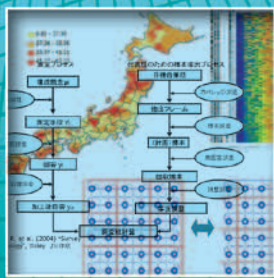
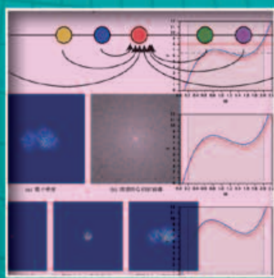
Research Organization of Information and Systems

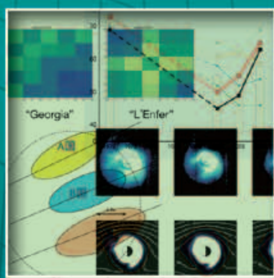
The Institute of Statistical Mathematics

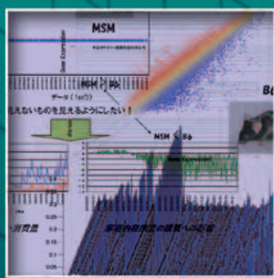
2012-2013

ISM









CONTENTS

Message from Director-General

We are starting to see revolutions occurring in a wide variety of areas, from cutting-edge R&D to business, in what is often called a "fourth paradigm". Over the last year or two, we have seen big data (referring to massive data sets that are of highly variable quality) emerging as an R&D methodology to provide better forecast information and services for different purposes, used effectively to build everything from global models to models for man-made structures and people. The basic science and technology needed to handle big data is born from the research field of data-centric science, which encompasses engineering for massive databases and the disciplines of statistical science, mathematical engineering, machine learning, and data mining. The Institute of Statistical Mathematics (ISM) is the only research institute in Japan to bring together significant numbers of researches from each of these disciplines.

With the growing need for professionals in data-centric science, the Institute launched the School of Statistical Thinking in fiscal 2011 as part of our project to foster statistical thinking, which is one of two major projects we are pursuing. The school accepts graduate students, researchers, and practitioners with deep knowledge of a particular specialized discipline, and, with the cooperation of mathematics-related institutions in and outside of Japan, strives to develop professionals who are highly specialized while possessing the broad foundational knowledge necessary to put the fourth paradigm into action. We hope that the School of Statistical Thinking will develop many next-generation librarians who can play a curating role for science in the big data era, based on a thorough understanding of the trans-disciplinary qualities of statistical science linking a broad range of research disciplines.

Our other major project to establish Network Of Excellence (NOE) in statistical mathematics has seen some changes. We closed our two strategic research centers in January 2012 and launched the Research Center for Statistical Machine Learning and Service Science Research Center. With this change, all of our research centers are now NOE-type centers, establishing a framework for the pursuit of broad collaborative research centering on five areas. While we are encouraging collaborative research at the organizational level in order to strengthen the functions of today's inter-university research institutes, the project to establish NOE represents a trend-leading initiative for collaborative research.

Since the disaster in Japan last year, there has been renewed recognition of the importance of research that relates to massive and complex systems, such as used in smart grid and other energy management and for risk management of large-scale man-made structures. As a research institute that carries out fundamental research for systems science, we understand that we have a responsibility to meet society's expectations. We look forward to your continued understanding and support of our activities.

Tomoyuki Higuchi

Director-General

The Institute of Statistical Mathematics

Basic Research

Department of Statistical Modeling

The Department of Statistical Modeling works on the structural modeling of physical phenomenon related to numerous factors, and it conducts research on model-based statistical inference methodologies. By means of the modeling of spatially and/or temporally varying phenomena, complex systems, and latent structures, the department aims to contribute to the development of cross-field modeling intelligence.

Spatial and Time Series Modeling Group

The Spatial and Time Series Modeling Group works on the development and evaluation of statistical models, which function effectively in terms of predicting phenomena or scientific discoveries, through data analysis and modeling related to space-time-varying phenomena.

Complex System Modeling Group

The Complex System Modeling Group conducts studies in order to discover the structures of complex systems, such as nonlinear systems and hierarchical networks, through statistical modeling.

Latent Structure Modeling Group

The Latent Structure Modeling Group works on the modeling of variable factors as latent structures existing behind various dynamic phenomena in the real world. It also conducts research on methodologies for inference computation associated with structures on the basis of data related to phenomena.

Department of Data Science

The aim of the Department of Data Science is to contribute to the development of natural and social sciences by conducting research into the methodology of designing statistical data collection systems, measuring and analyzing complex phenomena for evidence-based sciences, and performing exploratory multivariate data analyses.

Data Design Group

The Data Design Group focuses on research toward designing statistical data collection systems and developing the related data analysis methods in a variety of research and experimental environments.

Metric Science Group

The Metric Science Group studies methods for measuring and analyzing complex phenomena to extract statistical evidence behind them in the various fields of science.

Structure Exploration Group

Structure Exploration Group advances statistical and mathematical research by applying or developing exploratory multivariate data analyses to clarify latent structures of real phenomena in various fields of both natural and social sciences.

Department of Mathematical Analysis and Statistical Inference

The Department of Mathematical Analysis and Statistical Inference carries out research into general statistical theory, statistical learning theory, optimization, and algorithms in statistical inference.

Mathematical Statistics Group

The Mathematical Statistics Group is concerned with aspects of statistical inference theory, modeling of uncertain phenomena, stochastic processes and their application to inference, probability and distribution theory, and the related mathematics.

Learning and Inference Group

The Learning and Inference Group develops statistical methodologies to describe the stochastic structure of data mathematically and clarify the potential and the limitations of the data theoretically.

Computational Inference Group

The Computational Inference Group studies mathematical methodologies in the research fields of numerical analysis, optimization, discrete mathematics, and control and systems theory for computation-based statistical inference as well as their applications.

Strategic Research

Risk Analysis Research Center

The Risk Analysis Research Center is pursuing a scientific approach to the uncertainty and risks in society, which have increased with the growing globalization of society and the economy. The Center is also constructing a network for risk analysis with the goal of contributing to creating a safe and resilient society.

Research and Development Center for Data Assimilation

Research and Development Center for Data Assimilation aims to construct simulation models that can predict the future and to produce designs for effective observation systems by means of “data assimilation”, which is a fundamental technology integrating numerical simulations and observational data.

Survey Science Center

Founded on the accomplishments in social research by the Institute of Statistical Mathematics spanning over half a century including the Study of the Japanese National Character and the cross-national comparative research on national characteristics, the Survey Science Center was established in January of 2011 in order to facilitate further growth of the aforementioned sets of research as well as the establishment of networking ties with both domestic and international research organizations and the increase in the capacity to make contributions to wider society by creating what we call the NOE (Network Of Excellence).

Research Center for Statistical Machine Learning

Machine learning is a research field studying autonomous systems that learn from data. This field is based on the statistical science that concerns inference from data and the computer science that studies algorithms. The application of machine learning is broad, ranging from engineering, including robotics, and information sciences to natural science, such as brain science. This research center aims at supporting the academic community of the field, in addition to producing influential works via various joint projects.

Service Science Research Center

The aim of the newly established Service Science Research Center is to apply data-centric methodologies to the service fields — from marketing, supply chain management, and management engineering, to the modeling of social systems. We will integrate the insights from these fields to establish data-centric service sciences as a common discipline, through collaborations with universities and institutions worldwide, taking advantage of ISM's Network Of Excellence (NOE) program.

Research Support

Center for Engineering and Technical Support

The Center for Engineering and Technical Support assists the development of statistical science by managing the computer systems used for statistical computing, facilitating public outreach, and supporting the research activities of both staff and collaborators.

■ Computing Facilities Unit

The Computing Facilities Unit is in charge of managing computer facilities, software for research, networking infrastructure and network security.

■ Information Resources Unit

The Information Resources Unit is responsible for maintaining an extensive library and an electronic repository, and is in charge of planning statistical education courses to popularize research results.

■ Media Development Unit

The Media Development Unit is in charge of the publication and editing of research results and is responsible for public relations.

Suicide Prevention through Application of Spatio-temporal Analysis and Factorial Design

Small areal suicide data

Unfortunately, Japan is a country with one of the highest suicide rates in the world. To address this issue, small areal data, "Statistics of Community for the Death from Suicide", is being compiled. This is funded research from the National Institute of Mental Health, at the National Center of Neurology and Psychiatry in Japan. The data is divided in terms of area, year, age group, sex, manner of suicide, marital status and occupation. To make certain characteristics of the data recognizable, some visualizations such as a choropleth map, a generalized association plot (GAP), and RNavGraph (Fig. 1) have been applied.

Detection of spatio-temporal clusters

To determine where and/or when a highly concentrated area and/or time is located, respectively, spatio-temporal clustering is first applied to the suicide data, because the data possesses the advantage of having areal and temporal parameters. Figure 2 shows a choropleth map of the suicide ratio (1988 - 1992) with spatial clusters (circled) and corresponding echelon dendrogram included. Furthermore, focuses on the Kanto region, on fewer areas of suicides, and on increases or decreases in suicide rates are applied.

Factorial design of suicide data

Spatio-temporal suicide data were linked to multiple variables that are related to suicide backgrounds at the same spatial locations and the same temporal periods. Application analyses of these data were used to detect the reason why people are committing suicide. Marital status (especially the widow rate), occupational status (especially the unemployment rate), and spatial autocorrelation of suicide rates were used to apply regression analysis. Metrological and geographical variables were also used to detect territorial characteristics of suicide. Similarly, a structural equation model is applied by adding financial variables. This analysis will be applied to determine the relationship with mental health, including medical factors.

Takafumi Kubota

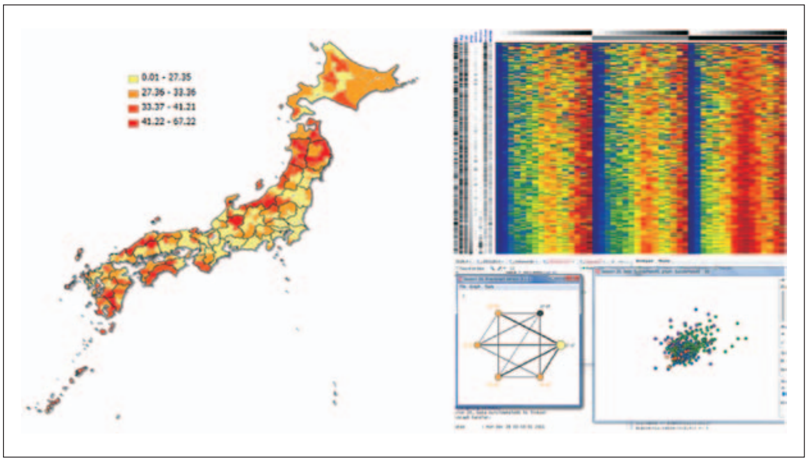


Figure 1: Choropleth map of suicide rates from 1988 to 1992 (left), also displaying a GAP (upper right) and an RnavGraph (lower right)

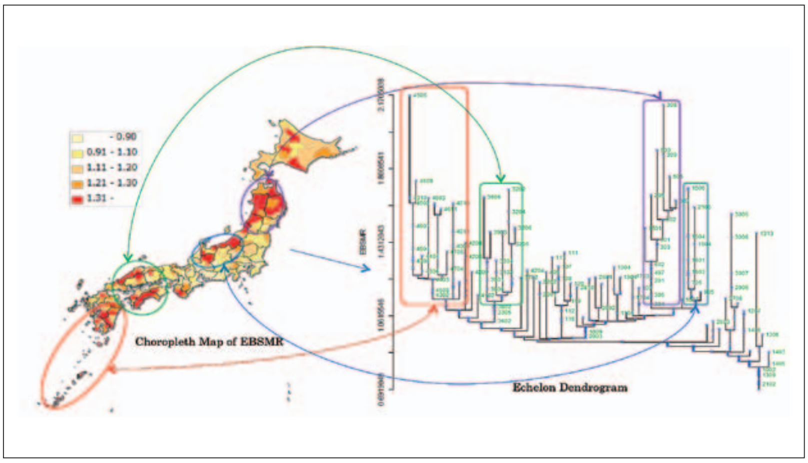


Figure 2: Choropleth Map of EBSMR of suicide (1988 - 1992) with spatial clusters (circled; left) and corresponding echelon dendrogram (right)

Genome Analysis Project

Mission of the project

The project was established in January of 2012. We try to contribute to understand risk based on genome information by developing methodologies to discover useful knowledge to resolve various issues in our world, such as personalized medicine and biodiversity, and methodologies to quantify latent risk by using the knowledge. Our problems include developing methodologies such as control of multiple comparison and influence analyses to find genes which are susceptible to diseases, drug responses, and heterosis. They also include analyses of biodiversity, pathogens evolution, and structure of amino acids. Quantifying risk of disclosure of genome information is also included. A result of our project is explained below.

P-value estimation for gene expression data

There are many studies using gene expression data. A typical study is to find differentially expressed genes. They have been detected using p-values with appropriate test statistics. The p-values can be estimated using permutation samples. However, such p-value estimates may be inaccurate because the number of experiments is often very small on gene expression data.

To improve the accuracy of the p-value estimation, the p-value on a gene has been estimated incorporating the permutation samples on the other genes. The number of permutation samples remarkably increases because there are many genes (typically thousands of genes) on gene expression data, and then we expect that the p-value estimation becomes more accurate. However, this may not be true, because the null hypothesis holds for some genes but does not hold for the other genes.

To overcome this problem, a cleverly-devised test statistic was proposed. We can make the corresponding null statistic and then estimate the p-value appropriately incorporating the permutation samples on the other genes. This idea is very interesting but very ad hoc. There remains the question that there may be a more powerful test than the cleverly-devised test.

New method discovered by mathematical invariance

We have considered what conditions allow us to appropriately incorporate the permutation samples on the other genes and then formalized the problem by mathematical invariance. We have derived the optimal test under the conditions obtained above. This test will be difficult to discover ad hoc and is theoretically ensured to have a higher power than the tests proposed in the past. Furthermore, it was shown by simulation and data analysis that the obtained method worked remarkably better than the methods proposed in the past.

Shuhei Mano, Hironori Fujisawa

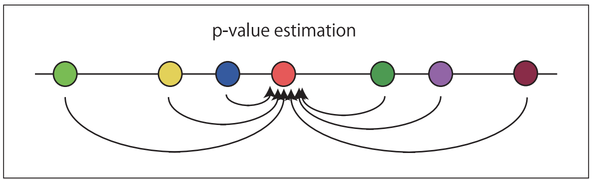


Figure 1: P-value estimation by incorporating the gene expression data on the other genes

$$\hat{p}\left(T(Z^*); t_g\right) = \frac{1}{B}\sum_{b=1}^{B} I\left(T(Z^*_{bg}) > t_g\right)$$

$$\Downarrow$$

$$\hat{p}\left(T(Z^*); t_g\right) = \frac{1}{BG}\sum_{b=1}^{B}\sum_{g'=1}^{G} I\left(T^{\mathrm{null}}(Z^*_{bg'}) > t_g\right)$$

Figure 2: P-value estimator. The upper formula is a standard one. The lower formula is a devised one.

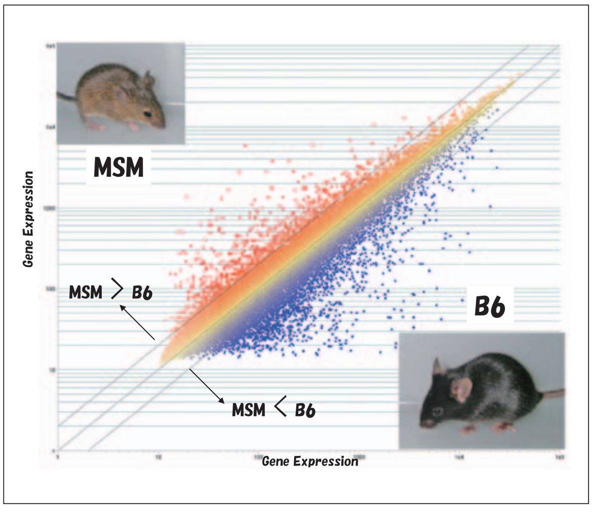


Figure 3: Gene expression differences between B6 and MSM (Mammalian Genetics Laboratory, National Institute of Genetics)

Developing Statistical Analysis System for Parallel Computing Environment

Statistics and computer

As one of the important objectives of statistics is to handle data and retrieve useful information from them, statistical software has been indispensable in statistics since the digital computer first appeared. Recently, statistical software is used not only for manipulating data but also for describing statistical models and data analysis techniques. Data assimilation is one of such computational intensive statistical methods which require powerful computer abilities essentially.

Statistical analysis system

Computer hardware has developed continuously and rapidly in these decades. Computer software also should advance together with it. Our main research interests are on statistical software that can use modern computer hardware efficiently and effectively, especially by developing user interface, graphics, language, network usage for complicated statistical analysis. Our experimental statistical analysis system Jasp has equipped and tested some of such new functions, and tries to be a next generation statistical analysis system (Figure 1).

Currently, one of popular and practical statistical analysis systems is R. R is easy to use, reliable and free multi-platform statistical software, and has been developed and supported by volunteer statisticians in all over the world. R is a complicated and large-scale system, which includes main body for basic statistical computation and graphics, several tools for supporting statistical research such as recording documents and analysis history, interface to external programs written in different computer languages. Figure 2 is an example of the snapshot of R on Windows. The graphics here are drawn by using our graphics library Jasplot that are developed in Java language.

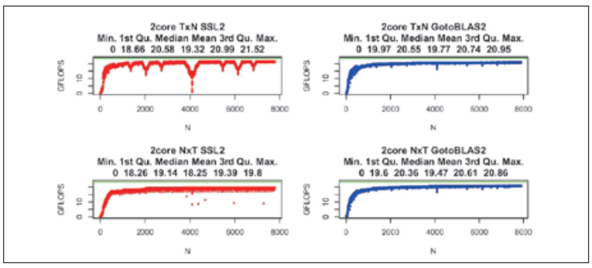


Figure 3: Comparison between the standard BLAS and GotoBLAS

Super computer and the statistical analysis system R

ISM owns world-class powerful super computer systems for statistical science. It is natural that heavy R users hope to run R on our super computers for handling large and complicated data analysis. Although R was not originally designed for using parallel computation ability which is realized on the current super computers, many researchers have added new functions for parallel computing on R. We use and improve GotoBLAS to perform parallel computation for large matrix calculations on our super computers. Figure 3 compares our GotoBLAS and standard BLAS library. Due to the CPU hardware design, performance of calculation inevitably becomes bad for particular data sizes. We can see that the performance of GotoBLAS has less affected by the size of data than the standard library. We also try to use R on Grid and/or Cloud computer environment. Figure 4 demonstrates the configuration of our system on which two or more super computers in the remote places with different architectures can perform calculations in parallel.

Junji Nakano

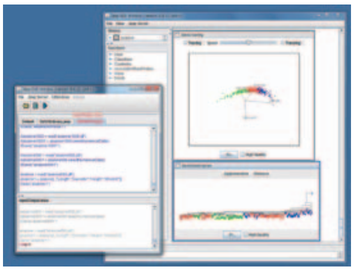


Figure 1:
Statistical analysis system Jasp

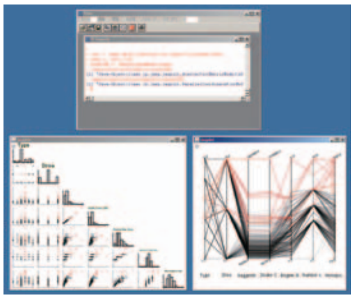


Figure 2:
Snapshot of R on Windows using Java graphical library Jasplot

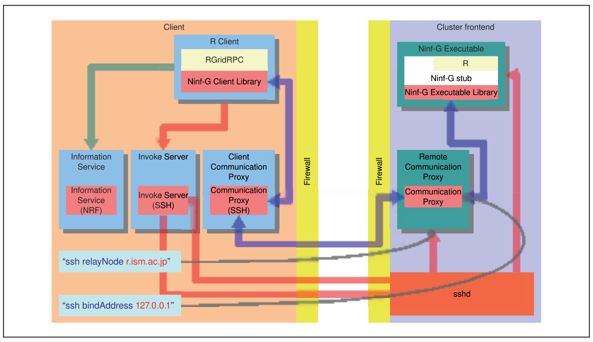


Figure 4: System configuration of parallel R on remote clusters by using GridRPC

Data Assimilation for Reproducing Temporal Evolution of a High-dimensional System

Estimation of high-dimensional system state

In spite of the availability of a large amount of data from a variety of observations, we can not hope that such data would provide the whole view of a system in general. On the other hand, recent progress in computer technology in terms of computational speed, parallel processing, and data storage allows us to perform numerical simulations at high spatial resolution with high accuracy producing realistic pictures of various phenomena in various fields. Data assimilation compensate the lack of observational data with a simulation model aiming at reproducing the phenomena as it actually occurred.

Data assimilation is also regarded as a way to compensate imperfection of the numerical simulation model with the observational data. In order to reproduce natural phenomena using numerical simulation, the initial state must be given accurately. Moreover, even if we could completely know the initial state, it is yet difficult to reproduce the true scenario due to various approximations and assumptions underlying the simulation model. A simulation model could thus produce various scenarios according to initial conditions, approximations, or assumptions. The data assimilation approach seeks the most likely scenario among those scenarios on the basis of the available observations.

In the data assimilation approach, we consider a probability density function of all the variables in a simulation model to allow the variety of scenarios. Although it is challenging to deal with a joint probability density of such a large amount of variables, we address this task with the following two approaches.

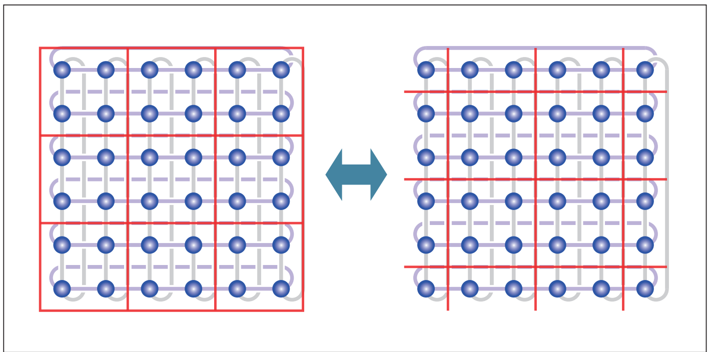


Figure 1: A schematic picture of a data assimilation algorithm which use a massively parallel computer effectively

Estimation with enormous sample size

A probability density function can be represented by a large amount of samples. The advantage of this approach is that it can deal with general non-linear and non-Gaussian problems. However, the number of the samples required in this approach exponentially increases as the number of the variables increases. We are developing techniques to efficiently perform estimation by using a massively parallel computer.

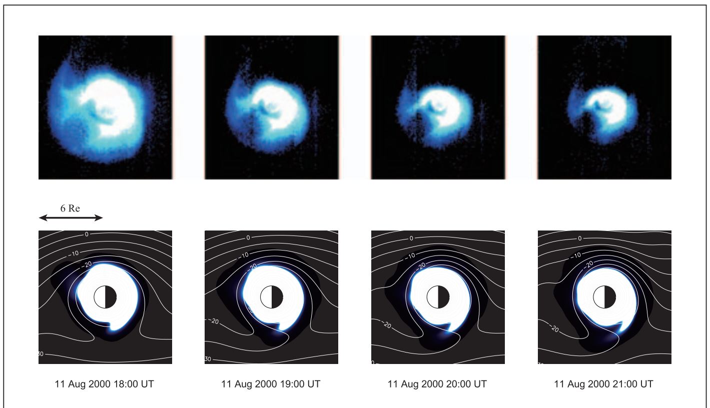


Figure 2: An example of data assimilation with small sample size. The upper panels show extreme ultraviolet (EUV) images from the IMAGE satellite. The lower panels show spatial distribution of plasma density estimated from the EUV data.

Estimation with small sample size

Data assimilation often deals with more than millions (or even billions) of state variables. A practical limited number of random samples would not provide an appropriate approximation of a joint probability density function of such an enormous number of variables. We are studying efficient algorithms in which covariance matrices are approximated by a small number of selected samples and applying such algorithms to various domains.

Shin'ya Nakano

Research on Survey Methodology and Planning of Collaborative Training Survey

Process of social survey and research on survey methodology

The Institute of Statistical Mathematics (ISM) has been conducting many social surveys for almost sixty years. One purpose of these surveys is to study public opinions in Japan. Another important purpose is to study survey methodology in real-life settings.

Social survey mainly consists of two processes, as is depicted in Figure 1. One is the process of sampling (right hand side), where representativeness of the sample is the main concern. The other is the process of measurement (left hand side), where we try to capture the opinion of respondents exactly. Each step in Figure 1 has its own methodological subjects to be studied.

Practice of survey research by ISM

Formerly surveys of ISM were administered by ourselves with the support from many universities, employing students as part-time interviewers. But during the past two decades this tradition has been lost, entrusting most of the survey operation to survey company. Worsening survey circumstances in the present society do not allow us to ask non-professional interviewers to complete our survey. But this also meant that we have gradually lost opportunities for research on survey methodology.

Planning of the collaborative training survey

More recently, social science departments of universities have undergone curriculum reformation which places more emphasis on survey practice. In line with this trend, Survey Science Center is going to administer what we call "Collaborative Training Survey", under close cooperation with university departments and other survey-related institutions. Thus, we will offer faculty members and students more chances to participate in large-scale surveys.

As a start-up, we conducted a nationwide survey on "Social Stratification and Social Psychology" (SSP survey) in 2010 with Osaka University. In 2011 we carried out a joint survey with National Institute for Japanese Language and Linguistics (NINJAL) called "Fourth Survey of Language Standardization in Tsuruoka". This is a cooperative survey project between ISM and NINJAL since 1950, and the survey in Tsuruoka-city, Yamagata Prefecture, has been repeated at about twenty-year intervals. The design of this survey is a combination of a repeated cross-sectional survey and panel survey as is depicted in Figure 2.

We are planning to continue this kind of survey practice for the coming years, with the support of visiting professors from outside the institute. The goal of this activity is to broaden the base of research on survey methodology by fostering more survey professionals.

Tadahiko Maeda

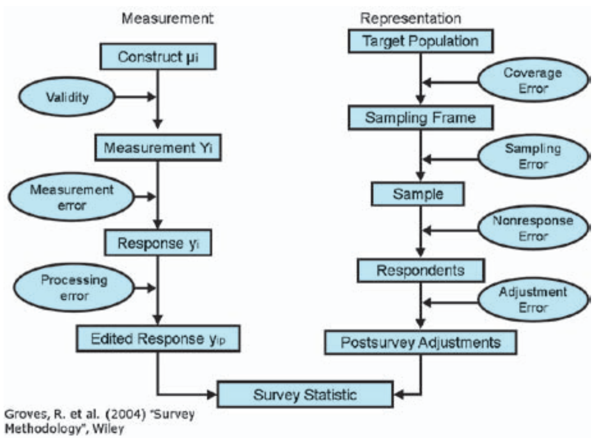


Figure 1: Process of social survey and subject of research on survey methodology

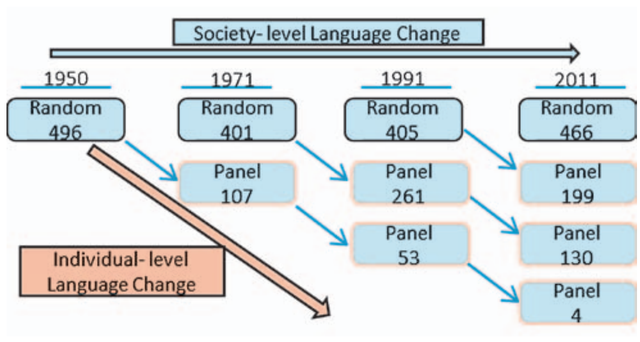


Figure 2: Design of Survey of Language Standardization in Tsuruoka, Sixty years of Cooperative Project with NINJAL. "Random" refers to a survey on random sample, "Panel" refers to a panel survey on the same informants. Numbers in the figure indicate sample size (as of Feb., 2012).

Multi-level Approaches in the Japanese National Character and Organizational Climate

The social system and the Japanese National Character

The Institute of Statistical Mathematics has been conducting a longitudinal nationwide survey, called “Nihonjin no Kokuminsei Chosa” on the Japanese national character since 1953. The main goal of the survey is to investigate nature of Japanese people and track change of Japanese society. Next survey, which is 13th survey is planned to be conducted in 2013.

National character is seldom changed by external change, while some institutional systems and customs are often changed by external reasons, such as rapid globalization in recent years. Does this social system change impact on individual’s behaviors and attitudes? The answer is Yes. However, ever since social system in Europe and the United States has been deployed in Japan, those system changes have not been fully penetrated into the Japanese social system. The difficulty of full deployment is attributed to difference in each national character. Therefore, it is important to clarify what aspects of people’s ways of thinking have been changed, which leads change of attitude trends in Japan.

Moderating effect of organizational climate

In order to assess the most recent attitudes and behaviors of the Japanese National Character in organizational climate, it is important to examine individuals embedded within organizations or countries. To achieve this goal, on top of individual assessment, we also focus on the variables in an organization level for each organization, such as corporate, school, regional society, etc. that an individual belongs to. Furthermore, we are planning cross-cultural research on the national character including international comparison, so as to catch the Japanese National Character in the wide range and various contexts.

Large-scale surveys and new statistics techniques

In order to develop a study of the Japanese National Character, it is required to conduct large-scale surveys based on a statistical sampling method, and carry out surveys on Japanese National Character including international as well as inter-organization comparative study by using the new statistical techniques such as structural equation modeling and multilevel analysis.

Yoosung Park

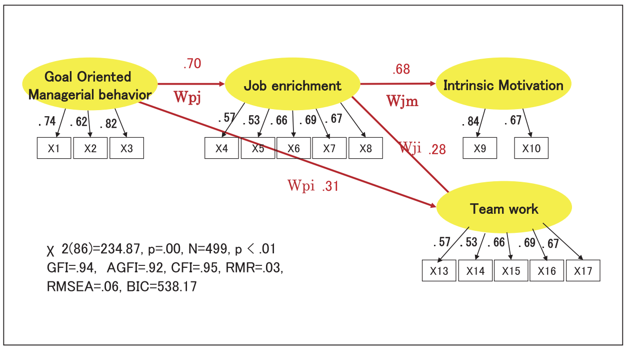


Figure 1: The impact of NPM on intrinsic motivation

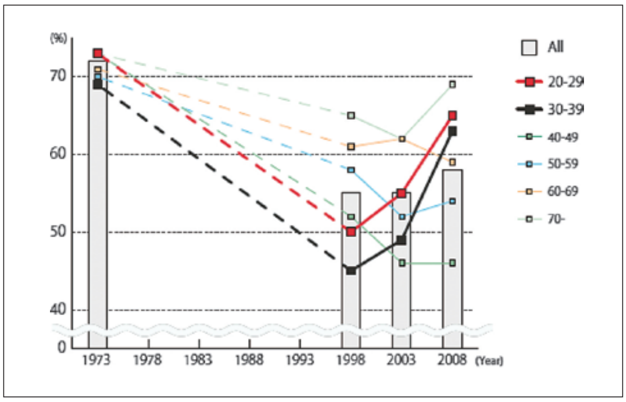


Figure 2: Movement to reconsider interpersonal relationships at the workplace

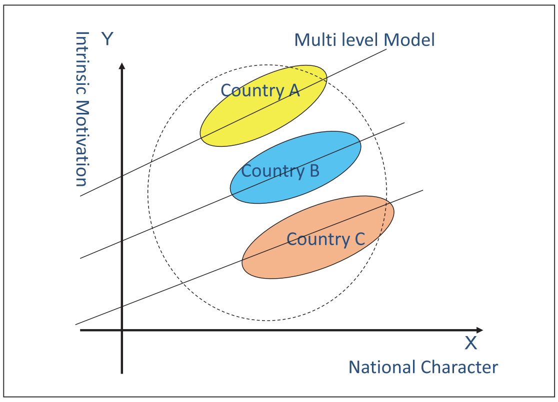


Figure 3: Moderating effect of nation and organization in the Japanese National Character

Sparsity Based Information Processing

Outline

In statistics, a method called LASSO was proposed in 1990's. The method employs the idea of sparsity, that is, a multi-dimensional information source is assumed to have a lot of zero components. When the assumption is correct, it has been proved theoretically that the original source can be reconstructed from restricted number of observations. The sparsity based information processing becomes an important research area not only in statistics, but also in information theory, machine learning, and etc.

Those methods have been applied to many types of data, such as genome data, image data, and data in neuroscience. We are also working for such applications, two of them are shown below.

Sparse representation of motor control

First topic is neuroscience. In 1990's, it has been shown that the sparsity is important for visual information processing in the brain. The idea is widely accepted these days. However, visual information processing is a passive process, and we do not know if the sparsity is important for active information processing in the brain.

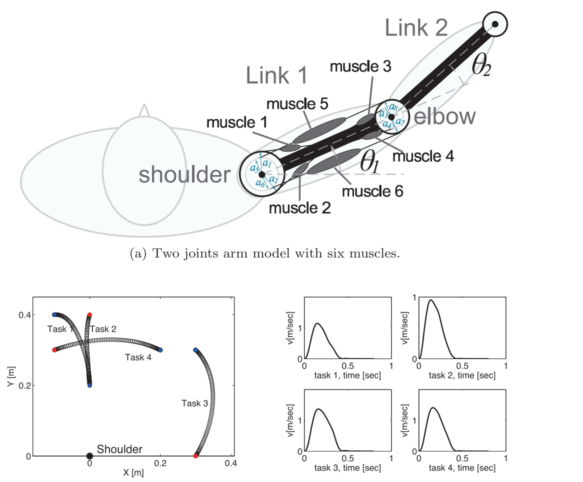
We have collaborated with professor Yutaka Sakaguchi at the University of Electro-Communications, and have studied the possibility of sparse information representation for motor control of two joints arm (Fig.1). We have shown that a sparsity based model works well for motor control, too.

Phase retrieval from X-ray diffraction imaging

Another topic is optics. In RIKEN SPring-8 center at Harima, Japan, a new laser facility called the X-ray free electron laser (XFEL) is built, and new projects started. A project is about the electron density estimation of a biomolecule from diffraction imaging. Commonly used approach is to crystallize biomolecules, and measure the diffraction image, but the goal of the project is to use a single biomolecule without crystallization.

The diffraction image corresponds to the power spectrum of the electron density. The power spectrum is computed from the Fourier transform of the electron density where only the power of each frequency component is given. In order to reconstruct the electron density, we need the phase information. We have collaborated with Dr. Hidetoshi Kono at the Japan Atomic Energy Agency, and have shown that the sparsity based analysis can solve the phase retrieval problem effectively.

Shiro Ikeda

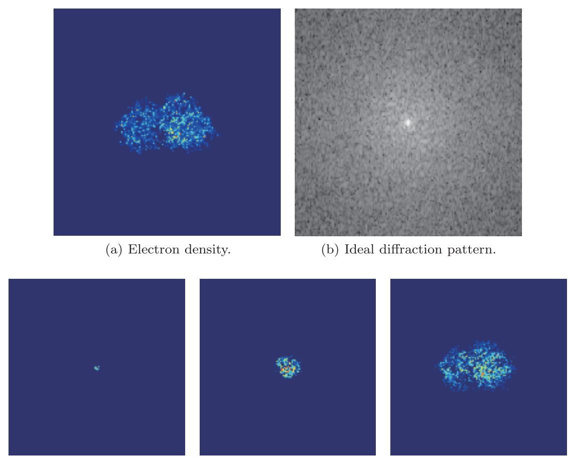


(a) Two joints arm model with six muscles.

(b) Trajectories of 4 reaching tasks.

(c) Velocity profiles of 4 reaching tasks.

Figure 1: Results of proposed method



(a) Electron density.

(b) Ideal diffraction pattern.

(c) Reconstructed electron density with $\mu = 10000$.

(d) Reconstructed electron density with $\mu = 100$.

(e) Reconstructed electron density with $\mu = 1$.

Figure 2: SPR results with different μ for true diffraction data

Statistical Natural Language Processing

■ Overview

Natural language processing deals with human languages to make computers understand and process them easily. Since the World Wide Web is introduced in 1990s and electronic texts became ubiquitous, the field has had deeper connections with statistics to enhance the field theoretically. Now statistical NLP is prevalent in many information infrastructure in the society, and become one of the leading areas in machine learning.

While statistical NLP so far has focused on “syntactic” problems of language such as parsing, dependency analysis and morphological analysis, “semantic” aspects of language is almost inevitable to explore when we consider the language as a means of communication. Because there are no explicit annotation of meanings in the text, from a statistical point of view we have to regard them as latent variables to estimate their values from large corpus of electronic texts.

This project aims to enhance these novel attempts of statistical NLP with the help of heritages in statistics in order to propose deeper and more advanced statistical models of natural language.

■ Bayesian statistics and natural language

Especially, opposed to the data in ordinary statistics, natural language data are inherently discrete, sparse and very high-dimensional (lexicon usually has more than tens of thousands of dimensions). In order to deal with such sparse high-dimensional data, Bayesian statistics is so useful a tool that we can also model “characteristics” of each text through a hierarchical Bayesian models.

Figure 1 shows a result of probabilistic latent semantic analysis, called LDA, on the beginning of the novel “Yukiguni” of Yasunari Kawabata. Based on these unsupervised analysis of language, we are also able to identify when the semantic context changes in a completely statistical fashion. Figure 2 is such a result, showing when the context change occurs by tracking a latent distribution in the latent semantic space by a sequential Monte Carlo method.

■ Natural language and continuous space

Although language is discrete, behind them there are hidden continuous space where meanings and emotions reside. Furthermore, analyzing time-stamped texts, such as emails and twitters, and annual observations of language statistics, call for continuous-time models and time series analysis methods. Figure 3 shows latent “image” of some movies leaned from its reviews using Gaussian processes. While this study is still preliminary, we are going to model and visualize such latent continuous events as emotions.

Associated with these research, we are now conducting joint research with NTT Communication Science Laboratories, National Institute of Informatics, and Advanced Industrial Science and Technology. Furthermore, we started to cooperate with the neighboring institute, National Institute of Japanese Language, for statistical analysis of the balanced corpus of contemporary written Japanese (BCCWJ).

Daichi Mochihashi

国境の長いトンネルを抜けると雪国であった。
夜の底が白くなった。信号所に汽車が止まった。
向側の座席から娘が立って来て、島村の前のガラス
窓を落した。雪の冷気が流れこんだ。…

Figure 1: Probabilistic latent semantic analysis of the beginning of "Yukiguni", where colors indicate semantic topics

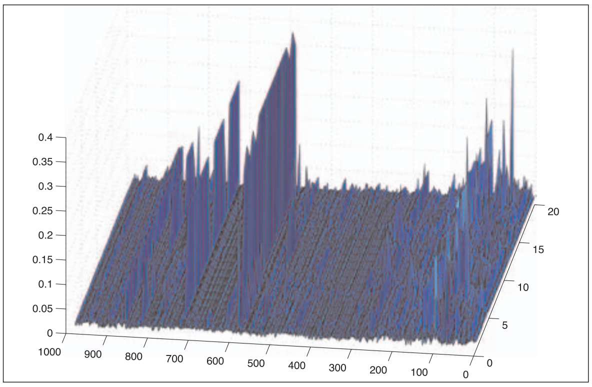


Figure 2: Semantic change point probabilities of a text through probabilistic latent semantic analysis

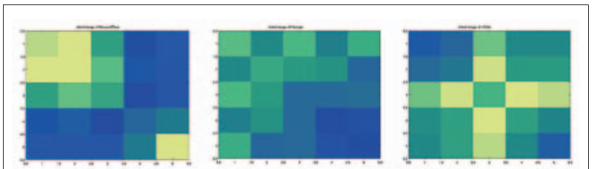


Figure 3: Estimated “image” of movies from the review sentences, using Gaussian processes

New Statistical Methods for Service Design Science

New framework for experimental studies in service science

Design of Experiments (DOE), which was proposed by Sir Ronald Fisher around 1920, is well known as one of powerful statistical methods for experimental data. In addition, Quality Engineering (QE), which was developed by Dr. Genichi Taguchi, has not only been recognized as one of effective experimental data analysis in product design science that elucidates the essence of "Monozukuri", but is also utilized in many fields other than engineering. However, the aim of both DOE and QE is implicitly to evaluate factorial effects based on a small sample. On the other hand, unlike product design science that focuses on uniform quality value, service science deals with customers' sense of values. Thus, under situations where many different items must be measured in order to quantify customer behaviors and it is difficult to effectively leverage the advantages of the DOE, it is necessary for service science to provide effective methods in order to evaluate the effects of service strategies on customers' behaviors using huge amounts of time series data. We are constructing a new framework for experimental studies in service science.

Elucidation of service process mechanism based on observed data with application to service strategies

Service industries, which have shifted from low-mix/high-volume production to high-mix/low-volume production, are required to establish new business models that are based not on corporate ethics but on customer ethics. In order to develop the business models, we have to consider customer characteristics, environments, and behaviors that may change on a daily life. To efficiently provide services based on customer requirements, it is necessary for the service providers to analyze customer behaviors from various perspectives as well as to extract potential customer characteristics and requirements based on observed data, and to shed light on the mechanism for service provision processes. We are conducting research on the unification of inductive inference based on data analysis methods and deductive inference based on marketing theory, in order to create a new paradigm that links the combined inference to a new service strategy based on customer perspectives.

Manabu Kuroki

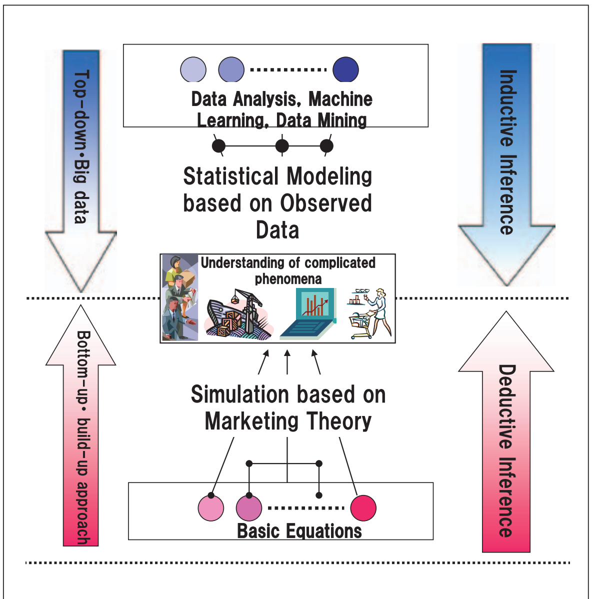


Figure 1: The combination of inductive and deductive inference in service science
(Provided by Prof. Sato, University of Tsukuba)

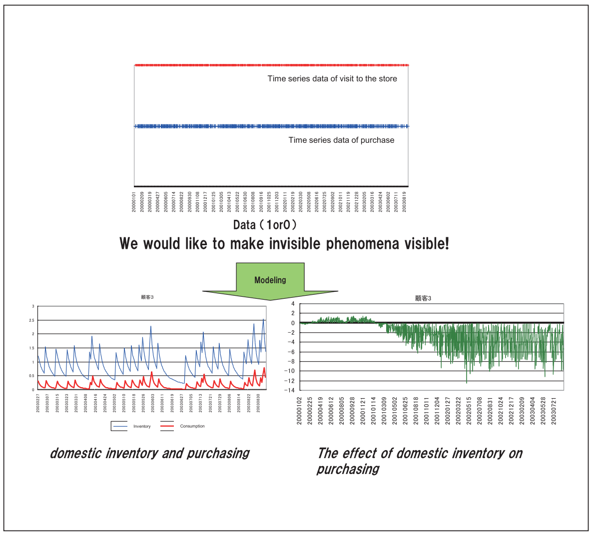


Figure 2: A case study of service science
(Provided by Prof. Sato, University of Tsukuba)

Statistical Methodology Development for Robust Parameter Design

Robust parameter design

Robust parameter design is a systematic engineering methodology for quality improvement, and was developed by Dr. Genichi Taguchi over the period of half a century. The purpose of this methodology is to find a good design of system control factors to reduce variation of the system output characteristic and functionality in order to make the system robust against noise factors such as environmental use conditions. This methodology calibrates system control factors in order to reduce output variation in a cost-efficient approach. This is the core of design and development processes of Japanese manufacturing industries.

Optimal design of a push button switch

A push-button switch design is supposed to give a gentle but quick snapping motion when the switch is pushed. This is caused by the reaction force of the push-button switch when the skirt portion is pushed and distorted. The deflection of the switch skirt increases proportionally with the reaction force. However, when the reaction force reaches a certain threshold (maximum) value, the skirt is deformed and the upper part of the button reaches the bottom quickly to provide the On-Off function. At the same time, the reaction force of the push-button switch is reduced dramatically from its maximum value to a minimum value.

The objectives of the optimization of the push-button switch are twofold: 1) stabilize the functionality of the switch against noise factors, and 2) make the range between the maximum and minimum values of reaction force as wide as possible. The first objective is to find the most significant factors that stabilize the functionality of the push-button switch, which is influenced by numerous noise factors. The second optimization objective is to maximize the range between maximum and minimum reaction force to provide the user an appropriate feel for the switch action, which is designed structurally to meet customer needs.

This research is based on the assumption of a cubic polynomial model that describes the maximum and minimum values as well as the deflection point for the input-output functionality of the push-button switch. The collected data are used to construct response function modeling (RFM) to describe the behavior of the push-button switch.

The analysis results illustrate the comparison between the initial design (Figure 1) and optimal design (Figure 2). The results show the optimal design has less variation (due to noise factors) than the initial design, while its range between maximum and minimum reaction forces is wider than the range in the initial design.

Toshihiko Kawamura

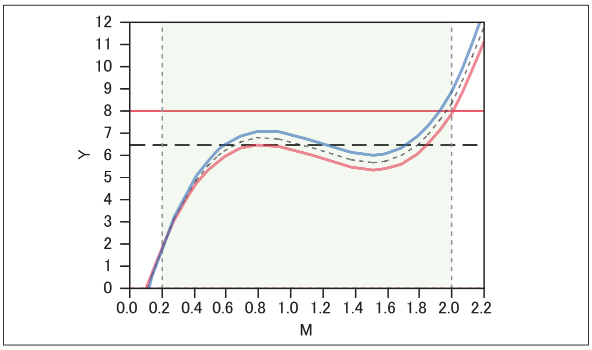


Figure 1: Prediction graphics of the initial design

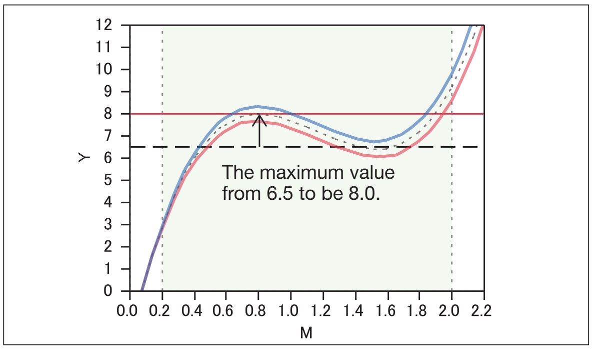


Figure 2 (a): Input-output response of the optimal design of Scenario (a)

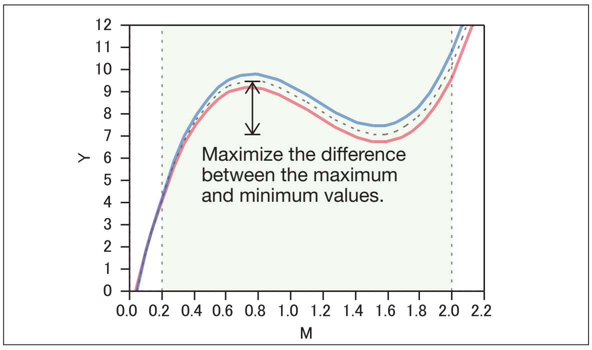


Figure 2 (b): Input-output response of the optimal design of Scenario (b)

NOE (Network Of Excellence) Project

Building a Framework for Advancing Strategic Research and Pursuing a New Approach to Collaborative Research

Biaxial Structure

The Institute of Statistical Mathematics pursues research and education along the two lines of basic research and strategic research, conducted by the basic research departments along a horizontal axis and the strategic research centers along a vertical axis (Figure 1). By its nature, the basic research departments cuts across and links various disciplines, developing tools for interdisciplinary research. The field of statistical mathematics must itself evolve to meet the changing needs of society and the data environment, and is therefore constantly evolving as a field of study. At the same time, there are approaches and directions that remain unchanged as the field evolves. For that reason, we have chosen to call it "basic research", to reflect both the fixed and evolving qualities of statistical mathematics. There are three basic research departments: statistical modeling, data science, and mathematical analysis and statistical inference. These departments engage in cutting-edge research to develop methodologies for rational prediction and decision making, based on data and existing knowledge. Each of the Institute's permanent researchers is assigned to one of these basic research departments.

Research Facilities

The Institute's research facilities comprise the strategic research centers and the school for developing professionals. The strategic research centers (vertical axis) conduct research activties that interface statistical mathematics with individual scientific disciplines, in order to find solutions to urgent social problems. These centers are staffed by permanent researchers within the Institute, project researchers (post-doctoral staff), and visiting professors and researchers. In January 2012, we closed the Prediction and Knowledge Discovery Research Center and Research Innovation Center. We then established the Research Center for Statistical Machine Learning and Service Science Research Center. The two new centers join the existing Risk Analysis Research Center, Research and Development Center for Data Assimilation, and Survey Science Center. Additionally, the Institute launched School of Statistical Thinking in November 2011 to foster and promote statistical thinking.

NOE (Network Of Excellence) Project

In accordance with the second medium-term plan of the Research Organization of Information and Systems, the Institute of Statistical Mathematics has set as a goal the establishment of NOE (Network Of Excellence) in statistical mathematics. We have been establishing NOE in the five research areas of integrated risk research, next-generation simulation, survey science, statistical machine learning, and service science. NOE pursues activities to establish new methodologies in their respective research fields and serves as hubs for interdisciplinary interaction. We operate NOE Promotion Unit to strengthen our coordination skills and to support the overall advancement of the NOE Project. Advisory Board of NOE Project, which is organized by experts in the private sector, academia, and the government (Table 1), advises our Managing Committee of NOE Project and each strategic research center so that we can formulate a unified management strategy to facilitate the project for the crucial goal of erecting a fourth scientific methodology in our knowledge society that extends beyond resolving individual problems.

The Institute has created a new logo in light of the continued growth of research under NOE. The logo

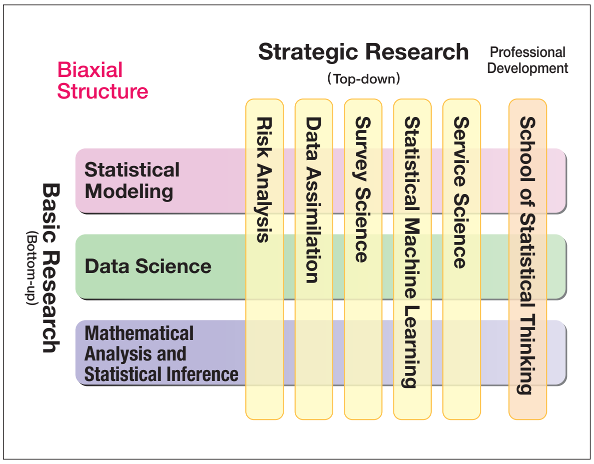


Figure 1: Biaxial Structure of Basic Research and Strategic Research (the Centers) and Professional Development in the Institute of Statistical Mathematics.

Senior Advisor, RIKEN Brain Science Institute	Dr. Shun-ichi Amari
Adjunct Professor, Graduate School of System Information, Kobe University	Dr. Yoshio Oyanagi
President, Shiga University	Dr. Takamitsu Sawa
Professor Emeritus, Tokyo University	Dr. Motoyuki Suzuki
President, Center for International Public Policy Studies	Prof. Naoki Tanaka
President, The Japan Pharmaceutical Manufactures Association	Dr. Isao Teshirogi
Professor, Sociology and Research Methodology School of Cultural and Creative Studies, Aoyama Gakuin University	Dr. Kazufumi Manabe
Director-General, Center for Research Development and Strategy, Japan Science and Technology Agency / Highest Emeritus Advisor, The National Institute of Advanced Industrial Science and Technology	Dr. Hiroyuki Yoshikawa
Director-General, Institute for Monetary and Economic Studies	Prof. Tomoo Yoshida

Table 1: Advisory Board of NOE Project

(Figure 2) symbolizes the advancement of comprehensive research through the combined and cumulative efforts of the five NOE, alongside research efforts in their respective research areas. The logo is used for the activities of the NOE Project at the Institute and at our related organizations.

Establishment of New Research Centers

The Research Center for Statistical Machine Learning is one of two new research centers that we established in January 2012. The center was formed by combining the Statistical Genome Diversity Research Group from the Prediction and Knowledge Discovery Research Center, and the Functional Analytic Inference Research Group, Optimization-based Inference Research Group, and Speech and Music Information Research Group from the Research Innovation Center. The new center includes researchers in other related disciplines, and all researchers pursue broad and international research in collaboration with researchers outside of Japan.

We also established the Service Science Research Center, which was formed with the Research Group for Reliability and Quality Assurance of Service and Product from the Risk Analysis Research Center as its base. This new center includes researchers in fields bordering service science, from within the Research and Development Center for Data Assimilation and the Institute.

In addition, the existing Risk Analysis Research Center has shifted from research groups to a project-based approach to pursue a broader scope of research and flexibly adapt to changes in the research environment. By the abovementioned changes, all five of our research centers are now NOE-type centers, to enable interdisciplinary knowledge transfer revolving around the Institute of Statistical Mathematics.

Expansion of Activities by NOE

The Institute is actively pursuing agreements with other research organizations, in order to expand the role of the five research centers as core research hubs. In the 2011–2012 academic year, we have signed new Memorandum of Agreements with one Japanese institute and three foreign organizations.

From a methodological perspective, our Institute is focusing all activities on advancing research in each of the research fields of risk research, next-generation simulation, survey science, statistical machine learning, and service science. And we are going to unite the five NOE mentioned above into one as the NOE Research Promotion Organization. Using this, the Institute will aim to develop new research areas and establish new collaborative research systems (Figure 3). To learn more about the project, please visit the website of the NOE Project (http://noe.ism.ac.jp/).

統計数理研究所
NOE形成事業

Figure 2: logo

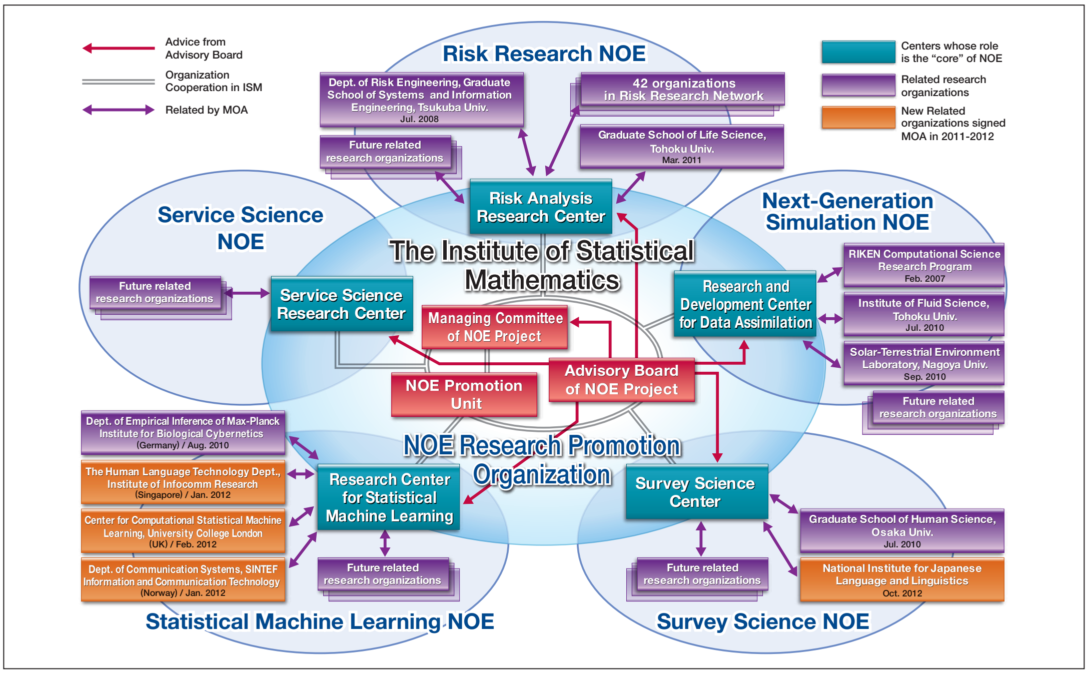


Figure 3: Relationship Diagram of NOE (Network Of Excellence)

Project for Fostering and Promoting Statistical Thinking

Because of the "data explosion" in modern society, people who can think and handle such data statistically and retrieve useful information are greatly needed in all fields. Unfortunately, the Japanese education system has fallen short in producing a sufficient number of people who have useful statistical thinking abilities. We established the School of Statistical Thinking in ISM to improve this situation. We hope that our activities, including tutorial courses, seminars, and cooperative research projects, are useful for developing professionals with the proper knowledge and skills to tackle complicated problems involving huge amounts of data.

Research Collaboration Start-up

The Institute has been providing a consultation service on statistical science. Along with the launch of the School of Statistical Thinking in November 2011, this service was reorganized as a research collaboration start-up. This program, being one of the projects to foster and promote statistical thinking, is mainly aimed at supporting applied scientists. Expert statisticians affiliated with the Institute give scientists advice on statistical modeling and data analysis. Some cases develop to the point of official research cooperation, which is our primary duty as an interuniversity research institute. The start-up program covers a variety of topics ranging from introductory to more specialized studies. Half of the clients are from the private sector, and the rest are staff at public organizations, university professors, or students. The Institute accepts about 20 cases annually, some of which benefit society in diverse ways.

Open-type Human Resource Development Program

In order to foster and promote "statistical thinking", the Institute of Statistical Mathematics is calling for research meeting and other workshop applications, particularly those related for developing young human resources.

Four workshops have already been selected in FY 2012.

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 free to attend. To view the seminar schedule and learn more about the program, please visit the Institute of Statistical Mathematics website.

http://www.ism.ac.jp/

Open Lecture

We hold an open lecture during Education and Culture Week every year (November 1 through 7), to introduce the Institute's activities and to promote statistical science. We invite lecturers to speak on a timely topic relating to statistical science. The lecture is open to the general public. For further information, please visit the website of the Institute of Statistical Mathematics.

http://www.ism.ac.jp/

Tutorial Courses

■ History

The Statistical Education Program started in 1944, the year that the Institute of Statistical Mathematics was founded, as an education program at the Numerical Computation Training Center of the Science Research Technical Assistant Training Center of the Ministry of Education, located within the Institute. In 1947, the affiliated Statistical Technician Training Center was opened as an educational organization for statistical technicians and instructors.

As social needs have changed, the purpose of the education program has gradually shifted away from supplying statistical technicians for the government, towards educating working people. Tutorial courses were therefore initiated.

In 1985, the Institute was reorganized as a member of the Inter-University Research Institute Corporation, and the affiliated Statistical Technician Training Center was abolished. However, in response to consistent public demand for tutorial courses, the Center for Engineering and Technical Support, together with other departments, ran three to four courses annually. In 2005, the number of courses rose to 13. In 2011, the number of courses was 10.

■ Courses

The total number of courses held from 1969 to March, 2012 was 282, with a total of 20,687 participants. These courses covered a wide range of fields from basic to applied statistics. The following table lists the courses held in the past year:

Year	Category	Title	Month	Number of participants
2011	Basic course	Introduction to Sampling Methods and Sample Surveys	May	39
	Basic course	Akaike Information Criterion and Statistical Modeling	June	92
	Basic course	Introduction to Multivariate Analysis	August - September	94
	Advanced course	New Development of Model-Free Controller Design — Basics and Applications of Fictitious Reference Iterative Tuning (FRIT) —	September	18
	Basic course	Basic Course of Statistics	October	85
	Standard course	Statistical Pattern Recognition —Toward Comprehensive Understanding—	October	93
	Advanced course	An Introduction to Statistical Analysis Based on Martingale Theory	November	53
	Standard course	Theory and Practice for Inferring Molecular Phylogenies	November	35
	Advanced course	Implementation of the Ensemble Kalman Filter	December	81
2012	Basic course	Introduction to Time Series Analysis for Bioscience	March	91

The schedule of tutorial courses can be found on the website of the Institute of Statistical Mathematics.

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

Research Cooperation

International Cooperation

Associated Foreign Research Institutes

Organization name	Address	Conclusion day
The Statistical Research Division of the U.S. Bureau of the Census	USA (Washington)	July 27, 1988 -
Stichting Mathematisch Centrum	The Kingdom of the Netherlands (Amsterdam)	May 10, 1989 -
Statistical Research Center for Complex Systems, Seoul National University	The Republic of Korea (Seoul)	October 17, 2002 -
Institute for Statistics and Econometrics, Humboldt University of Berlin	Germany (Berlin)	December 8, 2004 -
Institute of Statistical Science, Academia Sinica	Taiwan (Taipei)	June 30, 2005 -
The Steklov Mathematical Institute	Russia (Moscow)	August 9, 2005 -
Central South University	China (Changsha)	November 18, 2005 -
Soongsil University	The Republic of Korea (Seoul)	April 27, 2006 -
Department of Statistics, University of Warwick	The United Kingdom (Coventry)	January 16, 2007 -
The Indian Statistical Institute	India (Kolkata)	October 11, 2007 -
Department of Empirical Inference, Max Planck Institute for Biological Cybernetics	Germany (Tubingen)	August 11, 2010 -
Faculty of Medicine, University of São Paulo	Brasil (São Paulo)	April 15, 2011-
Department of Communication Systems, SINTEF Information and Communication Technology	Norway (Trondheim)	January 30, 2012-
Human Language Technology Department Institute for Infocomm Research	Singapore (Singapore)	February 16, 2012-
Centre for Computational Statistics and Machine Learning, University College London	The United Kingdom (London)	February 16, 2012-

Research Collaboration

This academic study program provides researchers from other academic institutes with access to the facilities of the Institute, and provides opportunities for researchers to conduct theoretical and applied studies on statistics.

Number of Activities

2006	2007	2008	2009	2010	2011
122	120	138	154	135	172

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	Number	Fields
a	Spatial and time series modeling	f	Computational statistics
b	Intelligent information processing	g	Mathematical statistics
c	Graph modeling	h	Learning and inference
d	Survey research	i	Computational mathematics
e	Multidimensional data analysis	j	Others

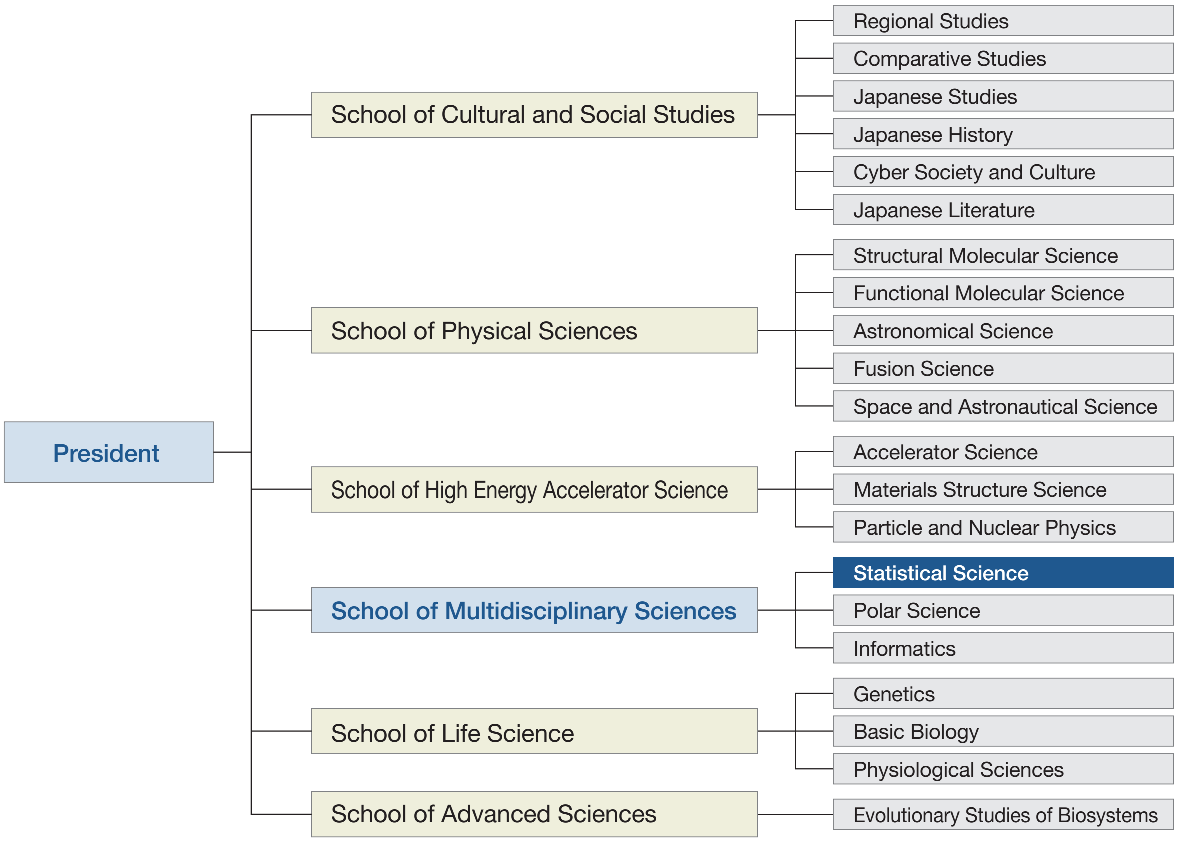
Major Research Fields

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	Others	Other research fields

Graduate School Program

Organization

The Institute of Statistical Mathematics is one of the platforms of 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 created 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.



Outline of Education and Research

The course includes designing of data-gathering systems, modeling, inference and forecasting in order to extract information and knowledge from the real world based on empirical data, as well as basic, mathematical and applied education and research related to these fields. The course aims to provide the student with skills that help to contribute to solving important and connected issues and give the ability to perform original research.

Field of Education and Research	Contents
Statistical Modeling	Education and research focuses on dynamic modeling such as spatial and space-time modeling, graphical modeling of temporally and/or spatially inter-related complex phenomena, and intelligent information processing. We also provide education and research on statistical inference based on various models, methods of calculation for inference, and evaluation of models based on data.
Data Science	We provide education and research on data design, investigation and analytical methods to cope with the uncertainty and incompleteness of information, as well as on computational statistics.
Mathematical and Statistical Inference	We provide education and research on the theory of statistics and related basic mathematics, statistical learning theory to extract information from data by automated learning and inference techniques; as well as theory and applications of optimization and computation algorithms which serve as the basis for computational inference.

Features of Education and Research

- The course is the only integrated doctoral program on statistical science in Japan. It has received students from a wide variety of disciplines and has offered education and research on statistical science by professors specialized in many different fields, from theory through to practical applications.
- The Institute of Statistical Mathematics, the platform for the course, is equipped with a world-class super computer, high-speed 3D graphic computers and simulators to generate physical random numbers, as well as a variety of software, including original statistical software developed by the Institute.
- The academic publications and books on statistical and mathematical sciences produced are some of the best in the world.
- In its role as an inter-university research institute, the Institute holds frequent workshops and seminars by visiting professors and researchers from both Japan and abroad. Students are free to attend and participate.
- It is possible to collaborate with researchers from other universities and institutions. It is also possible for students to develop their own projects by participating in research projects with other institutions through the Transdisciplinary Research Integration Center, Research Organization of Information and Systems.

Course Requirements and Type of Degree Granted

- Requirements to complete the course are as follows:
  Completion of at least 40 credits while a graduate student of five years, or completion of at least 10 credits while a doctorate student of three years who graduated Master's course meeting all the criteria set by the thesis committee of the Institute and successfully completing the final examination.
- On completion of the course, either a Doctorate in Statistical Science or, if the thesis deals mainly with an inter-disciplinary field related to statistical science, a Doctorate of Philosophy is awarded.
- The required number of years of study will be flexible if a student demonstrates outstanding research results.

Number of Students (As of April 1, 2012)

■ Doctor's course five years

Year of enrollment	2008	2009	2010	2012
Number of students	2 ①	1 (1)	2	2

■ Doctor's course three years

Year of enrollment	2004	2007	2008	2009	2010	2011	2012
Number of students	1 ①	2 ②	3 ③	3 ②	5 ④	8 ⑤	2 ②

* The figures in parentheses indicate the number of foreign students being supported at government expense.
* The figures in circles indicate those who are employed by other organizations.

University Background of Students

National and public universities

• Hokkaido University (1) • Tohoku University (2) • Fukushima University (1) • University of Tsukuba (6) • Saitama University (1) • Ochanomizu University (1) • Hitotsubashi University (6) • Chiba University (1) • The University of Tokyo (16) • Tokyo Medical and Dental University (1) • Tokyo Gakugei University (1) • Tokyo Institute of Technology (4) • Tokyo University of Marine Science and Technology (1) • Tokyo University of Agriculture and Technology (1) • Tokyo Metropolitan University (1) • Shizuoka University (1) • Japan Advanced Institute of Science and Technology, Hokuriku (1) • Nagoya University (3) • Toyohashi University of Technology (2) • Kyoto University (4) • Osaka University (2) • Osaka City University (1) • Okayama University (2) • Shimane University (3) • Kyushu University (2) • Oita University (1)

University Background of Students

Private universities

• Okayama University of Science (1) • Tokyo University of Science (5) • Kyoto Sangyo University (1) • Keio University (5) • Waseda University (6) • Chuo University (7) • Toyo University (1) • Nihon University (2) • Hosei University (7) • Kurume University (1) • Japan Women's University (1) • Shibaura Institute of Technology (1) • Nanzan University(1)

Foreign universities

• Aston University (1) • University of California, Irvine (1) • Universidade Eatadual of Campians (1) • University of Colorado at Boulder (2) • University of Dhaka (2) • University of Hawaii (1) • Jahangirnagar University (2) • University of Malaya (1) • Ohio University (1) • University of Rahshahi (2) • Stanford University (1) • Center for Analysis and Prediction, China Seismological Bureau (1) • Northeastern University of Technology, China (1) • The Hong Kong University of Science and Technology (1) • University of Science and Technology of China (1) • Chinese Academy of Sciences, Institute of Applied Mathematics (1)

Degrees Awarded

Year	2006	2007	2008	2009	2010	2011
Doctor of Philosophy	8 [1]	7 [1]	4 [1]	5 [1]	7 [1]	4

* [ ] Ph.D. on the basis of the dissertation only (included in the total)

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 • Hokkaido University • Tokyo Institute of Technology • Hiroshima University • 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

Private universities

• Sapporo Gakuin University • Tokyo Health Care University • Meiji University • Doshisha University • Josai University • Nihon University • Komazawa University • Tokyo University of Information Science • Shibaura Institute of Technology • Rikkyo 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. • Bank of Tokyo-Mitsubishi UFJ • Pfizer Japan Inc. • Doctoral Institute for Evidence Based Policy • Sony Corporation • NTTIT Corporation • Sompo Japan Insurance Inc.

Facilities and Equipment

Computation Resources

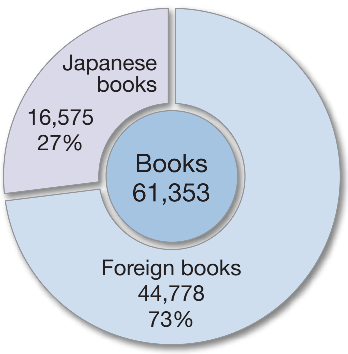
Since January 2010, the Supercomputer System for Statistical Science has been in operation and has analyzed a large volume of statistical data. The main components are a shared memory system (Fujitsu SPARC Enterprise M9000 with 2 nodes, the first with 64 quad-core SPARC64 CPUs and 2 TB of main memory, and the second with 24 quad-core SPARC64 CPUs and 1 TB of main memory), and a distributed memory system (Fujitsu PRIMERGY RX200S5 with 360 nodes, each with 2 quad-core Xeon X5570 CPUs and 48 or 24 GB of main memory. In total, 2880 cores and 12.1 TB of memory are available). The system also includes a large-scale shared storage system (1.37 PB disk storage supported by RAID6), a physical random number generating system (two random number generator boards, each of which can generate random numbers at 400 MB/s) and a visualization system (including a SXRD projector with a maximum resolution of 4,096 × 2,160 and a 200-inch rear projection screen).

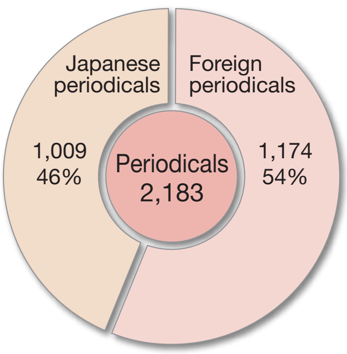
In the office building, the primary Local Area Network (LAN) consists of an Ethernet network using 10GBASE-SR for the main trunk and 1000Base-T for branches. The personal computers in researchers' offices, the Supercomputer System for Statistical Science are all connected to this network. A wireless LAN system that supports IEEE 802.11a,b,g,n is also available in the area of the building occupied by the institute. These LAN systems enable distributed processing and computing resources and statistical data to be used effectively. Comprehensive network security measures 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 SINET3 (1 Gbps).

Supercomputer System for Statistical Science

Library and Materials (As of April 1, 2012)

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 (2011)

Type	Personnel expenses	Non-personnel expenses	Total
Expenditure	765,005	881,427	1,646,432

Unit: ¥1,000

Accepted External Funds (2011)

Type	Subcontracted research	Joint research	Contribution for scholarship	Total
Items	9	4	4	17
Income	46,044	5,566	5,993	57,603

Unit: ¥1,000

Grant-in-Aid for Scientific Research "KAKENHI" (2011)

Research Category	Items	Amount Granted
Grant-in-Aid for Scientific Research (S)	1	30,420
Grant-in-Aid for Scientific Research (A)	3	31,850
Grant-in-Aid for Scientific Research (B)	3	12,090
Grant-in-Aid for Scientific Research (C)	15	15,129
Grant-in-Aid for Challenging Exploratory Research	4	6,760
Grant-in-Aid for Young Scientists (B)	8	11,440
Grant-in-Aid for Research Activity Start-up	1	1,222
Grant-in-Aid for JSPS Fellows	1	800
Total	36	109,711
Health and Labour Sciences Research Grants	1	3,000

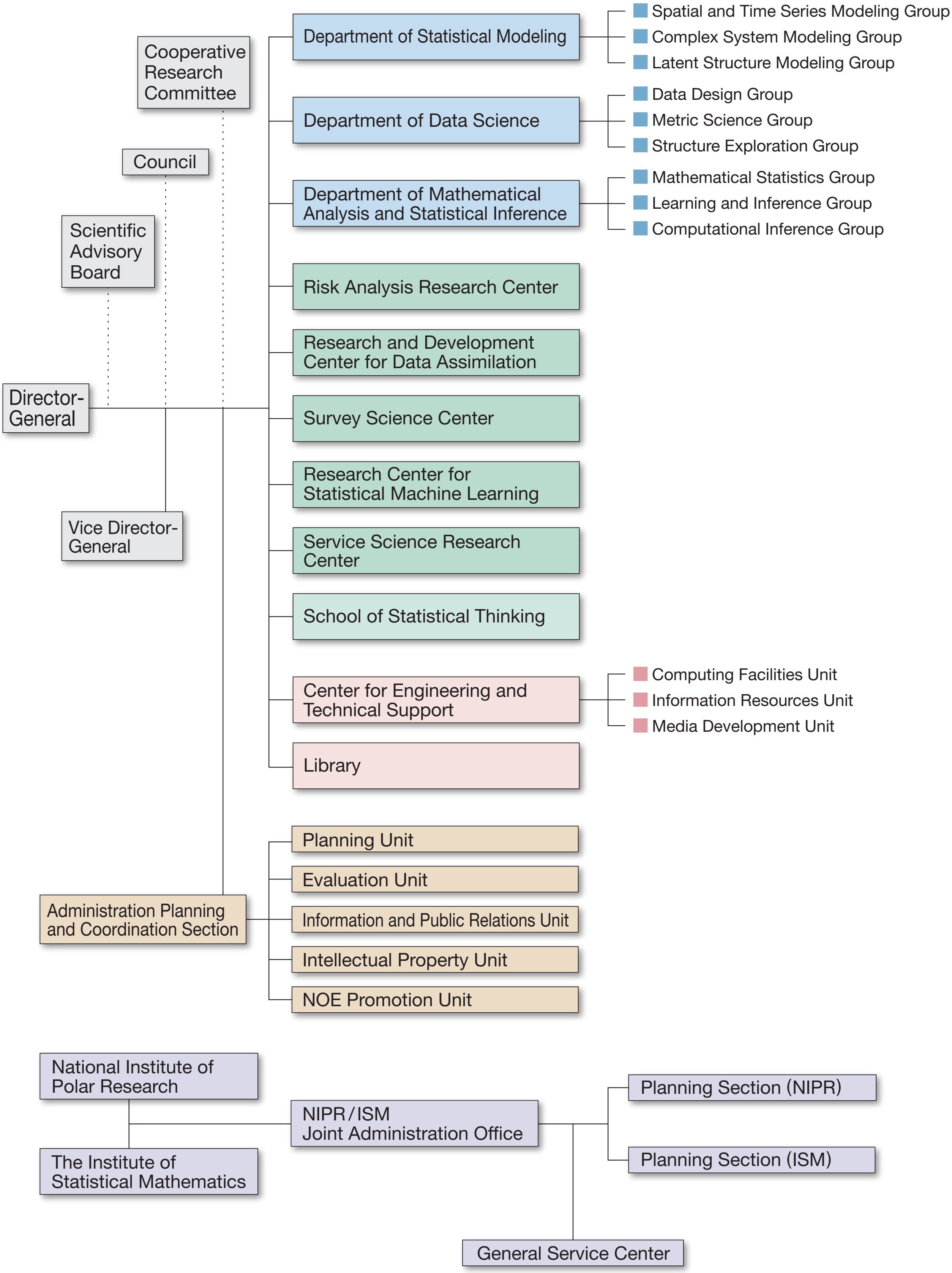
Unit: ¥1,000

Site and Buildings (As of April 1, 2012)

Site Area	62,450m²
Area for Buildings (total)	16,026m²

Organization

Organization Diagram (As of October 1, 2012)



Number of Staff (As of April 1, 2012)

Type	Director-General	Professor	Associate Professor	Assistant Professor	Administrative Staff	Technical Staff	Total
Director-General	1						1
Department of Statistical Modeling		5	8	2			15
Department of Data Science		6	7	6			19
Department of Mathematical Analysis and Statistical Inference		6	5	4			15
Center for Engineering and Technical Support						9	9
Administration Planning and Coordination Section					1		1
NIPR/ISM Joint Administration Office					12(29)	1 (2)	13(31)
Total	1	17	20	12	13(29)	10(2)	73(31)

( ) Total Number of Staff of NIPR/ISM Joint Administration Office

Staff (As of October 1, 2012)

Director-General Tomoyuki HIGUCHI

Vice Director-General Hiroe TSUBAKI

Vice Director-General Yoshiyasu TAMURA

Vice Director-General Hiroshi MARUYAMA

Department of Statistical Modeling

Director Tomoko MATSUI

Spatial and Time Series Modeling Group

Prof.	Nobuhisa KASHIWAGI	Prof.	Tomoyuki HIGUCHI	Assoc. Prof.	Jiancang ZHUANG
Assoc. Prof.	Genta UENO	Assist. Prof.	Shinya NAKANO		

Complex System Modeling Group

Prof.	Yoshiyasu TAMURA	Prof.	Junji NAKANO	Assoc. Prof.	Yukito IBA
Assoc. Prof.	Yumi TAKIZAWA	Assoc. Prof.	Fumikazu MIWAKEICHI	Assist. Prof.	Shinsuke KOYAMA

Latent Structure Modeling Group

Prof.	Hiroshi MARUYAMA	Prof.	Tomoko MATSUI	Assoc. Prof.	Yoshinori KAWASAKI
Assoc. Prof.	Seisho SATO	Assoc. Prof.	Ryo YOSHIDA		

Department of Data Science

Director Takashi NAKAMURA

Data Design Group

Prof.	Takashi NAKAMURA	Prof.	Ryozo YOSHINO	Assoc. Prof.	Naomasa MARUYAMA
Assoc. Prof.	Tadahiko MAEDA	Assoc. Prof.	Takahiro TSUCHIYA	Assist. Prof.	Toshihiko KAWAMURA

Metric Science Group

Prof.	Satoshi YAMASHITA	Prof.	Shigeyuki MATSUI	Assoc. Prof.	Kenichiro SHIMATANI
Assoc. Prof.	Masayuki HENMI	Assist. Prof.	Nobuo SHIMIZU	Assist. Prof.	Hisashi NOMA

Structure Exploration Group

Prof.	Hiroe TSUBAKI	Prof.	Koji KANEFUJI	Assoc. Prof.	Jun ADACHI
Assoc. Prof.	Manabu KUROKI	Assist. Prof.	Ying CAO	Assist. Prof.	Koken OZAKI
Assist. Prof.	Yoo Sung PARK				

Department of Mathematical Analysis and Statistical Inference

Director Satoshi KURIKI

Mathematical Statistics Group

Prof.	Satoshi KURIKI	Assoc. Prof.	Yoichi NISHIYAMA	Assoc. Prof.	Shuhei MANO
Assist. Prof.	Takaaki SHIMURA	Assist. Prof.	Shogo KATO	Assist. Prof.	Kei KOBAYASHI
Visiting Prof.	Yoshihiko KONNO				

Learning and Inference Group

Prof.	Shinto EGUCHI	Prof.	Kenji FUKUMIZU	Assoc. Prof.	Shiro IKEDA
Assoc. Prof.	Hironori FUJISAWA	Assoc. Prof.	Daichi MOCHIHASHI		

Computational Inference Group

Prof.	Yoshihiko MIYASATO	Prof.	Atsushi YOSHIMOTO	Prof.	Satoshi ITO
Assist. Prof.	Tadayoshi FUSHIKI				

Risk Analysis Research Center

Director Hiroe TSUBAKI Vice Director Satoshi YAMASHITA

Prof.	Hiroe TSUBAKI	Prof.	Satoshi YAMASHITA	Prof.	Satoshi KURIKI
Prof.	Shigeyuki MATSUI	Prof.	Shinto EGUCHI	Prof.	Koji KANEFUJI
Prof.	Nobuhisa KASHIWAGI	Prof.	Atsushi YOSHIMOTO	Assoc. Prof.	Masayuki HENMI
Assoc. Prof.	Manabu KUROKI	Assoc. Prof.	Shuhei MANO	Assoc. Prof.	Fumikazu MIWAKEICHI
Assoc. Prof.	Yoshinori KAWASAKI	Assoc. Prof.	Yoichi NISHIYAMA	Assoc. Prof.	Seisho SATO
Assoc. Prof.	Jiancang ZHUANG	Assoc. Prof.	Hironori FUJISAWA	Assoc. Prof.	Jun ADACHI
Assist. Prof.	Takaaki SHIMURA	Assist. Prof.	Ying CAO	Assist. Prof.	Shogo KATO
Assist. Prof.	Hisashi NOMA	Assist. Prof.	Tadayoshi FUSHIKI	Project Assoc. Prof.	Takaki IWATA
Project Assist. Prof.	Takafumi KUBOTA	Project Assist. Prof.	Takayuki YAMADA	Visiting Prof.	Sadaaki MIYAMOTO
Visiting Prof.	Rinya TAKAHASHI	Visiting Prof.	Manabu IWASAKI	Visiting Prof.	Tosiya SATO
Visiting Prof.	Yoichi KATO	Visiting Prof.	Masaaki MATSUURA	Visiting Prof.	Kunio SHIMIZU
Visiting Prof.	Mihoko MINAMI	Visiting Prof.	Megu OTAKI	Visiting Prof.	Tetsuji IMANAKA
Visiting Prof.	Nobuo YOSHIDA	Visiting Prof.	Satoshi TAKIZAWA	Visiting Prof.	Nakahiro YOSHIDA
Visiting Prof.	Naoto KUNITOMO	Visiting Prof.	Hiroshi TSUDA	Visiting Prof.	Toshio HONDA
Visiting Prof.	Michiko MIYAMOTO	Visiting Prof.	Toshinao YOSHIBA	Visiting Prof.	Shinji TODA
Visiting Prof.	Hirohisa KISHINO	Visiting Prof.	Hidetoshi SHIMODAIRA	Visiting Prof.	Tatsuhiko TSUNODA

Staff

Risk Analysis Research Center

Visiting Assoc. Prof.	Hideki KATAGIRI	Visiting Assoc. Prof.	Koji OKUHARA	Visiting Assoc. Prof.	Toshikazu KITANO
Visiting Assoc. Prof.	Hisayuki HARA	Visiting Assoc. Prof.	Toshio ONISHI	Visiting Assoc. Prof.	Satoshi TERAMUKAI
Visiting Assoc. Prof.	Jun OHASHI	Visiting Assoc. Prof.	Hisateru TACHIMORI	Visiting Assoc. Prof.	Makoto TOMITA
Visiting Assoc. Prof.	Toshihiro HORIGUCHI	Visiting Assoc. Prof.	Takashi KAMEYA	Visiting Assoc. Prof.	Yoshiyuki NINOMIYA
Visiting Assoc. Prof.	Satoru ENDO	Visiting Assoc. Prof.	Hitoshi ISHIKAWA	Visiting Assoc. Prof.	Kenichi KAMO
Visiting Assoc. Prof.	Masashi KONOSHIMA	Visiting Assoc. Prof.	Toshiaki OWARI	Visiting Assoc. Prof.	Masakazu ANDO
Visiting Assoc. Prof.	Yasutaka SHIMIZU	Visiting Assoc. Prof.	Masaaki FUKASAWA	Visiting Assoc. Prof.	Takahiro YONEZAWA
Visiting Assoc. Prof.	Hiroshi SYONO	Project Researcher	Ryo AKAISHI	Project Researcher	Takao KUMAZAWA
Project Researcher	Chiho KAMIYAMA				

Research and Development Center for Data Assimilation

Director Tomoyuki HIGUCHI Vice Director Yoshiyasu TAMURA

Prof.	Tomoyuki HIGUCHI	Prof.	Yoshiyasu TAMURA	Prof.	Junji NAKANO
Assoc. Prof.	Seisho SATO	Assoc. Prof.	Genta UENO	Assoc. Prof.	Ryo YOSHIDA
Assoc. Prof.	Yukito IBA	Assist. Prof.	Shinya NAKANO	Project Assoc. Prof.	Hiromichi NAGAO
Project Assist. Prof.	Christopher Andrew ZAPART	Project Assist. Prof.	Masaya SAITO	Visiting Prof.	Takashi WASHIO
Visiting Assoc. Prof.	Toru ONODERA	Visiting Assoc. Prof.	Koji HUKUSHIMA	Visiting Assoc. Prof.	Kazuyuki NAKAMURA

Survey Science Center

Director Ryozo YOSHINO

Prof.	Ryozo YOSHINO	Prof.	Takashi NAKAMURA	Assoc. Prof.	Tadahiko MAEDA
Assoc. Prof.	Takahiro TSUCHIYA	Assist. Prof.	Koken OZAKI	Assist. Prof.	Yoo Sung PARK
Visiting Assoc. Prof.	Toru KIKKAWA	Visiting Assoc. Prof.	Takahito ABE	Visiting Assoc. Prof.	Wataru MATSUMOTO
Project Researcher	Kosuke NIKAIDO	Project Researcher	Kiyohisa SHIBAI	Project Researcher	Naoko KATO
Project Researcher	Taisuke FUJITA				

Research Center for Statistical Machine Learning

Director Kenji FUKUMIZU Vice Director Tomoko MATSUI

Prof.	Kenji FUKUMIZU	Prof.	Tomoko MATSUI	Prof.	Shinto EGUCHI
Prof.	Yosihiko MIYASATO	Prof.	Satoshi ITO	Assoc. Prof.	Shiro IKEDA
Assoc. Prof.	Daichi MOCHIHASHI	Assist. Prof.	Tadayoshi FUSHIKI	Assist. Prof.	Kei KOBAYASHI
Assist. Prof.	Shinsuke KOYAMA	Visiting. Prof.	Atsuko IKEGAMI	Visiting. Prof.	Takashi TSUCHIYA
Visiting. Prof.	Tadashi WADAYAMA	Visiting. Prof.	Masataka GOTO	Visiting. Prof.	Koji TSUDA
Visiting Assoc. Prof.	Yuji SHINANO	Visiting Assoc. Prof.	Takafumi KANAMORI	Visiting Assoc. Prof.	Arthur GRETTON
Project Researcher	Yu NISHIYAMA				

Service Science Research Center

Director Hiroshi MARUYAMA

Prof.	Hiroshi MARUYAMA	Prof.	Tomoyuki HIGUCHI	Prof.	Hiroe TSUBAKI
Prof.	Tomoko MATSUI	Prof.	Junji NAKANO	Assoc. Prof.	Manabu KUROKI
Assist. Prof.	Toshihiko KAWAMURA	Assist. Prof.	Nobuo SHIMIZU	Visiting Prof.	Yoichi MOTOMURA
Visiting Prof.	Shusaku TSUMOTO	Visiting Prof.	Nobuhiko TERUI	Visiting Prof.	Yoshiki YAMAGATA
Visiting Assoc. Prof.	Tsukasa ISHIGAKI	Visiting Assoc. Prof.	Tadahiko SATO	Visiting Assoc. Prof.	Yukihiko OKADA
Project Researcher	Hisanao TAKAHASHI				

School of Statistical Thinking

Director Junji NAKANO　Vice Director Yoshinori KAWASAKI

Prof.	Hiroshi MARUYAMA	Adjunct Professor	Masami HASEGAWA	Adjunct Professor	Yasumasa BABA
Adjunct Professor	Makio ISHIGURO	Project Assist. Prof.	Osamu KOMORI		

Project Researchers

Project Assoc. Prof.	Kazuhiro MINAMI	Project Assist. Prof.	Kazuhiko SHIBUYA	Project Researcher	Motoi OKAMOTO
Project Researcher	Satoko SAITA	Project Researcher	Xiaoling DOU	Project Researcher	Eiki TANAKA
Project Researcher	Kazue SUZUKI				

Center for Engineering and Technical Support

Director Junji NAKANO　Vice Director Yoshinori KAWASAKI

Deputy Manager Yuriko WATANABE　Senior Specialist Saeko TANAKA

Head of Computing Facilities Unit	Kazuhiro NAKAMURA	Head of Information Resources Unit	Saeko TANAKA
Head of Media Development Unit	Yuriko WATANABE		

Library

Head Junji NAKANO

Administration Planning and Coordination Section

Director Tomoyuki HIGUCHI

Head of Planning Unit	Hiroe TSUBAKI	Head of Evaluation Unit	Yoshiyasu TAMURA
Head of Information and Public Relations Unit	Hiroshi MARUYAMA	Head of Intellectual Property Unit	Hiroshi MARUYAMA
Head of NOE Promotion Unit	Hiroe TSUBAKI	Visiting Prof.	Takashi NAMESHIDA

Staff

NIPR/ISM Joint Administration Office

Director Tsugio TOKUTA — Director of General Service Center Akira UCHIYAMA

Planning Section (ISM)

Head of Planning Section Kenichi TADA

Deputy Head	Mitsuaki OGAWA	Specialist	Fumio SUTO	Specialist	Tomonori SANO
Team Leader	Mitsuo ENDO	Team Leader	Hiroaki ARAI		

Planning Section (NIPR)

Head of Planning Section Seiko TOBE

Deputy Head	Yasuyuki EDURE	Team Leader	Kazuhisa OSHITA	Team Leader	Norihito SETO
Team Leader	Michihito SAKURAI	Specialist	Hiroyasu KUMAGAI		

General Service Center

Deputy Head	Takashi KOSAKA	Deputy Head	Koji SAKAMOTO	Deputy Head	Takashi KUBOTA
Deputy Head	Tomohiko MIYAUCHI	Team Leader	Kazuyoshi ASO	Team Leader	Yoji ISHII
Team Leader	Kenichi SHIOBARA	Specialist	Yoshihiro YAMADA	Specialist	Yumiko OKAWA

Council of The Institute of Statistical Mathematics (As of April 1, 2012)

Yasushi AKIYAMA	Professor, Graduate School of Information Science and Engineering , Tokyo Institute of Technology
Masanori IYE	Professor, Optical and Inferred Astronomy Division, National Astronomical Observatory of Japan, National Institutes of Natural Sciences
Koji KURIHARA	Professor, Okayama University Executive Vice Director / The Graduate School of Environmental and Life Science
Kunio SHIMIZU	Professor, Faculty of Science and Technology, Keio University
Nobuhiko TERUI	Professor, Graduate School of Economics and Management, Tohoku University
Ryuei NISHII	Professor, Institute of Mathematics for Industry, Kyushu University
Yoshihiro YAJIMA	Professor, Graduate School of Economics, The University of Tokyo
Shoichi YOKOYAMA	Professor, Department of Linguistic Theory and Structure, National Institute for Japanese Language and Linguistics
Takashi WASHIO	Professor, The Institute for Scientific and Industrial Research, Osaka University
Michiko WATANABE	Professor, The Graduate School of Health Management, Keio University
Hiroe TSUBAKI	Professor (Vice Director-General, ISM)
Yoshiyasu TAMURA	Professor (Vice Director-General, ISM)
Hiroshi MARUYAMA	Professor (Vice Director-General, ISM)
Tomoko MATSUI	Professor (Director of Department of Statistical Modeling, ISM)
Takashi NAKAMURA	Professor (Director of Department of Data Science, ISM)
Satoshi KURIKI	Professor (Director of Department of Mathematical Analysis and Statistical Inference, ISM)
Junji NAKANO	Professor (Director of Center for Engineering and Technical Support, ISM)
Shinto EGUCHI	Professor (Department of Mathematical Analysis and Statistical Inference, ISM)
Kenji FUKUMIZU	Professor (Department of Mathematical Analysis and Statistical Inference, ISM)
Nobuhisa KASHIWAGI	Professor (Department of Statistical Modeling, ISM)
Ryozo YOSHINO	Professor (Department of Data Science, ISM)

Cooperative Research Committee (As of April 1, 2012)

Masayuki UCHIDA	Professor, Graduate School of Engineering Science, Osaka University
Akifumi OIKAWA	Professor, The Graduate University for Advanced Studies
Toshimitsu HAMASAKI	Associate Professor, Graduate School of Medicine, Osaka University
Yoshinori FUJII	Professor, Faculty of Education and Culture, University of Miyazaki
Yuichi MORI	Professor, Faculty of Informatics, Okayama University of Science
Tomoko MATSUI	Professor (Director of Department of Statistical Modeling, ISM)
Ryozo YOSHINO	Professor (Department of Data Science, ISM)
Yoshihiko MIYASATO	Professor (Department of Mathematical Analysis and Statistical Inference, ISM)
Atsushi YOSHIMOTO	Professor (Department of Mathematical Analysis and Statistical Inference, ISM)

Research Ethics Review Committee (As of April 1, 2012)

Specialist on epidemiology and social research	Kazuo SEIYAMA	Professor, Kwansei Gakuin University
Specialist on epidemiology and social research	Keiko SATO	Associate professor, Kyoto Unit Center Japan Environment & Children's Study, Graduate School of Medicine, Kyoto University
Specialist in the field of ethics and law	Hitomi NAKAYAMA	Lawyer, Kasumigaseki-Sogo Law Offices
Person in citizen's position	Yutaka KURIKI	Principal, Tachikawa City Daiichi Elementary School
Research education staff of ISM	Takashi NAKAMURA	Professor (Director of Department of Data Science, ISM)
Research education staff of ISM	Hiroe TSUBAKI	Professor (Vice Director-General, ISM)
Research education staff of ISM	Shigeyuki MATSUI	Professor (Department of Data Science, ISM)
Research education staff of ISM	Tadahiko MAEDA	Associate Professor (Department of Data Science, ISM)

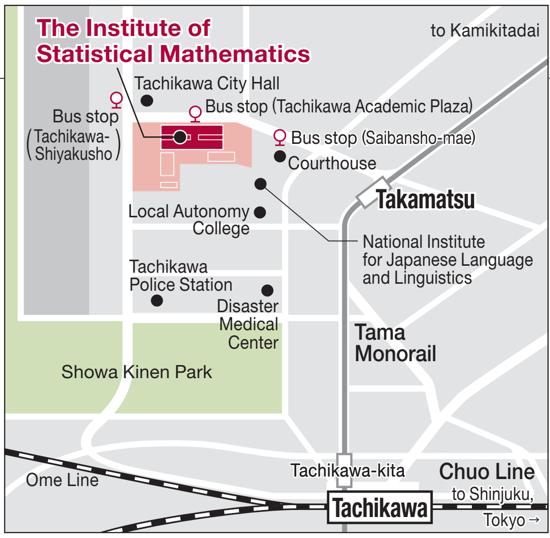
Professor Emeritus (As of April 1, 2012)

Kameo MATUSITA	Sigeki NISIHIRA	Tatsuzo SUZUKI
Giitiro SUZUKI	Ryoichi SHIMIZU	Noboru OHSUMI
Masakatsu MURAKAMI	Kunio TANABE	Tadashi MATSUNAWA
Masami HASEGAWA	Yoshiyuki SAKAMOTO	Takemi YANAGIMOTO
Yoshiaki ITOH	Yasumasa BABA	Katsuomi HIRANO
Masaharu TANEMURA	Makio ISHIGURO	Yosihiko OGATA

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 an 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 our 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.
1993	April	The Planning Coordination Chief System was instituted.
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 in the School of Mathematical and Physical Science, SOKENDAI, was reorganized. In addition, the Dept. of Statistical Science and the School of Multidisciplinary Sciences were instituted.
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. The Intellectual Property Unit was instituted.
2009	October	The Institute was moved to 10-3 Midori-cho, Tachikawa, Tokyo.
2010	June	Officially opened the Akaike Guest House.
	July	Reorganized the Administration Office to create the NIPR/ISM Joint Administration Office and launch the General Service Center. The NOE Forwarding Unit (now we call "NOE Promotion Unit") was instituted within the Administration Planning and Coordination Section.
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.

The Institute of Statistical Mathematics



Access to the ISM

◎ Tama Monorail
—10 min walk from Takamatsu Sta.

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

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
http://www.ism.ac.jp/