers'. For FY 2023, ten workshops have been accepted after review.

Data-scientist-type Researcher Training Project of The Graduate University for Advanced Studies

The Graduate University for Advanced Studies (SOKENDAI) launched a program to train researchers in data science in FY 2023. Postdoctoral researchers employed at other institutes conduct joint research with our institute's faculty members and participate in our educational program. The School of Statistical Thinking is cooperating in the project as the implementing agency on the Institute's side.

Statistical Mathematics Seminar Series

The Institute holds weekly seminar series on statistical mathematics every Wednesday. The seminars are led by in-house and external lecturers to showcase their latest studies. These lectures are currently held online. To view the seminar schedule and learn more about the program, please visit the Institute of Statistical Mathematics website.

https://www.ism.ac.jp/index_e.html

Some seminars are streamed online from the seminar room.

Data Science Research Plaza

Researchers funded by private-sector firms can maintain a desk and phone in the School of Statistical Thinking. This program is subject to fees, and the contract can be renewed annually. A faculty mentor gives advice to the accepted funded researcher so that he or she can freely attend various events, such as seminars, workshops, conferences, and extension courses. After learning the expertise of the ISM research staff, participants in this program are invited to take advantage of paid consultations and funded research collaboration.

Tutorial Courses

The education program at ISM dates back to 1944, the year of founding. The Ministry of Education installed a training center within ISM to foster technicians in numerical computation. After the World War II, this training center was relaunched in 1947 to develop pollsters and census takers. It helped to cultivate professionals in the field of statistical surveys, while a growing number of entries from business and industry coming for various types of training were also observed.

Now the tutorial courses are operated by the School of Statistical Thinking, which was established in 2011.

In FY 2023, 10 lectures were held and the number of participants was 643. The total numbers of lectures and courses held from 1969 to March, 2024

were 411 and 5 respectively, with a total of 30,556 participants. These lectures covered a wide range of fields from basic to applied statistics. The schedule of tutorial courses can be found on the website of the Institute of Statistical Mathematics.

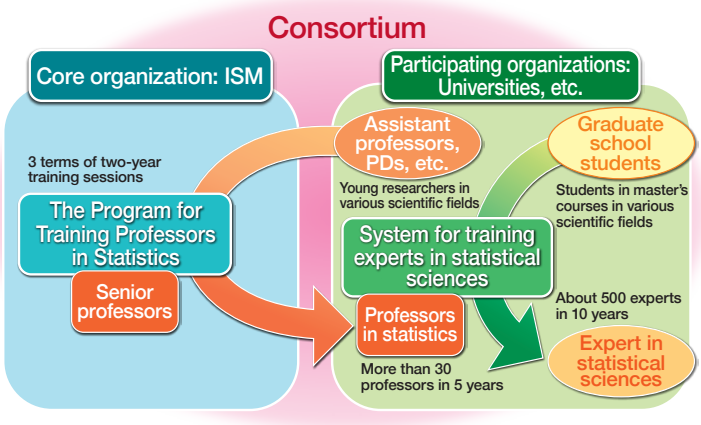
https://www.ism.ac.jp/lectures/kouza.html

Project for Training Experts in Statistical Sciences

Many universities have recently established data science departments and faculties. This has led to a shortage of expert faculty members in statistics, which are the core of data science. To address this issue, the Institute of Statistical Mathematics (ISM) has launched the "Project for Training Experts in Statistical Sciences" with the support of the Ministry of Education, Culture, Sports, Science and Technology (MEXT).

In this pioneering project, ISM trains young researchers in various academic fields at universities and research institutes across Japan to become "professors in statistics". These professors in statistics will give lectures on statistics, which is the foundation of data analysis, to master students of graduate schools and supervise academic research using statistics, which will develop "experts in statistical sciences" at universities and research institutes nationwide. Then these experts will leverage statistics to contribute to academic research and industrial promotion.

The goal of the project is to establish a virtuous cycle of professional development in the field of statistics. This project strives to develop at least 30 professors in statistics over the 5-year project period and to train approximately 500 experts in statistical sciences over a 10-year period, including the project period.



Project framework.

■ Consortium for Training Experts in Statistical Sciences

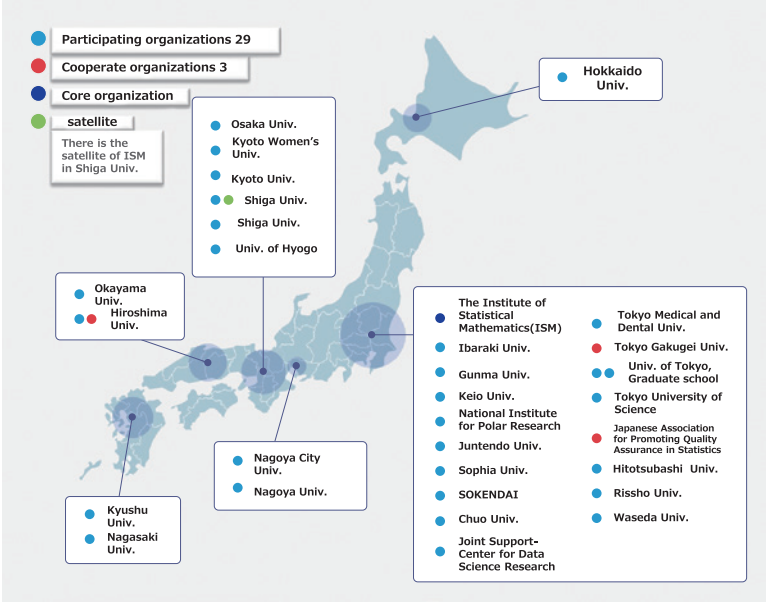
In August 2021, ISM established the "Consortium for Training Experts in Statistical Sciences" to promote the project in cooperation and collaboration with universities and research institutes nationwide. The Consortium consists of the core organization, participating organizations, and cooperating organizations. At the core of the Consortium is ISM. Universities and research institutes nationwide are either cooperating organizations if they participate in the development of education programs or participating organizations. When the Consortium was established, there were 21 participating organizations. Today there are 29 participating organizations.

In January 2022, ISM established the "Center for Training Professors in Statistics" as an official internal organization to ensure smooth operation of the Consortium. ISM also established a satellite at Shiga University as a base for training in western Japan.

■ Statistics Professors Training Program

ISM provides the "Statistics Professors Training Program", which is a two-year program to train young researchers in various academic fields at universities and research institutes nationwide to become professors in statistics. The program is to support three cohorts. The first cohort, which started in October 2021, involved 6 senior professors training 12 young

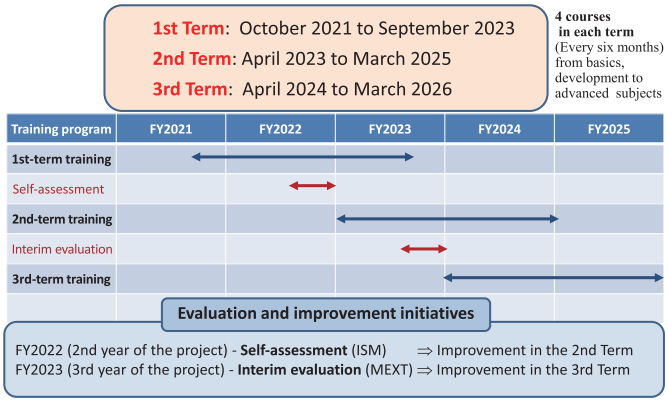
The number of participating institutions has expanded **from 21** at the time of establishment **to 29 in two years**



Members of Consortium for training experts in Statistical Sciences.

researchers. The second cohort, which started in April 2023, included 8 senior professors training 13 young researchers. The third cohort, attended by 14 young researchers, started in April 2024.

The program aims to improve the trainees' knowledge of statistics, strengthen their ability to give lectures on statistics, and enhance their skills to conduct academic research using statistics. To improve teaching abilities, trainees repeatedly give "mock lectures" in which they take on the role of a teacher and lecture on various statistics topics to accumulate experience. Additionally, trainees attend lectures in advanced data science areas such as statistical causal inference and acquire knowledge about programming languages such as Python and R.



The Program for Training Professors in Statistics – Schedule.

The goal of training is not to develop "statisticians" majoring in statistics. Instead, the program strives to develop university faculty members who can educate students on statistics and supervise academic research using statistics while respecting the trainees' academic fields of specialization such as engineering, medicine, pharmacy, economics, and literature.

■ Workshop and Presentation of Trainees' Achievements

Each year, the Consortium holds a "Workshop for the Development of Statistical Experts Training System". Here, trends in statistics education in other countries and the status of the development of statistics education programs at leading universities in Japan are shared to help universities and research institutes develop experts in statistical sciences. In 2022, the Consortium also hosted an invited lecture series by prominent overseas researchers in the fields of statistics and data science education.

Trainees of the Statistics Professors Training Program present their research results based on the skills they have refined through the program at various academic conferences such as the Japanese Joint Statistical Meeting organized by the Japanese Federation of Statistical Science Associations, and the Interim Professional Development Report Meeting organized by ISM.

■ Project Evaluations

In 2023, the Ministry of Education, Culture, Sports, Science and Technology conducted an interim evaluation of the project. The project received the highest overall rating of 'S', indicating progress beyond the original plan and further excellent results are expected with the continuation of the project. The consortium's activities were highly evaluated, including the fact that the results to date far exceeded its initial targets. In September 2023, the project was awarded the 19th Statistical Activity Award of the Japan Statistical Society. If the project's initiatives proceed smoothly, then the major roadblock of the "shortage of professors in statistics" will surely be overcome. The project was recognized as a highly commendable activity in the field of statistics at large.

■ Initiatives of Consortium Participating Organizations

The actual situation of statistics education at consortium participating organizations is diverse. Some have established graduate schools of data science, while others have developed statistics education programs across graduate schools. Additionally, a few organizations provide some statistics education at each graduate school. Because the goal is for participating organizations to develop educational programs for the systematic study of statistics, various efforts are being made. These include curricula reviews, the development of teaching materials, and provision of computers and software necessary for data analysis.

Graduate students who have completed a systematic course in statistics through this statistics education program are designated as Experts in Statistical Sciences regardless of their specialty. Additionally, graduate students who receive guidance directly from professors in statistics who trained through the Statistics Professors Training Program are also designated as Experts in Statistical Sciences.

International Cooperation

Associated Foreign Research Institutes

Organization name	Address	Conclusion date
The Statistical Research Division of the U.S. Bureau of the Census	USA (Washington)	July 27, 1988
Stichting Mathematisch Centrum	Netherlands (Amsterdam)	May 10, 1989
Institute for Statistics and Econometrics, Humboldt University of Berlin	Germany (Berlin)	December 8, 2004
The Steklov Mathematical Institute	Russia (Moscow)	August 9, 2005
Central South University	China (Changsha)	November 18, 2005
Soongsil University	Republic of Korea (Seoul)	April 27, 2006
University of Warwick	United Kingdom (Coventry)	January 16, 2007
Indian Statistical Institute	India (Kolkata)	October 11, 2007
Institute of Statistical Science, Academia Sinica	Taiwan (Taipei)	June 19, 2008
Department of Empirical Inference, Max Planck Institute for Biological Cybernetics	Germany (Tubingen)	August 11, 2010
Department of Communication Systems, SINTEF Information and Communication Technology	Norway (Trondheim)	January 30, 2012
University College London	United Kingdom (London)	February 16, 2012
Department of Electronics and Telecommunications, Norwegian University of Science and Technology	Norway (Trondheim)	May 22, 2012
Department of Probability and Mathematical Statistics, Charles University in Prague	Czech Republic (Prague)	October 10, 2012
Department of Ecoinformatics, Biometrics and Forest Growth of the Georg-August University of Goettingen	Germany (Goettingen)	October 18, 2012
Korean Statistical Society (KSS)	Republic of Korea (Seoul)	July 9, 2013
Toyota Technological Institute at Chicago	USA (Chicago)	February 10, 2014
Australian National University	Australia (Canberra)	May 15, 2014
RiskLab ETH Zurich	Switzerland (Zurich)	February 7, 2015
Institut de Recherche en Composants logiciel et matériel pour l'Information et la Communication Avancee	France (Paris)	February 9, 2015
Centre de Rechereche en Informatique, Signal et Automatique de Lille	France (Paris)	February 12, 2015
University College London Big Data Institute	United Kingdom (London)	February 26, 2015
The Institute of Forestry, Pokhara of Tribhuvan University	Nepal (Pokhara)	March 6, 2015
The Institute of Forest and Wildlife Research and Development of the Forestry Administration of Cambodia	Cambodia (Phnom Penh)	March 6, 2015
Forest Inventory and Planning Institute of Vietnam	Vietnam (Hanoi)	June 2, 2015
Zuse Institute Berlin	Germany (Berlin)	June 20, 2016
The University of Porto	Portugal (Porto)	June 22, 2016
National University of Laos	Laos (Vientiane)	March 15, 2017
Institute of Geophysics China Earthquake Administration	China (Beijing)	April 28, 2017
Hong Kong Baptist University	Hong Kong (Kowloon Tong)	August 28, 2017
Unversidade de Évola	Portugal (Evola)	November 30, 2017
The Korean Association for Survey Research	Republic of Korea (Seoul)	February 14, 2018
The Jean Golding Institute for data-intensive research, University of Bristol	United Kingdom (Bristol)	January 15, 2019
Survey Research Center, Sungkyunkwan University	Republic of Korea (Seoul)	February 25, 2019
University of Lampung	Indonesia (Lampung)	March 6, 2019
Department of Earth and Space Sciences, Southern University of Science and Technology	China (Shenzhen Shi)	March 25, 2019
Université Bretagne Sud	France (Lorient)	March 29, 2019
North Carolina State University	USA (Raleigh)	November 13, 2019
Singapore-ETH Centre	Singapore	March 18, 2020
Department of Actuarial Studies and Business Analytics, Macquarie University	Australia (Sydney)	December 21, 2020
EURECOM	France (Sophia Antipolis)	August 25, 2021
The University of Texas at Dallas,School of Economic, Political and Policy Sciences	USA (Dallas)	March 11, 2022
Universität Ulm	Germany (Ulm)	February 20, 2023

Associated Foreign Research Institutes

Organization name	Address	Conclusion date
Laboratoire de Mathématiques Blaise Pascal, University of Clermont Auvergne	France (Clermont-Ferrand)	March 13, 2023
Istituto Nazionale di Oceanografia e di Geofisica Sperimentale (OGS)	Italy (Sgonico)	March 30, 2023
Laboratoire de Mathématiques de Bretagne Atlantique (LMBA)	France (Brest)	February 12, 2024
Timber Pricing Branch, Government of British Columbia, Canada	Canada (Victria)	March 13, 2024
Dept. of Forest Management and Remote Sensing, Czech University of Life Science Prague	Czech Republic (Prague)	March 13, 2024

Research Collaboration

ISM performs many activities for collaborating with researchers in the various fields of statistical science, from the individual level to the national level. The ISM cooperative research program regularly performs research activities to provide the research resources of ISM to researchers at universities or research institutes in order to advance their academic research. Available research resources include books, journals, supercomputers, some commercial statistical software packages, as well as statistical packages developed by ISM, and also the researchers in ISM themselves, who have abundant professional knowledge and experience in statistical science and data analysis. The ISM cooperative research program provides not only research support funds but also opportunities for the various researchers in many fields who require statistical knowledge to make use of the resources available at ISM. ISM's aim is to be a place for interaction and fusion among researchers inside and outside of ISM, and to contribute to multidisciplinary development of both the theory and the application of statistical science.

■ Number of Activities

Year	2018	2019	2020	2021	2022	2023
Number of Activities	166	178	145	143	122	125

■ Fields of Research Collaboration

Research collaboration is classified by research field as follows. Applicants can use the table below to find the most appropriate type of project.

ISM Fields

Number	Fields
a	Prediction and Control Group
b	Complex System Modeling Group
c	Data Assimilation Group
d	Survey Science Group
e	Metric Science Group
f	Structure Exploration Group
g	Mathematical Statistics Group
h	Learning and Inference Group
i	Mathematical Optimization Group
j	Others

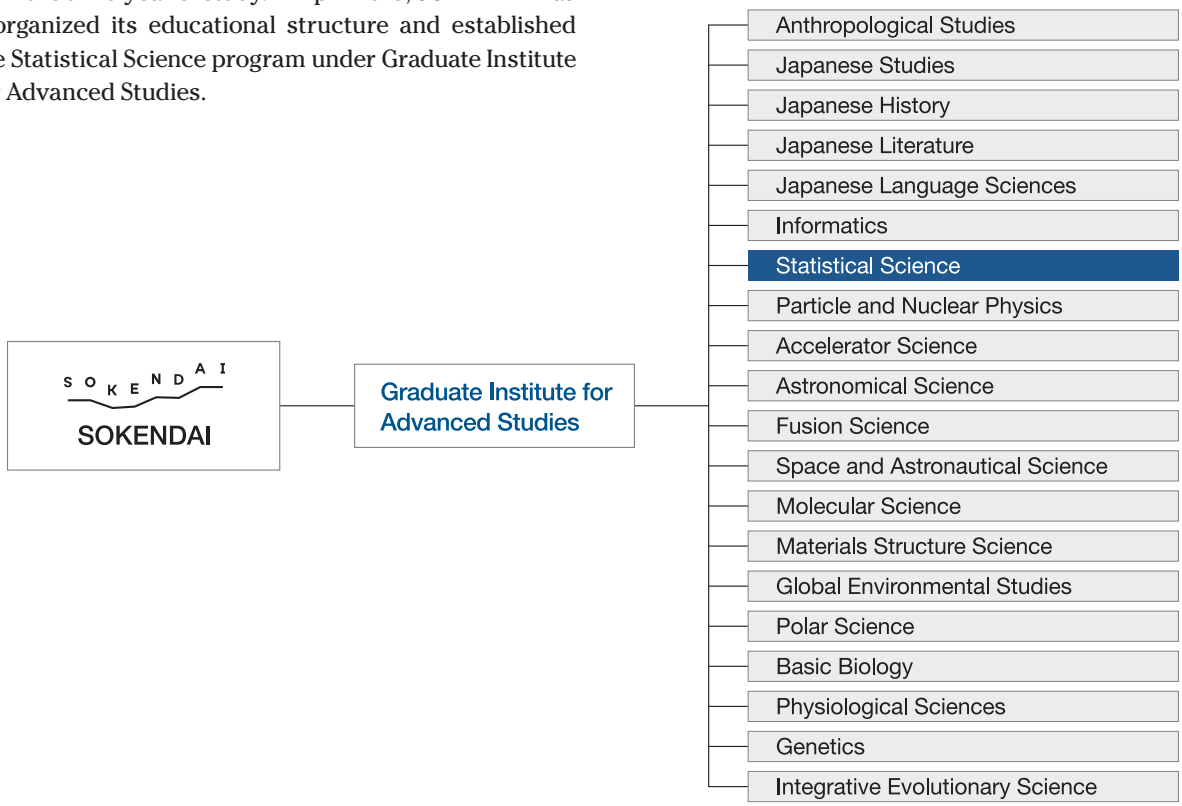
Major Research Fields

Number	Fields	Major Research Domains
1	Statistical mathematics	Mathematical theory of statistics, optimization, etc.
2	Information science	Algorithms, use of computer in statistics, etc.
3	Biological science	Medicine, pharmacy, epidemiology, genetics, etc.
4	Physical science	Space, planet, earth, polar region, materials, etc.
5	Engineering	Mechanics, electronics, control, chemistry, architecture, etc.
6	Human science	Philosophy, art, psychology, education, history, geography, culture, language, etc.
7	Social science	Economics, law, politics, society, management, official statistics, population, etc.
8	Environmental science	Environmental statistics, environmentrics, agricultural statistics, statistical meteorology, land economics, landscape management, forest management, etc.
9	Others	Other research fields

Graduate School Program

Organization

The Institute of Statistical Mathematics is one of the platforms of SOKENDAI (The Graduate University for Advanced Studies; the headquarters in Hayama, Kanagawa), which was opened in October 1988 to offer graduate education. Since its opening, the Institute has included the Department of Statistical Science and, since April 1989, has accepted students for education and research in doctoral programs. In 2006, the Institute adopted a five-year system, offering either a five-year education and research program, or a three-year education and research program starting from the third year of study. In April 2023, SOKENDAI has reorganized its educational structure and established the Statistical Science program under Graduate Institute for Advanced Studies.



Outline of Education and Research

The Statistical Science program, which is based on the Institute of Statistical Mathematics (ISM) serving as its underlying platform, aims to cultivate individuals who possess creative research skills to contribute to solving various important intricately-intertwined problems. To this end, the program conducts education and research related to the basis, mathematics and applications of data collection designs, modeling, inference and prediction, and equip students with the ability to extract information and knowledge from the real world based on the effective use of data.

Field of Education and Research	Contents
Advanced Data Science	We conduct educational and research activities in the theories, methods, and applications of advanced data sciences, focusing on statistical machine learning, mathematical optimization, and their applications in various sciences.
Fundamental Statistical Mathematics	We conduct education and research activities on the development and utilization of models that probabilistically represent the variation of diverse data, as well as on the theory and applications of statistical inference and optimization for making rational decisions from data.
Interdisciplinary Statistical Mathematics	We are dedicated to exploring the vast landscape of statistical mathematics, focusing on both its foundational theories and methodologies. Our interdisciplinary educational and research activities are designed to equip students with the skills to apply these principles across a diverse range of fields, including humanities and social sciences, biological, medical, and environmental sciences, as well as engineering and information sciences. This approach prepares students to tackle complex problems in various domains using the power of statistical analysis.

Features of Education and Research

- Statistical Science program is one of the few comprehensive doctoral programs in statistical science in Japan, and has accepted students from a wide range of academic fields. Education and research in all aspects of statistical science is conducted by faculty members specializing in a variety of fields, from theory to application.
- The Institute of Statistical Mathematics, the platform for the program, is equipped with a world-class super computer, as well as a variety of software, including original statistical software developed by the Institute.
- The Institute of Statistical Mathematics has an extensive library covering a wide variety of journals and books on statistical and mathematical sciences.
- The Institute of Statistical Mathematics, as a joint research institute, frequently holds research meetings and seminars presented by visiting professors and researchers from Japan and abroad. Students are encouraged to participate in these seminars and interact with the presenters.
- Students have the opportunity to participate in different research projects through collaborations with other universities and research institutes.

Requirements for Graduation in/after AY 2023

3-year doctoral program

To be enrolled at the Graduate Institute for Advanced Studies for more than three years (excluding the period of leave of absence).

To earn at least 16 credits, including 12 credits of Dissertation Work in Advanced Studies ⅢA~VB.

5-year doctoral program

To be enrolled at the Graduate Institute for Advanced Studies for more than five years (excluding the period of leave of absence).

To earn at least 42 credits, including 20 credits of Dissertation Work in Advanced Studies IA~VB.

To receive the necessary research guidance and pass an examination for a doctoral thesis.
To make full payment for the tuition fee (excluding students with the exemption of the tuition fee).

Number of Students (As of April 1, 2024)

5-year doctoral course:Quota,2

Year of enrollment	2021	2022	2023
Number of students	1	1	1

3-year doctoral course:Quota,6

2018	2019	2020	2021	2022	2023	2024
2 ②	4 ④	1 ①	3 ②	9 ⑦	9 ⑥	3 ②

* The figures in circles indicate those who are employed by other organizations.

University Background of Students

National and public universities

• Hokkaido University (5) • Tohoku University (5) • Fukushima University (1) • University of Tsukuba (8) • Saitama University (1) • Chiba University (1) • Ochanomizu University (1) • National Graduate Institute for Policy Studies (1) • Tokyo Medical and Dental University (1) • Tokyo University of Marine Science and Technology (1) • Tokyo Gakugei University (2) • Tokyo Institute of Technology (6) • The University of Tokyo (30) • Tokyo Metropolitan University (1) • Tokyo University of Agriculture and Technology (1) • Hitotsubashi University (7) • Shizuoka University (1) • Kanazawa University (1) • Japan Advanced Institute of Science and Technology (1) • Nagoya University (4) • Toyohashi University of Technology (2) • Kyoto University (9) • Osaka City University (1) • Osaka University (3) • Nara Institute of Science and Technology (1) • Okayama University (2) • Shimane University (3) • Kyushu University (5) • Oita University (1) • The University of Electro-Communications (2) • University College London (1) • University of London (1)

University Background of Students

Private universities

• Aoyama Gakuin University (1) • Kitasato University (1) • Keio University (8) • International Christian University (1) • Shibaura Institute of Technology (1) • Sophia University (1) • Chuo University (9) • Tokyo University of Science (7) • Toyo University (1) • Japan Women's University (1) • Nihon University (2) • Hosei University (7) • Waseda University (9) • Nanzan University (1) • Osaka Electro-Communication University (1) • Kansai University (1) • Kyoto Sangyo University (1) • Ritsumeikan University (1) • Okayama University of Science (1) • Kurume University (1)

Foreign universities

• Aston University (1) • University of California, Irvine (1) • California State University, Long Beach (1) • University of Campinas (1) • University of Colorado Boulder (2) • University of Dhaka (2) • University of Hawaii (1) • Jahangirnagar University (2) • University of Malaya (1) • Northeast Normal University (1) • Ohio University (2) • University of Rajshahi (2) • Stanford University (1) • The University of Nottingham (1) • Zhejiang University (1) • Institute of Applied Mathematics, AMSS, CAS (1) • University of Science and Technology of China (1) • Center for Analysis and Prediction, China Seismological Bureau (1) • Northeastern University (1) • The Hong Kong University of Science and Technology (1) • China University of Geosciences (1)

Degrees Awarded

Year	2017	2018	2019	2020	2021	2022	2023
Doctor of Philosophy	7	5	5	5	4	7	10

Alumni

National and public universities, and public organizations

• Obihiro University of Agriculture and Veterinary Medicine • University of Tsukuba • University of Hyogo • The University of Tokyo • The University of Electro-Communications • Saitama University • Nagoya University • Kyushu University • Kyushu Institute of Technology • University of the Ryukyus • The Institute of Statistical Mathematics • Tohoku University • Yokohama National University • Hokkaido University • Tokyo Institute of Technology • Hiroshima University • Oita University of Nursing and Health Sciences • JAXA's Engineering Digital Innovation Center • Kyoto University • Nara Institute of Science and Technology • Bank of Japan • Japan Broadcasting Corporation • Railway Technical Research Institute • Statistical Information Institute for Consulting and Analysis • Government Pension Investment Fund • Public School • RIKEN • Statistics Bureau of Japan • Pharmaceuticals and Medical Devices Agency (PMDA) • National Institute of Information and Communications Technology

Private universities

• Sapporo Gakuin University • Tokyo Health Care University • Meiji University • Doshisha University • Josai University • Nihon University • Komazawa University • Aichi University of Technology • Tokyo University of Information Sciences • Shibaura Institute of Technology • Rikkyo University • Waseda University • Keio University • Tokyo Medical University

Foreign universities

• Jahangirnagar University • Victoria University • Massey University • University of Otaga • Statistics New Zealand • University of Rajshahi • University of California, Los Angeles • Asia-Pacific Center for Security Studies Department • Central South University • Hong Kong Baptist University • University of South Carolina • The University of Warwick

Private companies, etc.

• Hitachi, Ltd. Central Research Laboratory • NTT Communication Science Laboratories • Seiwa Kikaku • NLI Research Institute • Mizuho Trust and Banking • Nomura Securities Co., Ltd. • ATR Computational Neuroscience Laboratories • Toyota Motor Corporation, Higashi-Fuji Technical Center • Schlumberger Limited • Macquarie Securities, Japan • Non-Life Insurance Rating Organization of Japan • Barclays Global Investors • Open Technologies Corporation • Yamaha Corporation • Goldman Sachs Asset Management L.P. • CLC bio Japan, Inc. • MUFG Bank, Ltd. • Pfizer Japan Inc. • Doctoral Institute for Evidence Based Policy • Sony Corporation • NTTIT Corporation • Sompo Japan Insurance Inc. • Qualicaps Co.,Ltd. • Bridgestone Corporation • Brain Pad Inc. • Sumitomo Chemical Co.,Ltd. • PricewaterhouseCoopers Aarata • Mitsubishi Tanabe Pharma Corporation • Daiichi Sankyo Co.,Ltd. • Shizuoka Cancer Center • CPC Clinical Trial Hospital, Medipolis Medical Research Institute • CRD Association • Japan Society for the Promotion of Science • Tokyo Electric Power Company Holdings, Inc. • Asahi Kasei Corporation • Honda R&D Co.,Ltd. • Yokogawa Electric Corporation • Kao Corporation • Advanced Smart Mobility Co., Ltd. • NEC Corporation • Janssen Pharmaceutical K.K. • Taisho Pharmaceutical Holdings • Otsuka Pharmaceutical Co., Ltd. • Kyowa Kirin Co., Ltd. • KOSÉ Corporation • Novartispharma K.K. • Nikkei Inc. • Mizuho–DL Financial Technology Co., Ltd. • Daicel Corporation • Aichi Steel Corporation

Facilities and Equipment

Computational Resources (As of August 1, 2024)

ISM operates a supercomputer system suitable for analyzing large-scale datasets called the Supercomputer System for Statistical Science. The current system is HPE Cray XD2000, which was introduced in March 2024. It has been fully operational since June 2024. Its predecessor, an HPE SGI8600 system, was decommissioned in February 2024. HPE Cray XD2000 is a distributed-memory parallel computer with a total theoretical peak performance of 1.563 PFLOPS. The system is liquid cooled and consists of 212 computing nodes. Each node has two 96-core CPUs (AMD EPYC 9654) and 768 GB memory.

In March 2021, we introduced the Communal Cloud Computing System to provide a computing environment that is easy for each user to use and customize. This system is equipped with 64 computing nodes (HPE ProLiant DL385 Gen 10 Plus; total theoretical computing performance of 154.0 TFLOPS), and each node has two 32-core CPUs (AMD EPYC 7452), 1 TB of main memory, and an SSD with 20 TB of usable capacity.

In March 2023, we launched the Supercomputer System for Data Assimilation to advance the analysis of large-scale data without parallel programming. This is a distributed shared-memory computer with a large memory, which can be accessed from any CPU. This system is equipped with two HPE Superdome Flex computing nodes and has a total theoretical computing performance of 154.8 TFLOPS. Each node is equipped with 32 28-core CPUs (Intel Xeon Platinum 8280L) with a main memory of 48 TB, and an SSD with 880 TB of usable capacity.

In the main office building, the primary local area network (LAN) consists of an Ethernet network using 10GBase-SR for the main trunk and 1000Base-T for branches. The personal computers in researchers' offices and the supercomputer system are all connected to this network. A wireless LAN system is also available in the immediate area of the building occupied by ISM. These LAN systems enable distributed processing and allow computing resources and statistical data to be used effectively. Comprehensive network security methods have been implemented, such as a firewall system, anti-virus software, and an intrusion prevention system. To encourage joint research with researchers both in Japan and abroad, as well as the exchange of e-mails, the network is connected to the Internet through SINET6 (100Gbps).

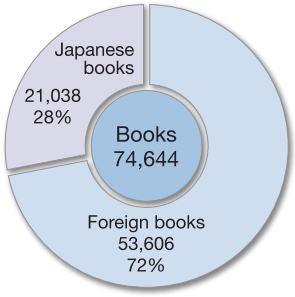
Supercomputer System for Statistical Science (HPE Cray XD2000)

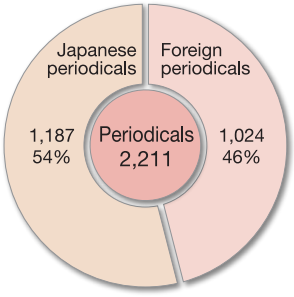
Library and Materials (As of April 1, 2024)

We have a large number of major Japanese/foreign journals covering a wide variety of fields including statistics, mathematics, computer science and informatics. In addition, we also have a large library consisting of books on humanities, social science, biology, medical science, science and engineering.

Besides contributed to Japanese and foreign publications, we also have a collection of journals that we publish ourselves: Annals of the Institute of Statistical Mathematics (English; Springer), Proceedings of the Institute of Statistical Mathematics (Japanese), ISM Survey Research Report (Statistical Researches mainly related to the Japanese National Character), Computer Science Monographs, Cooperative Research Reports (for collaborative research projects), Research Memorandum, ISM Reports on Statistical Computing, and ISM Report on Research and Education.

All materials are properly catalogued and can be searched from the web in order to meet the needs of researchers working in a wide of fields. We also accept photocopy requests.





Finance and Buildings

Administration Subsidy and Others (2023)

Type	Personnel expenses	Non-personnel expenses	Total
Expenditure	711,692	694,353	1,406,045

Unit: 1,000JPY

Accepted External Funds (2023)

Type	Items	Income
Joint research	21	32,295
Joint research division	2	20,000
Subcontracted research, Trustee business	22	516,038
Contract researchers	—	—
Academic consulting	6	5,439
Contribution for scholarship	1	500
Total	52	574,272

Unit: 1,000JPY

Grants-in-Aid for Scientific Research "KAKENHI" (2023)

Research Category	Items	Amount Granted
Grant-in-Aid for Scientific Research on Innovative Areas	1	19,370
Grant-in-Aid for Transformative Research Areas (A)	2	40,560
Grant-in-Aid for Transformative Research Areas (B)	1	10,140
Grant-in-Aid for Scientific Research (S)	—	—
Grant-in-Aid for Scientific Research (A)	4	59,930
Grant-in-Aid for Scientific Research (B)	10	41,340
Grant-in-Aid for Scientific Research (C)	18	22,523
Grant-in-Aid for Challenging Research (Exploratory)	2	3,640
Grant-in-Aid for Challenging Research (Pioneering)	1	5,590
Grant-in-Aid for Early-Career Scientists	10	12,383
Grant-in-Aid for Forming an Independent Foundation	—	—
Grant-in-Aid for Research Activity Start-up	6	6,890
Grant-in-Aid for JSPS Fellows	—	—
Total	55	222,366

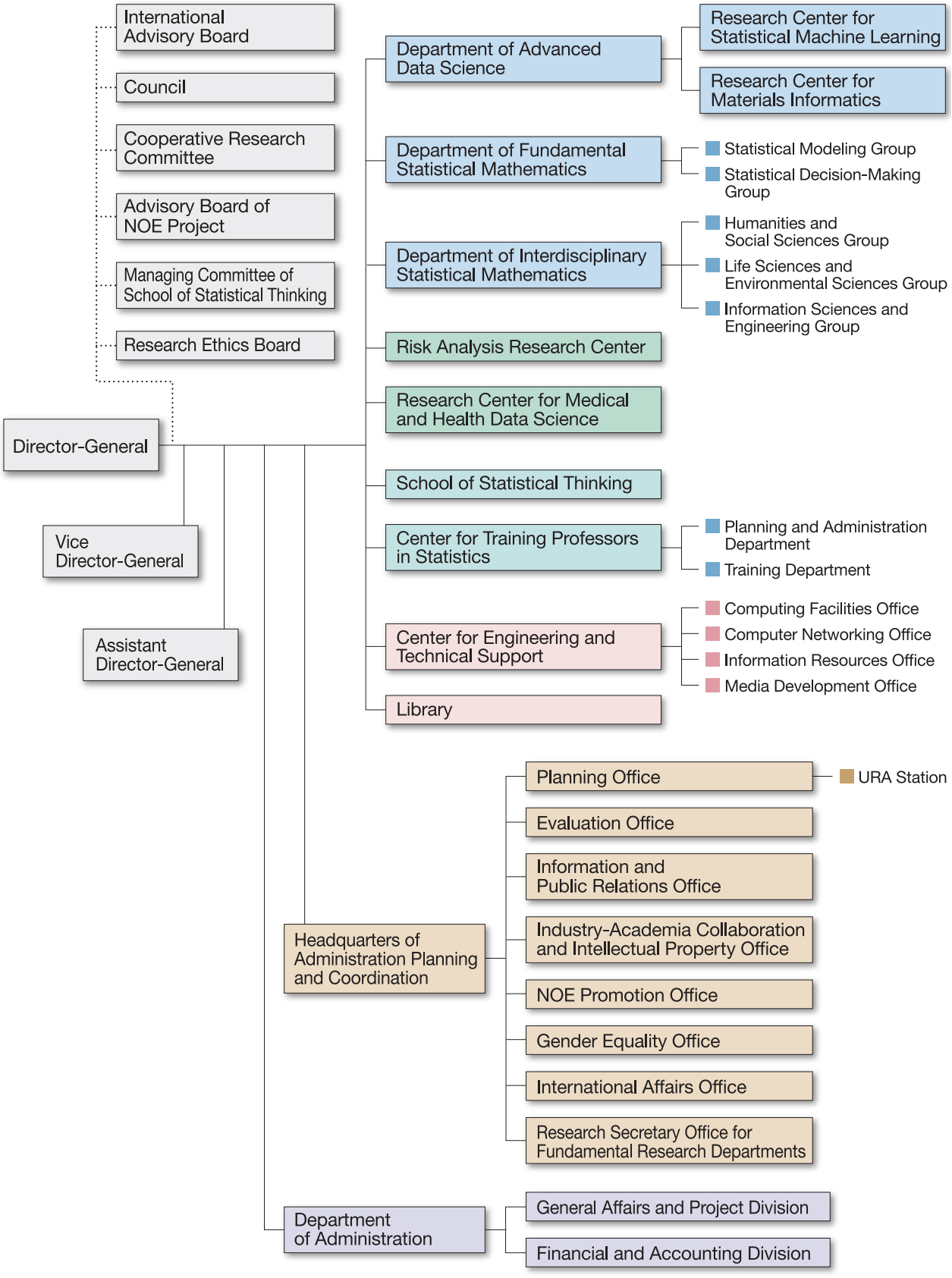
Unit: 1,000JPY

Site and Buildings (As of April 1, 2024)

Site Area	62,450m^2
Area for Buildings (total)	16,209m^2

Organization

Organization Diagram (As of April 1, 2024)



Number of Staff (As of April 1, 2024)

Type	Director-General	Professor	Associate Professor	Assistant Professor	Administrative Staff	Technical Staff	Total
Director-General	1						1
Department of Advanced Data Science Research Center for Statistical Machine Learning		3	2	1			6
Department of Advanced Data Science Research Center for Materials Informatics		1	1	1			3
Department of Fundamental Statistical Mathematics		9	10	2			21
Department of Interdisciplinary Statistical Mathematics		10	8	1			19
School of Statistical Thinking				3			3
Center for Engineering and Technical Support						10	10
Headquarters of Administration Planning and Coordination					1		1
Department of Administration					14		14
Total	1	23	21	8	15	10	78

The number of technical staff includes one rehired employee.

Staff (As of July 1, 2024)

Director-General.	Hiroe TSUBAKI	Vice Director-General	Yoshinori KAWASAKI	Vice Director-General	Satoshi YAMASHITA
		Vice Director-General	Kazuhiro MINAMI	Assistant Director-General	Satoshi ITO

Department of Advanced Data Science

Research Center for Statistical Machine Learning

Director Kenji FUKUMIZU

Prof.	Shiro IKEDA	Prof.	Hideitsu HINO	Prof.	Kenji FUKUMIZU
Project Prof.	Kazuo MUROTA	Assoc. Prof.	Tasuku SOMA	Assoc. Prof.	Ching-pei LEE
Assist. Prof.	Tam LE	Project Assist. Prof.	Donghao ZHU	Project Assist. Prof.	Hideto NAKASHIMA
Project Assist. Prof.	Shinji FUJITA	Project Researcher	Yuto TANIMOTO	Visiting Prof.	Arthur GRETTON
Visiting Prof.	Dino SEJDINOVIC	Visiting Assoc. Prof.	Masaaki IMAIZUMI	Visiting Assoc. Prof.	Tsutomu TAKEUCHI
Visiting Assoc. Prof.	Makoto YAMADA				

Research Center for Materials Informatics

Director Ryo YOSHIDA

Prof.	Ryo YOSHIDA	Assoc. Prof.	Stephen WU	Project Assoc. Prof.	Masato ONISHI
Assist. Prof.	Yoshihiro HAYASHI	Project Assist. Prof.	Keiko SHINODA	Project Assist. Prof.	Liu CHANG
Project Researcher	Kaoru KIMURA	Project Researcher	Minoru KUSABA	Project Researcher	Aiko TAKAHASHI
Project Researcher	Yoh NOGUCHI	Project Researcher	Erina FUJITA	Project Researcher	Naohiro YAMADA
Visiting Prof.	Junichiro SHIOMI	Visiting Prof.	Junko MORIKAWA	Visiting Assoc. Prof.	Yu OTAKE

Department of Fundamental Statistical Mathematics

Director Hironori FUJISAWA

Statistical Modeling Group

Prof.	Takeshi EMURA	Prof.	Kengo KAMATANI	Prof.	Jiancang ZHUANG
Prof.	Shuhei MANO	Assoc. Prof.	Shogo KATO	Assoc. Prof.	Ayaka SAKATA

Staff

Statistical Modeling Group

Assoc. Prof.	Takaaki SHIMURA	Assoc. Prof.	Ikuko FUNATOGAWA	Assoc. Prof.	Daisuke MURAKAMI
Assoc. Prof.	Daichi MOCHIHASHI	Assist. Prof.	Kei NOBA	Visiting Prof.	Kentaro TANAKA
Visiting Prof.	Genso WATANABE				

Statistical Decision-Making Group

Prof.	Satoshi ITO	Prof.	Yukito IBA	Prof.	Satoshi KURIKI
Prof.	Yoshiyuki NINOMIYA	Prof.	Hironori FUJISAWA	Assoc. Prof.	Mirai TANAKA
Assoc. Prof.	Bruno FIGUEIRA LOURENÇO	Assoc. Prof.	Masayuki HENMI	Assoc. Prof.	Keisuke YANO
Assist. Prof.	Akifumi OKUNO	Visiting Prof.	Kei KOBAYASHI	Visiting Prof.	Yoshihiko KONNO
Visiting Prof.	Yuji SHINANO	Visiting Prof.	Katsuki FUJISAWA		

Department of Interdisciplinary Statistical Mathematics

Director Tomoko MATSUI

Humanities and Social Sciences Group

Prof.	Yoshinori KAWASAKI	Prof.	Satoshi YAMASHITA	Assoc. Prof.	Yoo Sung PARK
Assoc. Prof.	Tadahiko MAEDA	Assist. Prof.	Nobuo SHIMIZU	Project Assist. Prof.	Mika ICHINO
Project Assist. Prof.	Kiyohisa SHIBAI	Project Researcher	Hiroka HAMADA	Project Researcher	Xiaoxing WANG
Project Researcher	Yasuhiro TANAKA	Visiting Prof.	Takatoshi IMADA	Visiting Prof.	Koken OZAKI
Visiting Prof.	Toru KIKKAWA	Visiting Prof.	Yoshimichi SATO	Visiting Prof.	Wataru MATSUMOTO
Visiting Prof.	Kazufumi MANABE	Visiting Assoc. Prof.	Yusuke INAGAKI	Visiting Assoc. Prof.	Naoko KATO
Visiting Assoc. Prof.	Taisuke FUJITA				

Life Sciences and Environmental Sciences Group

Prof.	Koji KANEFUJI	Prof.	Hisashi NOMA	Prof.	Shigeyuki MATSUI
Prof.	Atsushi YOSHIMOTO	Assoc. Prof.	Jun ADACHI	Assoc. Prof.	Kenichiro SHIMATANI
Assoc. Prof.	Yumi TAKIZAWA				

Information Sciences and Engineering Group

Prof.	Genta UENO	Prof.	Shin'ya NAKANO	Prof.	Tomoko MATSUI
Prof.	Kazuhiro MINAMI	Project Prof.	Shigeru FUJITA	Assoc. Prof.	Shinsuke KOYAMA
Assoc. Prof.	Fumikazu MIWAKEICHI	Assoc. Prof.	Takao MURAKAMI	Project Researcher	Zhiheng LIN
Visiting Prof.	Masako KAMIYAMA	Visiting Prof.	Masataka GOTO	Visiting Prof.	Konstantin MARKOV
Visiting Prof.	Tadahiko SATO	Visiting Prof.	Kazuyuki NAKAMURA	Visiting Prof.	Tomoyuki HIGUCHI
Visiting Prof.	Tomoe MASUDA	Visiting Prof.	Eiji MOTOHASHI	Visiting Assoc. Prof.	Hiroshi KATO
Visiting Assoc. Prof.	Masaya SAITO	Visiting Assoc. Prof.	Sayaka SHIOTA	Visiting Assoc. Prof.	Hiromichi NAGAO
Visiting Assoc. Prof.	Shunichi NOMURA	Visiting Assoc. Prof.	Yosuke FUJII	Visiting Assoc. Prof.	Takashi YAMAMOTO
Visiting Lecturer	Yusaku OHKUBO				

Risk Analysis Research Center

Director Shogo KATO Vice Director Satoshi YAMASHITA

Prof.	Koji KANEFUJI	Prof.	Kengo KAMATANI	Prof.	Yoshinori KAWASAKI
Prof.	Satoshi KURIKI	Prof.	Jiancang ZHUANG	Prof.	Yoshiyuki NINOMIYA
Prof.	Hironori FUJISAWA	Prof.	Tomoko MATSUI	Prof.	Kazuhiro MINAMI
Prof.	Satoshi YAMASHITA	Prof.	Atsushi YOSHIMOTO	Project Prof.	Kunio SHIMIZU
Assoc. Prof.	Stephen WU	Assoc. Prof.	Shogo KATO	Assoc. Prof.	Ayaka SAKATA
Assoc. Prof.	Kenichiro SHIMATANI	Assoc. Prof.	Takaaki SHIMURA	Assoc. Prof.	Yumi TAKIZAWA
Assoc. Prof.	Mirai TANAKA	Assoc. Prof.	Ikuko FUNATOGAWA	Assoc. Prof.	Masayuki HENMI
Assoc. Prof.	Daisuke MURAKAMI	Assoc. Prof.	Takao MURAKAMI	Assoc. Prof.	Daichi MOCHIHASHI
Assoc. Prof.	Keisuke YANO	Project Assoc. Prof.	Takao KUMAZAWA	Assist. Prof.	Akifumi OKUNO
Project Assist. Prof.	Wenting ZHANG	Project Assist. Prof.	Tran DUC VU	Project Assist. Prof.	Shotaro YAGISHITA

Risk Analysis Research Center

Project Assist. Prof.	Yujie XUE	Project Assist. Prof.	Shota TAKEISHI	Project Researcher	Yosihiko OGATA
Project Researcher	Hong PENG	Visiting Prof.	Masakazu ANDO	Visiting Prof.	Shinsuke ITO
Visiting Prof.	Makoto ITO	Visiting Prof.	Takashi INOUE	Visiting Prof.	Tetsuya IWASA
Visiting Prof.	Masao UEKI	Visiting Prof.	Tadashi ONO	Visiting Prof.	Yukihiko OKADA
Visiting Prof.	Aitaro KATO	Visiting Prof.	Takashi KAMEYA	Visiting Prof.	Kenichi KAMO
Visiting Prof.	Shuichi KAWANO	Visiting Prof.	Takafumi KUBOTA	Visiting Prof.	Masashi KONOSHIMA
Visiting Prof.	Naoki SAKAI	Visiting Prof.	Takayuki SASAJIMA	Visiting Prof.	Natsuki SANO
Visiting Prof.	Yo SHEENA	Visiting Prof.	Yasutaka SHIMIZU	Visiting Prof.	Kiyomi SHIRAKAWA
Visiting Prof.	Kazuyuki SUZUKI	Visiting Prof.	Takenori TAKAHASHI	Visiting Prof.	Rinya TAKAHASHI
Visiting Prof.	Isao TAKABE	Visiting Prof.	Satoshi TAKIZAWA	Visiting Prof.	Hideatsu TSUKAHARA
Visiting Prof.	Hiroshi TSUDA	Visiting Prof.	Tetsuji TONDA	Visiting Prof.	Katsutoshi NAGASHIMA
Visiting Prof.	Hiroaki NAGAFUJI	Visiting Prof.	Kazuyoshi NANJO	Visiting Prof.	Shunji HASHIMOTO
Visiting Prof.	Hisayuki HARA	Visiting Prof.	Masaaki FUKASAWA	Visiting Prof.	Satoshi FUJII
Visiting Prof.	Toshihiro HORIGUCHI	Visiting Prof.	Toshio HONDA	Visiting Prof.	Hiroshi MATSUZOE
Visiting Prof.	Mihoko MINAMI	Visiting Prof.	Sadaaki MIYAMOTO	Visiting Prof.	Hitoshi MOTOYAMA
Visiting Prof.	Tomoya MORI	Visiting Prof.	Hirokazu YANAGIHARA	Visiting Prof.	Yoshiki YAMAGATA
Visiting Prof.	Nakahiro YOSHIDA	Visiting Prof.	Yasushi YOSHIDA	Visiting Prof.	Takaaki YOSHINO
Visiting Prof.	Toshinao YOSHIBA	Visiting Assoc. Prof.	Takaki IWATA	Visiting Assoc. Prof.	Yuma UEHARA
Visiting Assoc. Prof.	Bogdan Dumitru ENESCU	Visiting Assoc. Prof.	Teppei OGIHARA	Visiting Assoc. Prof.	Yuta KOIKE
Visiting Assoc. Prof.	Tatsuhiko SAIGO	Visiting Assoc. Prof.	Noriyoshi SAKUMA	Visiting Assoc. Prof.	Seisho SATO
Visiting Assoc. Prof.	Keiko SONODA	Visiting Assoc. Prof.	Masaaki TAKADA	Visiting Assoc. Prof.	Junichi TAKAHASHI
Visiting Assoc. Prof.	Yuta TANOUE	Visiting Assoc. Prof.	Junchao ZHANG	Visiting Assoc. Prof.	Hiroshi TSURUOKA
Visiting Assoc. Prof.	Xiaoling DOU	Visiting Assoc. Prof.	Hideaki NAGAHATA	Visiting Assoc. Prof.	Shunichi NOMURA
Visiting Assoc. Prof.	Keisuke FUKUI	Visiting Assoc. Prof.	Yuta MITSUI	Visiting Assoc. Prof.	Masumi YAMADA
Visiting Assoc. Prof.	Yuuki RIKIMARU	Visiting Assoc. Prof.	Hayafumi WATANABE	Visiting Lecturer	Tomoaki IMOTO
Visiting Lecturer	Takaaki KOIKE	Visiting Lecturer	Koyomi NAKAZAWA	Visiting Assist. Prof.	Kazuharu HARADA
Visiting Assist. Prof.	Hikaru YAMAGUCHI				

Research Center for Medical and Health Data Science

Director Shigeyuki MATSUI　　Vice Director Takeshi EMURA

Prof.	Takeshi EMURA	Prof.	Shigeyuki MATSUI	Prof.	Satoshi YAMASHITA
Project Prof.	Shinto EGUCHI	Project Prof.	Tosiya SATO	Assoc. Prof.	Masayuki HENMI
Assoc. Prof.	Fumikazu MIWAKEICHI	Project Assoc. Prof.	Mayumi OKA	Project Assoc. Prof.	Koki MIMURA
Project reseacher	Kosuke NAKAZONO	Visiting Prof.	Manabu AKAZAWA	Visiting Prof.	Yoichi M. ITO
Visiting Prof.	Senichiro KIKUCHI	Visiting Prof.	Ken KIYONO	Visiting Prof.	Kunihiko TAKAHASHI
Visiting Prof.	Masataka TAGURI	Visiting Prof.	Hisateru TACHIMORI	Visiting Prof.	Satoshi TERAMUKAI
Visiting Prof.	Nobuaki NISHIYAMA	Visiting Prof.	Satoshi HATTORI	Visiting Prof.	Michiko WATANABE
Visiting Assoc. Prof.	Chieko ISHIGURO	Visiting Assoc. Prof.	Ryoichi KIMURA	Visiting Assoc. Prof.	Haruhisa FUKUDA

School of Statistical Thinking

Director Satoshi KURIKI　　Vice Director Yukito IBA

Prof.	Shiro IKEDA	Prof.	Yukito IBA	Prof.	Yoshinori KAWASAKI
Prof.	Satoshi KURIKI	Prof.	Hideitsu HINO	Prof.	Hironori FUJISAWA
Prof.	Kazuhiro MINAMI	Project Prof.	Tosiya SATO	Project Prof.	Kunio SHIMIZU
Project Prof.	Hiroko NAKANISHI	Assoc. Prof.	Ayaka SAKATA	Assoc. Prof.	Kenichiro SHIMATANI
Assoc. Prof.	Masayuki HENMI	Assoc. Prof.	Fumikazu MIWAKEICHI	Assoc. Prof.	Keisuke YANO
Assist. Prof.	Masato SHIRASAKI	Assist. Prof.	Kohei HATTORI	Assist. Prof.	Ryota YUASA
Assist. Prof.	Akifumi OKUNO	Assist. Prof.	Nobuo SHIMIZU	Assist. Prof.	Kei NOBA
Visiting Prof.	Osamu KOMORI	Visiting Prof.	Masayuki YOKOYAMA	Visiting Assoc. Prof.	Kei TAKAHASHI

Staff

Center for Training Professors in Statistics

Director Masato CHINO

Prof.	Yoshinori KAWASAKI	Prof.	Kazuhiro MINAMI	Prof.	Satoshi YAMASHITA
Project Prof.	Manabu IWASAKI	Project Prof.	Hideki ORIGASA	Project Prof.	Naoki KAMIYA
Project Prof.	Naoto KUNITOMO	Project Prof.	Yasunori SAWAMURA	Project Prof.	Kunio SHIMIZU
Project Prof.	Masakazu JIMBO	Project Prof.	Kunio TANABE	Project Prof.	Masato CHINO
Project Prof.	Hiroko NAKANISHI	Project Prof.	Tetsuhisa MIWA	Project Prof.	Kazuo MUROTA
Project Prof.	Shotaro AKAHO	Project Prof.	Masahiro MIZUTA	Project Assoc. Prof.	Masayoshi TAKAYANAGI
Assist. Prof.	Ryota YUASA	Assist. Prof.	Taishi HASHIMOTO	Visiting Assoc. Prof.	Ken ISHIBASHI
Visiting Assoc. Prof.	Kazue NAGAI	Visiting Assoc. Prof.	Hiroyasu MATSUSHIMA	Visiting Lecturer	Yu ZHAO
Visiting Lecturer	Jun TSUCHIDA	Visiting Assist. Prof.	Yutaro KABATA	Visiting Assist. Prof.	Jiaming JIANG
Visiting Assist. Prof.	Hiroyuki SATO	Visiting Assist. Prof.	Yusuke TAJIMA	Visiting Assist. Prof.	Yoshio NAKANO

Center for Engineering and Technical Support

Director Genta UENO

Vice Director Shin'ya NAKANO Vice Director Fumikazu MIWAKEICHI Deputy Manager Kazuhiro NAKAMURA

Office Leader of Computing Facilities Office	Mitsuru HAYASAKA	Office Leader of Computer Networking Office	Kazuhiro NAKAMURA
Office Leader of Information Resources Office	Noriaki MIYAZONO	Office Leader of Media Development Office	Hiroki IKEDA

Library

Head Genta UENO

Headquarters of Administration Planning and Coordination

Chief Director Hiroe TSUBAKI

Director of Planning Office	Yoshinori KAWASAKI	Director of Evaluation Office	Yoshihiko MIYASATO
Vice Director of Evaluation Office	Yoshinori KAWASAKI	Director of Information and Public Relations Office	Yoshihiko MIYASATO
Vice Director of Information and Public Relations Office	Kazuhiro MINAMI	Director of Industry-Academia Collaboration and Intellectual Property Office	Satoshi YAMASHITA
Director of NOE Promotion Office	Satoshi YAMASHITA	Director of Gender Equality Office	Yoshinori KAWASAKI
Director of International Affairs Office	Kengo KAMATANI	Director of Research Secretary Office for Fundamental Research Departments	Satoshi ITO
		Vice Director of Research Secretary Office for Fundamental Research Departments	Masaya MASADA

URA Station

Kozo KITAMURA	Motoi OKAMOTO	Keisuke HONDA

Department of Administration

General Manager Shuji SUZUKI

General Affairs and Project Division

Manager Masaya MASADA Deputy Manager Wataru HASHIMOTO

Head, Personnel Administration Team	Yusuke KASAKAWA	Head, Research Promotion Team	Isao SAKUMA

Financial and Accounting Division

Manager Takashi BAN Deputy Manager Hiroaki ARAI

Specialist	Takuya SAITO	Specialist	Junichi NAKATA
Head, Budget and Account Settlement Team	Akiko MAEKAWA	Head, Accounting and Contract Team	Ichiro KAWAJI

International Advisory Board (As of April 1, 2024)

Song Xi CHEN	Professor, Peking University
Arthur GRETTON	Professor, University College London
Juan Carlos JIMÉNEZ-SOBRINO	Professor, Instituto de Cibernética, Matemática y Física
Jibum KIM	Professor, Sungkyunkwan University
Gareth W. PETERS	Professor, University of California Santa Barbara
Evgeny SPODAREV	Professor, Ulm University

Council of The Institute of Statistical Mathematics (As of April 1, 2024)

Makoto AOSHIMA	Professor, University of Tsukuba
Satoru IGUCHI	Professor, National Astronomical Observatory of Japan
Shinobu OGI	Executive Vice President, NTT DATA Mathematical Systems Inc
Kenji KAJIWARA	Director, Institute of Mathematics for Industry, Kyushu University
Fumiyasu KOMAKI	Professor, The University of Tokyo
You SHIINA	Professor, Shiga University
Masashi SUGIYAMA	Director, RIKEN Center for Advanced Intelligence Project / Professor, The University of Tokyo
Akiko TAKEDA	Professor, The University of Tokyo
Hiroshi MARUYAMA	Senior Advisor, Preferred. Networks, Inc.
Toshiaki WATANABE	Professor, Dean of Faculty of Social Data Science, Hitotsubashi University
Yoshinori KAWASAKI	Professor (Vice Director-General, ISM)
Satoshi YAMASHITA	Professor (Vice Director-General, ISM)
Kazuhiro MINAMI	Professor (Vice Director-General, ISM)
Satoshi ITO	Professor (Assistant Director-General, ISM)
Kenji FUKUMIZU	Professor (Director of Research Center for Statistical Machine Learning, ISM)
Ryo YOSHIDA	Professor (Director of Research Center for Materials Informatics, ISM)
Hironori FUJISAWA	Professor (Director of Department of Fundamental Statistical Mathematics, ISM)
Tomoko MATSUI	Professor (Director of Department of Interdisciplinary Statistical Mathematics, ISM)
Satoshi KURIKI	Professor (Director of School of Statistical Thinking, ISM)
Genta UENO	Professor (Director of Center for Engineering and Technical Support, ISM)

Cooperative Research Committee (As of June 1, 2024)

Fumio ISHIOKA	Professor, Faculty of Environmental, Life, Natural Science and Technology, Okayama University
Takafumi KUBOTA	Professor, School of Management & Information Sciences, Tama University
Shido SAI	Professor, Department of Economics, Faculty of Economics, Okayama Shoka University
Aki-Hiro SATO	Professor, Department of Data Science, Graduate School of Data Science, Yokohama City University
Toshinao YOSHIBA	Professor, Graduate School of Management, Tokyo Metropolitan University
Kengo KAMATANI	Professor (Department of Fundamental Statistical Mathematics, ISM)
Kenichiro SHIMATANI	Associate Professor (Department of Interdisciplinary Statistical Mathematics, ISM)
Mirai TANAKA	Associate Professor (Department of Fundamental Statistical Mathematics, ISM)
Hiroko NAKANISHI	Project Professor (Center for Training Professors in Statistics, ISM)

Advisory Board of NOE Project (As of April 1, 2024)

Satoshi ITOH	Chief Coordinator, Foundation for Computational Science
Naonori UEDA	Deputy Director, RIKEN Center for Advanced Intelligence Project (AIP)
Hiroaki UENO	President, The Japan Pharmaceutical Manufacturers Association
Masafumi KAMACHI	Director, Ocean Eyes Co., Ltd.
Yoshimichi SATO	Dean and Professor, Faculty of Humanitie, Kyoto University of Advanced Science
Ken CHIKADA	Director-General, Institute for Monetary and Economic Studies, Bank of Japan

Managing Committee of School of Statistical Thinking (As of April 1, 2024)

Ken KUROKAWA	Vice Director/Professor, National Institute of Genetics
Manabu KOBAYASHI	Professor, Center for Data Science, Waseda University
You SHIINA	Professor/Dean, Faculty of Data Science, Shiga University
Yoshihiko NISHINO	Director, Advanced Analytics & AI Innovation Division, SAS Institute Japan, Ltd.
Jinfang WANG	Professor, School of International Liberal Studies, Waseda University
Satoshi KURIKI	Director (School of Statistical Thinking, ISM)
Yukito IBA	Vice Director (School of Statistical Thinking, ISM)
Yoshinori KAWASAKI	Professor (Vice Director-General, ISM)
Hiroko NAKANISHI	Project Professor (Center for Training Professors in Statistics, ISM)

Research Ethics Board (As of April 1, 2024)

Specialist on epidemiology and social research	Masayuki KANAI	Professor, School of Human Sciences, Senshu University
Specialist on epidemiology and social research	Keiko SATO	Associate Professor, Department of Health Informatics Graduate School of Medicine & School of Public Health, Kyoto University
Specialist in the field of ethics and law	Hitomi NAKAYAMA	Lawyer, Kasumigaseki-Sogo Law Offices
Specialist in the field of ethics and law	Hiroe TSUBAKI	Director-General, The Institute of Statistical Mathematics
Person in citizen's position	Yutaka KURIKI	Director, Social welfare corporation Kunitachi nursery school
Research education staff of ISM	Hisashi NOMA	Professor (Department of Interdisciplinary Statistical Mathematics, ISM)
Research education staff of ISM	Tadahiko MAEDA	Associate Professor (Department of Interdisciplinary Statistical Mathematics, ISM)
Research education staff of ISM	Yoo Sung PARK	Associate Professor (Department of Interdisciplinary Statistical Mathematics, ISM)

Professor Emeritus (As of August 1, 2024)

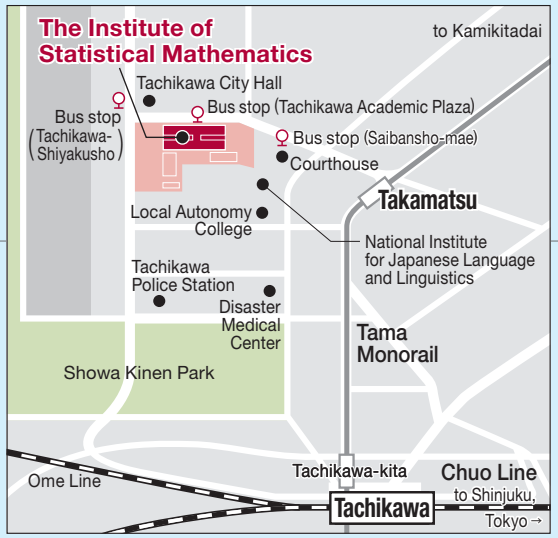
Sigeki NISIHIRA	Ryoichi SHIMIZU	Noboru OHSUMI	Masakatsu MURAKAMI
Kunio TANABE	Tadashi MATSUNAWA	Masami HASEGAWA	Takemi YANAGIMOTO
Yoshiaki ITOH	Yasumasa BABA	Katsuomi HIRANO	Masaharu TANEMURA
Makio ISHIGURO	Yosihiko OGATA	Hiroe TSUBAKI	Genshiro KITAGAWA
Nobuhisa KASHIWAGI	Takashi NAKAMURA	Yoshiyasu TAMURA	Tomoyuki HIGUCHI
Junji NAKANO	Shinto EGUCHI	Yoshihiko MIYASATO	

History

1944	June	Based on a proposal submitted at an academic study conference in December 1943, the organization was founded as an institute under the direct control of the Ministry of Education. This proposal aimed to provide supervision for studies looking into the mathematical principles of probability and their application, and was also intended to facilitate, unify and promote the publication of research results.
1947	April	The affiliated statistical specialists' school was opened.
	May	The Institute was divided into the 1st Research Dept. (fundamental theories), the 2nd Research Dept. (statistical theories for the natural sciences), and the 3rd Research Dept. (statistical theories for the social sciences).
1949	June	The Institute was placed under the control of the Ministry of Education because of the enforcement of the Ministry of Education Establishment Law.
1955	September	Reorganized into the 1st Research Dept. (fundamental theories), the 2nd Research Dept. (natural and social science theories), and the 3rd Research Dept. (operations research, statistical analysis theories). The laboratory system, comprising 9 laboratories and the research guidance promotion room, was adopted.
1969	October	A new office building was constructed in Minato Ward.
1971	April	The 4th Research Dept. (informatics theories) was instituted.
1973	April	The 5th Research Dept. (prediction and control theories) was instituted.
1975	October	The 6th Research Dept. (statistical theories of human behavior) was instituted.
1979	November	The Information Research Building was constructed.
1985	April	Repositioned as a National Inter-University Research Institute due to the regulation change. The new mission includes providing facilities and skills to other universities, in addition to conducting cutting-edge research on statistical mathematics. Accordingly, the Institute was reorganized into four basic research departments (Fundamental Statistical Theory, Statistical Methodology, Prediction & Control, and Interdisciplinary Statistics) and two strategic centers (Statistical Data Analysis Center and Statistical Education & Information Center). The Statistical Technical Training Center was terminated.
1988	October	The Dept. of Statistical Science was instituted in the School of Mathematical and Physical Science, part of the Graduate University for Advanced Studies (SOKENDAI).
1989	June	The Institute was reorganized as an Inter-University Research Institute based on the National School Establishment Law.
1997	April	The affiliated Statistical Data Analysis Center was reorganized into the Center for Development of Statistical Computing, and the Statistical Education and Information Center was reorganized into the Center for Information on Statistical Sciences.
2003	September	The Prediction and Knowledge Discovery Research Center was instituted.
2004	April	The Institute was reorganized into the Institute of Statistical Mathematics, part of the Research Organization of Information and Systems of the Inter-University Research Institute based on the National University Corporation Law. The Planning Coordination Chief System was abolished and the position of Vice Director-General was instituted instead. The Dept. of Statistical Science, the School of Mathematical and Physical Science, SOKENDAI, was reorganized to form the Dept. of Statistical Science, the School of Multidisciplinary Sciences.
2005	April	The research organization was reorganized into three research departments (the Department of Statistical Modeling, the Department of Data Science, and the Department of Mathematical Analysis and Statistical Inference). The affiliated Center for Development of Statistical Computing, the Center for Information on Statistical Sciences, and the Engineering and Technical Services Section were integrated into the Center for Engineering and Technical Support. The Risk Analysis Research Center was instituted.
2008	April	The Research Innovation Center was instituted.
2009	October	The Institute was moved to 10-3 Midori-cho, Tachikawa, Tokyo.
2010	June	Officially opened the Akaike Guest House.
2011	January	Research and Development Center for Data Assimilation was instituted. Survey Science Center was instituted.
2012	January	Research Center for Statistical Machine Learning, Service Science Research Center and School of Statistical Thinking were instituted.

2017	January	Survey Science Center and Service Science Research Center were closed.
	July	Data Science Center for Creative Design and Manufacturing was instituted.
2018	April	Research Center for Medical and Health Data Science was instituted.
2019	March	Research and Development Center for Data Assimilation was closed.
2022	January	Center for Training Professors in Statistics was instituted.
2023	April	The Department of Statistical Science of the School of Multidisciplinary Sciences, SOKENDAI, was reorganized to establish the Statistical Science Program in the Graduate Institute for Advanced Studies.
2024	March	The research departments were reorganized into Fundamental Research Departments (the Department of Advanced Data Science, the Department of Fundamental Statistical Mathematics, and the Department of Interdisciplinary Statistical Mathematics). The Centers for Advanced Research (Research Center for Statistical Machine Learning and Research Center for Materials Informatics) were established in the Department of Advanced Data Science. Two NOE-type research centers, Research Center for Statistical Machine Learning, and Data Science Center for Creative Design and Manufacturing, were abolished. An Assistant Director-General position was appointed.
	April	Research Secretary Office for Fundamental Research Departments was instituted in the Headquarters of Administration Planning and Coordination. The Tachikawa Administration Department of ROIS was abolished and reorganized as the Administration Department in the Institute.

The Institute of Statistical Mathematics



Access to the ISM

◎ Tachikawa Bus
— Tachikawa Academic Plaza bus stop
— 5 min walk from Saibansho-mae or Tachikawa-Shiyakusho bus stop

◎ Tama Monorail
—10 min walk from Takamatsu Sta.

◎ JR Chuo Line
—25 min walk from Tachikawa Sta.

Research Organization of Information and Systems
The Institute of Statistical Mathematics
10-3 Midori-cho, Tachikawa, Tokyo 190-8562, Japan
Tel: +81-(0)50-5533-8500 Fax: +81-(0)42-527-9302
https://www.ism.ac.jp/