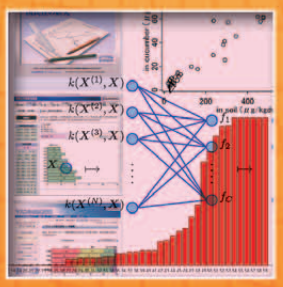
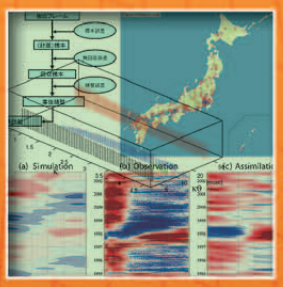
Research Organization of Information and Systems

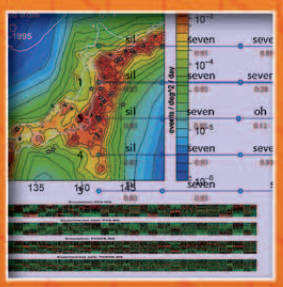
The Institute of Statistical Mathematics

2011-2012

ISM







CONTENTS

Message from Director-General

The Institute of Statistical Mathematics is a well-established research institute founded in 1944 during the Second World War. Following the retirement of former Director-General Dr. Kitagawa, I became the Institute's eleventh Director-General on April 1, 2011 amidst a turbulent research environment caused by the largest ever natural disaster in Japanese history. It is still unknown how much impact the current pervasive sense of uncertainty about Japan's future will have on society and academia. When I consider a role that the Institute should fulfill as an inter-university research organization under these circumstances, I am both sobered and filled with resolve at the thought of the heavy responsibilities of this office.

In 2011, the second year of the second medium-term period since incorporation, the Institute of Statistical Mathematics is steadily implementing the Network Of Excellence (NOE) project and a project to foster statistical thinking, and engaging in advanced research as Japan's foremost institute for statistical mathematics research and education. With regard to the NOE project, we plan to launch a new strategic research center that will become a nucleus for the pursuit of research in machine learning and service science. In the project to foster statistical thinking, we plan to strengthen collaboration with other organizations involved with mathematical science and further increase our contribution to the fostering and development of professionals with skills essential in today's era of large-scale data.

Statistical mathematics is a science that deals with research on methodologies to appropriately link scattered and unevenly distributed pieces of information, allowing rational prediction based on data using mathematics as a tool. Accordingly, it is no exaggeration to say that statistical mathematics performs a role in connecting free and flexible ideas of researchers to the real world. The Institute of Statistical Mathematics utilizes this connective role to link researchers from different academic disciplines and wide-ranging research fields and to connect university to university, industry to academia, and academia with society at large.

We live in an age of globalism that has brought not only unexpected changes in the natural environment, but also a tremendous increase in the uncertainty of human affairs, including financial and economic crises and dramatic changes in the international balance of power. Our aim is to create new research fields by clearly recognizing and accepting the expectations of society and fully harnessing the connective role of the Institute, and to contribute to the revitalization of Japan by connecting people with each other. We would appreciate your continued understanding and support for the activities of the Institute of Statistical Mathematics.

Tomoyuki Higuchi
Director-General
The Institute of Statistical Mathematics

Institute Overview

Basic Research

Department of Statistical Modeling

The Department of Statistical Modeling conducts research on the modeling of causally, temporally and/or spatially interrelated complex phenomena, including intelligent information processing systems. It also conducts researches on model-based statistical inference methodologies.

Spatial and Time Series Modeling Group

The Spatial and Time Series Modeling Group works on modeling and inference for the statistical analysis of time series, spatial, and space-time data, and on their applications to prediction and control.

Intelligent Information Processing Group

The Intelligent Information Processing Group works on concepts and methods for the extraction, processing and transformation of information in intelligent systems, motivated by an active interest in practical problems in engineering and science.

Graph Modeling Group

The Graph Modeling Group works on analyses of the data generated by systems with a graph structure and on the modeling required in order to reconstruct the original system.

Department of Data Science

The Department of Data Science aims to develop research methods for surveys, multidimensional data analyses, and computational statistics.

Survey Research Group

The Survey Research Group focuses on research related to statistical data collection and data analyses.

Multidimensional Data Analysis Group

The Multidimensional Data Analysis Group studies methods for analyzing phenomena grasped on multidimensional space and ways for collecting multidimensional data.

Computational Statistics Group

The Computational Statistics Group studies sophisticated uses of computers in statistical methodology such as computer-intensive data analyses, computational scientific methods, and statistical systems.

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 theory, and the practice of statistics in science.

Mathematical Statistics Group

The Mathematical Statistics Group is concerned with aspects of statistical theory and probability theory that have statistical applications.

Learning and Inference Group

The Learning and Inference Group develops statistical methodologies that enable researchers to learn from data sets and to properly extract information through appropriate inference procedures.

Computational Mathematics Group

The Computational Mathematics Group studies computational algorithms as well as mathematical methodologies used for statistical modeling and inference.

Strategic Research

Prediction and Knowledge Discovery Research Center

The Prediction and Knowledge Discovery Research Center studies the statistical modeling and inference algorithms that can be used to extract useful information from the huge amount of data which complex systems produce, and thus attempts to solve real-world problems in many different scientific domains, especially genomics, earth and space sciences.

Molecular Evolution Research Group

The Molecular Evolution Research Group researches the area of molecular phylogenetics, and seeks to develop statistical methods for inferring evolutionary trees of life using DNA and protein sequences.

Statistical Seismology Research Group

The Statistical Seismology Research Group is concerned with the evaluation of seismicity anomalies, detection of crustal stress changes, their modeling, and the probability forecasting of large aftershocks and earthquakes.

Statistical Genome Diversity Research Group

The Statistical Genome Diversity Research Group aims to construct novel methodologies for learning and inference from a variety of data sets in the rapidly growing area of bioinformatics.

Risk Analysis Research Center

The Risk Analysis Research Center is pursuing a scientific approach to the study of the increased uncertainty and risk associated with the increasing globalization of the society and economy. The center is also constructing a network for risk analysis in order to contribute to the creation of a reliable and safe society.

Food and Drug Safety Research Group

The Food and Drug Safety Research Group aims to develop the statistical framework and methodology of quantitative risk evaluation for substances ingested by the human body.

Environmental Risk Research Group

The Environmental Risk Research Group studies the statistical methodologies related to environmental risk and environmental monitoring.

Financial Risk and Insurance Research Group

The Financial Risk and Insurance Research Group explores the use of statistical modeling methods to quantify the risks involved with financial instruments and insurance products.

Research Group for Reliability and Quality Assurance of Service and Product

The Research Group for Reliability and Quality Assurance of Service and Product aims to improve the safety of products and services by developing statistical methods that contribute to quality assurance and reliability and by promoting the adoption of these methods in the industrial world.

Research Innovation Center

The objective of this center is to establish innovative research in statistical mathematics to keep up with new trends in the academic and real world. The center carries out original research projects, ranging over both pure and applied frontiers.

Functional Analytic Inference Research Group

This group aims to develop nonparametric methodology for statistical inference using reproducing kernel Hilbert spaces given by positive definite kernels, and to apply these techniques to causal inference problems.

Advanced Monte Carlo Algorithm Research Group

The Advanced Monte Carlo Algorithm Research Group aims to develop Markov Chain Monte Carlo and Sequential Monte Carlo algorithms and study their applications.

Speech and Music Information Research Group

The Speech and Music Information Research Group investigates novel information retrieval methods using machine learning from time series data, including speech, music, and brain data.

Optimization-based Inference Research Group

Optimization-based Inference Research Group focuses on optimization methodology as a fundamental tool for computational inference and aims to develop new inference techniques in statistical applications.

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.

Data Assimilation Project

Theoretical studies of sequential Bayesian filters that update simulation models by referring to observation data, and applications of data assimilation to various fields of science.

Physical Random Number Generation

Implementation of technologies related to rapid generation of high-quality physical random numbers, essential in statistical computations including data assimilation.

Strategic Research

Research and Development Center for Data Assimilation

Statistical Analysis on Massively Parallel Computers

Development of platforms to conduct statistical analyses in the R language on massively parallel computers.

Cloud Computing Services

Provision of cloud computing services in which statistical computations using parallel programs developed in the center are available through the internet.

Visualization Software Project

3-D visualization software developed in order to demonstrate results of data assimilation as well as to give hints leading to better simulation models.

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).

The Study of the Japanese National Character (JNC)

The longitudinal nationwide survey has been carried out since 1953 every 5 years with the purpose of clarifying the Japanese national character. This study shows some stable aspects such as human relationships in Japan, as well as some other aspects changing over years with the changes of economic, political and social conditions.

The Cross-national Studies of the National Character

The JNC survey has been developed into the cross-national comparative surveys which cover the people with Japanese ancestry overseas since 1971. This study attempts to understand the Japanese people and their culture in the comparative context as well as the global configuration of psychological distances of many countries (a sort of cultural manifold).

The Project on Accumulating Information on Social Research

Many data sets of our past surveys in various fields have been accumulated. These are being organized as a database open to researchers in the ISM collaboration studies, and to public eventually.

The Project on Collaborative Experimental Survey Research

In collaborations with universities or institutes, we carry out experimental survey research on various topics. We expect many young researchers to experience practical surveys through our efforts, including statistical sampling, data-cleaning and data analyses.

The Project on Utilizing Information on Social Research

Under our paradigm “Science of Data”, we study practical and scientific ways to utilize survey data and develop new statistical methods and techniques to collect and analyze survey data.

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.

NOE Establishing Project for Statistical Mathematics: Building a Framework for Advancing Strategic Research and Pursuing a New Approach to Collaborative Research

Basic Research and Strategic Research Framework

The Institute of Statistical Mathematics pursues research and education along the two lines of basic research and strategic research. As shown in Figure 1, these are performed respectively by basic research departments, arranged horizontally, and the strategic research centers, arranged vertically. By its nature, statistical mathematics cuts across various broad disciplines, linking them. The basic research departments develop the interdisciplinary tools that make this possible.

The phrase "basic research" is used rather than "fundamental" or "foundational research" because this best describes the two major qualities of statistical mathematics. To echo the words of our former Director-General, Genshiro Kitagawa, the field of statistical mathematics must itself evolve to meet the changing needs of society and our data environment, and is therefore a field of study that is neither fixed nor universal in nature. At the same time, there are approaches and directions at the heart of statistical mathematics that remain unchanged as the field evolves.

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. All of the Institute's permanent researchers are assigned to one of the basic research departments.

Strategic Research Centers

The strategic research centers pursue research activities that interface statistical mathematics with individual scientific disciplines in order to find solutions to real and urgent social problems. The strategic research centers are staffed by permanent researchers within the Institute, together with visiting professors, post-doctoral staff, and visiting researchers.

The Institute launched two new centers on January 1, 2011, in the previous fiscal year, in addition to the existing Prediction and Knowledge Discovery Research Center and the Risk Analysis Research Center. The two new centers are the Research and Development Center for Data Assimilation and the Survey Science Center. The Research and Development Center for Data Assimilation was formed to further the research of the Data Assimilation Research Group (of the Prediction and Knowledge Discovery Research Center) and the Random Number Research Group (of the Research Innovation Center), replacing both groups. The Survey Science Center concentrates on specific areas of research that are close to problem resolution from among those covered by the Survey Research Group of the Department of Data Science, and was formed to replace the Social Survey Information Research Group (of the Research Innovation Center). In addition to the four strategic research centers, the Institute operates the Research Innovation Center as an incubation center for pursuing innovative research that will facilitate the growth of the two new strategic research centers.

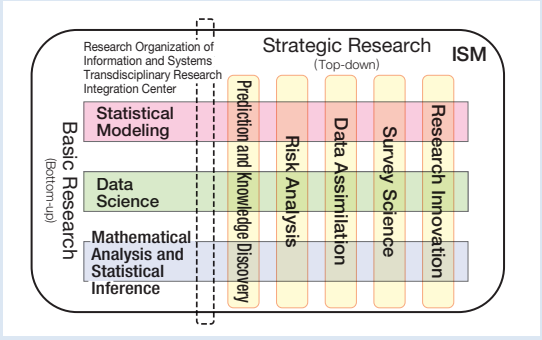


Figure 1. Basic Research Departments and Strategic Research Centers of the Institute of Statistical Mathematics

NOE Establishing Project

The Institute of Statistical Mathematics is part of the Research Organization of Information and Systems, whose new medium-term plan directs the Institute to establish Networks Of Excellence (NOE) in statistical mathematics. We have formed or are in the process of forming NOE in five research areas: integrated risk research, survey science, next-generation simulation science, statistical machine learning, and service science. The NOE pursue activities to establish new methodologies in their respective research fields and serve as hubs for interdisciplinary interaction.

We have established an NOE Forwarding Unit to facilitate and provide overall coordination for advancing the NOE Establishing Project. The NOE Forwarding Unit provides support and coordination that is crucial to the goal of establishing a fourth scientific methodology (i.e., data centric science) in our knowledge society, beyond efforts to resolve individual problems. The NOE Establishing Project draws on advice from experts in the private sector and from universities and government organizations. Using this advice, the Managing Committee of the NOE Establishing Project comprehensively formulates a unified strategy for managing the project.

Acting as central hubs, the Risk Analysis Research Center, Survey Science Center, and Research and Development Center for Data Assimilation have already formed NOE in the respective areas of integrated risk research, survey science, and next-generation simulation science. The NOE Research Promotion Organization centrally oversees and coordinates all activities by the five planned NOE to advance research in each respective area from the standpoint of establishing new methodologies (Figure 2). The Institute will establish a Research Center for Statistical Machine Learning and a Service Science Research Center later in 2011 fiscal year. The establishment of these centers will create a framework to enable the interdisciplinary transfer of knowledge revolving around the Institute of Statistical Mathematics.

For more information about the NOE Establishing Project, please visit http://noe.ism.ac.jp/english/.

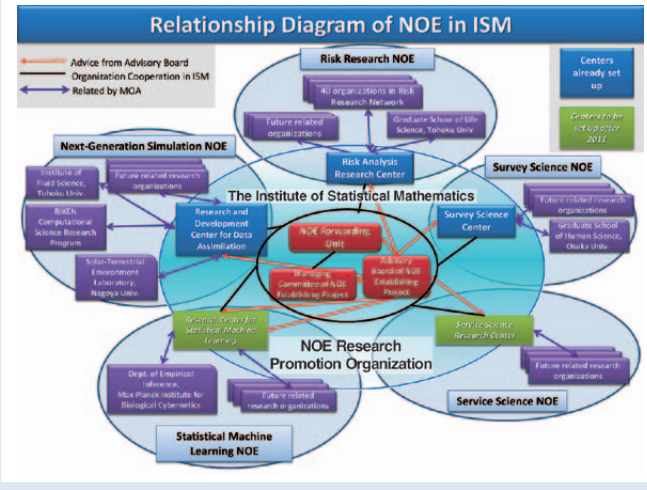


Figure 2. Institute of Statistical Mathematics and Networks Of Excellence

The Role of Probability Forecast of Earthquakes and the Standard Statistical Model

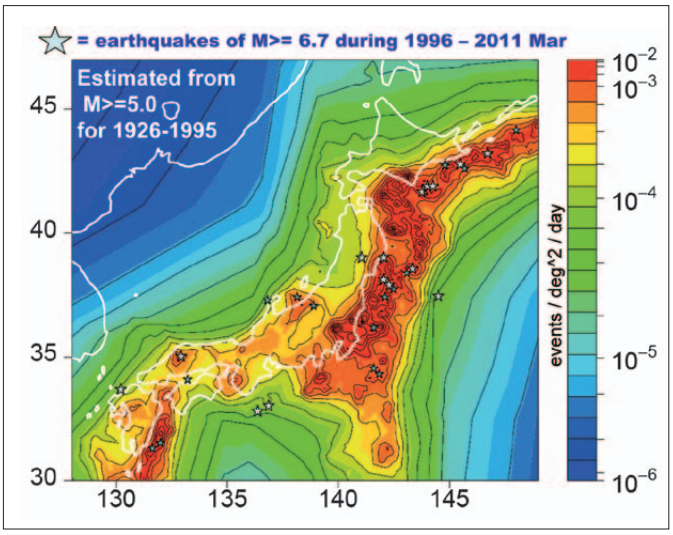
The occurrences of earthquakes are not completely disordered but obey a lot of statistical empirical laws, and a probabilistic forecast is possible to some degree. For instance, the epidemic-type aftershock sequence (ETAS) model has been developed in the Institute of Statistical Mathematics, and is a standard stochastic model that forecasts the earthquake occurrence rate by using the data of past earthquakes. It is used worldwide for the comparison research between simulated and real seismicity data. The earthquake forecasting by the ETAS model will be adopted in U.S. California state. We further study anomalies in seismic activity by diagnosis analysis using the ETAS model. This model evolves to accept serious needs under huge hypocenter data so that various effective analyses are possible.

The research of earthquake mechanisms has advanced with steady steps. However, it is very hard to find a silver bullet for earthquake prediction. Even if a promising finding comes out, it doesn't fully contribute to disaster prevention unless it accompanies some quantification and modeling that lead to prediction. The stochastic forecasting is realistic if we think about a complexity and regional diversity of the earth's crust internal faults and the stress distribution. To place this in the starting point and steadily advance it, like piling up the bricks, is an intention of the international Collaborative Study of Earthquake Predictability (CSEP) project. The CSEP project will advance the revision of the standard seismic activity models which suit various places in the world. Also, a variety of earthquake forecasts can be evaluated by the comparisons. They are objectively measured and can be compared by statistical methods.

As a matter of course, inclusive researches of earthquake mechanisms and abnormality phenomena are indispensable to forecast a large earthquake with higher probability gains than the standard statistical model does, and to obtain a better evaluation that shows the advancement of the forecast. It is necessary for researchers to digest many examples to see the imminence and the uncertainty of large earthquake generation from the various anomalous phenomena. Those findings are built in an advanced model to achieve a better forecast than the standard seismic activity model.

Yosihiko Ogata

(1)



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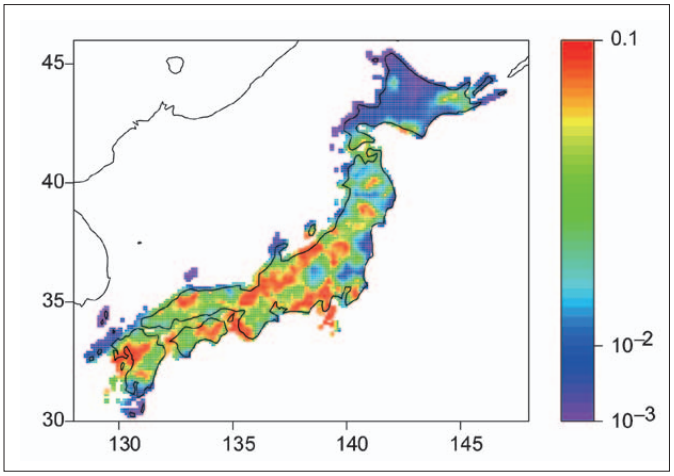


Figures:
Examples of regional earthquake probability forecast:

(1) The colors show probabilities per unit area and time that an earthquake of magnitude (M) five or larger occurs in the region. The asterisks show large earthquakes of M6.7 or larger that occurred in the last 15 years.

(2) One year probability forecasts that an inland earthquake of M4 or larger occurs per unit area.

A Long Way for Building Prediction Model to Enhance Personalized Medicine

Genome omics data

This project has been started to exploit statistical methods for knowledge discovery for extracting information in the vast hull of genome and omics data sets since 2004. Here genome and omics data denote typically SNP (Single Nucleotide Polymorphism) data, microarray data for gene expression and proteome data for protein expression. Presently our group proceeds co-operative work with research teams of National Cancer Center and those of Mitsubishi Chemical Holdings in which we challenge statistical prediction for a phenotype expressing pathological diagnosis or treatment effect on the basis of genome and omics data sets. For a final goal we aim to build a prediction model for the phenotype based on a specific set of gene expressions. There is underlying a difficult problem called ' p << n ' problem, where p and n denote the dimension of data vector and sample size, respectively. Recently, the quality of genome and omics data has been improved. A data base named 'Gene Expression Omnibus' administrated by National Center for Biotechnical Information in USA collects more than 540.000 data sets for gene expression.

Machine learning approach

Our original strategy is to extract precious information by the advanced use of machine learning techniques. Currently a boosting machine for maximizing Partial Area under the Curve for the prediction of the phenotype is published. In this way the original strategy gets successful outcomes, but we face to a difficult aspect unsolved for a practical use of prediction model. We can suggest that one of the most difficult problems is a problem of reproducibility for performance of the prediction model when it is applied to data sets got from different institutions. For example, there is a strange phenomenon for behaviors of test error. Figure expresses a plot presented at a final stage for building prediction model with n = 59. We did partition two groups of 49 patients and of 10 patients randomly 100 times. In every partition we build the best prediction model by 10-fold cross-validation. We conclude the best prediction score with test error 19.1 percent in average, which suggests a reasonable performance. However, surprisingly we observed a substantial bias when we monitored the error rates of all subjects for 100 replications. There are 26 patients with correct classification in all 100 trials; 6 patients with all wrong classification. Thus we encountered there are suggested serious problems even if the prediction is apparently appropriately performed. In the long run we could detect inconsistency of a score factor, and suggested reanalysis in the co-operative work.

Reproducibility

We attain to understand there are several causes for the problem of reproducibility with complicated situations. We can summarize that almost causes are attributed to a situation in data are observational rather than sampled by random design. Therefore, there comes into existence of selection bias related with heterogeneous variables behind patients and inconsistent treatment protocols and so forth. In fact, disease type ranges over cancer, stroke and cardiac infarction with severe cases in which the treatments are apprehensive over the adverse effect. Hence random clinical design is almost impossible in the ethical sense. In statistical literature the problem of selection bias has been highly discussed in conformal paradigm; it is not well established in explanatory paradigm. However, if there is a new objective to employ statistical prediction, then we have to do interactive thinking between explanatory and conformal discussion with concurrent manner. For this we will deeply discuss all possible ideas to strengthen prediction performance and the universality for different data sets.

Shinto Eguchi

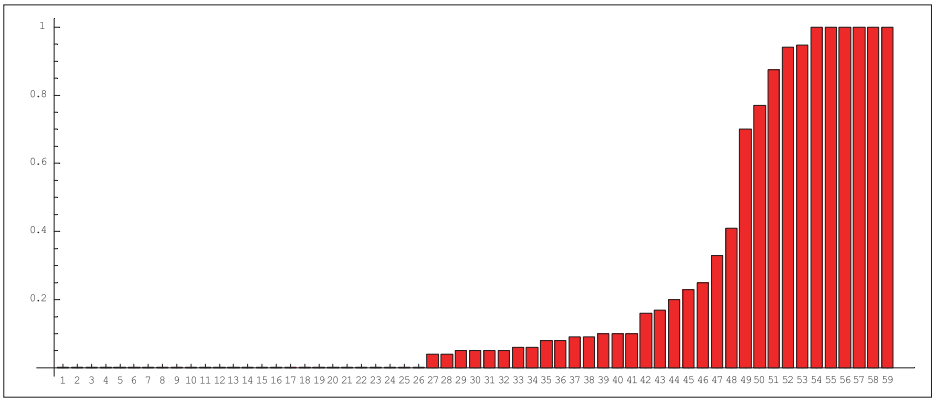


Figure:
Plot of averaged test errors for 59 patients

Evaluating Benefit-Risk Balance of Food and Drug

Mission

For establishing a proper usage of drug and food in our society, evidence regarding their benefit and risk is needed. Actually, the primary evidence is acquired from clinical/epidemiological studies. In the Food and Drug Safety Research group, we have conducted researches on statistical methods for design and analysis of clinical/epidemiologic studies on drug and food and their application to real problems.

Design and analysis of clinical trials for drug development

Although general theory and methodology for design and analysis of clinical trials have been well developed, appropriate statistical methods should be selected respectively and carefully incorporating specific characteristics of the disease and drug under study. In many cases, development of novel statistical methods with improved performance is warranted. We have developed several statistical methods and demonstrated their performance through application to real examples and Monte Carlo simulation.

Development of statistical methodologies for accelerating predictive medicine

Advances in genomics and biotechnology have established molecular heterogeneity of human diseases and accelerated clinical researches for predicting patients' susceptibility for certain toxicities and disease outcomes using genomic information to guide treatment decisions for individual patients. In promotion of predictive medicine, drug development is undergoing a paradigm shift, and new methods of the design and analysis of clinical trials for codevelopment of predictive biomarkers and relevant drugs are needed. We conduct researches on statistical methods in this field with their applications to many clinical genomics studies.

Benefit/risk analysis of drugs based on large-scale database

Various large-scale databases have been available for the scientific benefit/risk evaluation and risk management of post-marketing drugs in Europe and North America. In Japan, however, such a large-scale database does not exist. As the first step to improve this situation, we are building original databases using data collected from pre-marketing clinical trials and post-marketing surveillance, and we conduct benefit/risk analysis of drug effect.

Shigeyuki Matsui

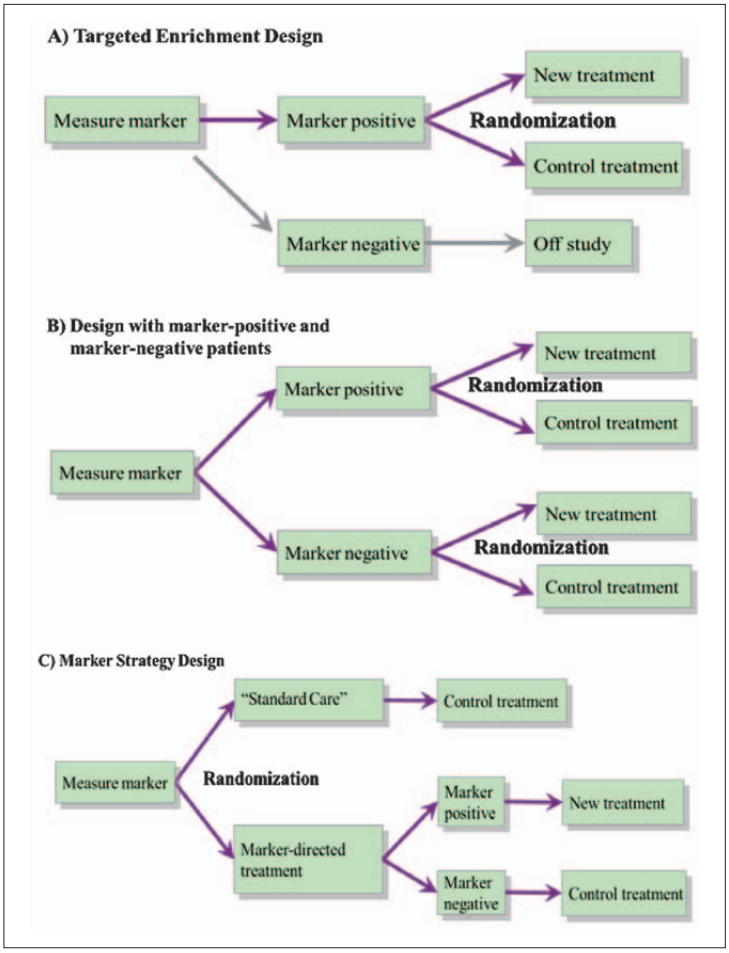


Figure:
Codevelopment of predictive biomarker and drug: basic designs of randomized clinical trials with predictive biomarkers

The Effort of the Statistical Science towards Solution of Environmental Problems

Mission

A risk analysis research center/environmental risk research section aims at performing the contribution towards solution of the environmental problem which is a modern subject by developing the optimal new statistical methodology for each environmental problem (for example, the problem of dioxin, the problem of global warming, the problem of continuous use of safe water). Moreover, in order to realize this purpose, in cooperation with the community of environmental science, research is carried out including a visiting teacher or a project researcher.

Ambient water quality criteria for dissolved oxygen in Japan

Oxygen is one of the most essential environmental constituents supporting life. Ministry of the Environment Government of Japan has derived a set of dissolved oxygen criteria to protect specific aquatic life communities. The use of the specific statistical methods is recommended for assessing spatial and temporal water quality criteria exceedance in the Tokyo Bay. (Fig.1)

On persistent organic pollutants

To identify the sources of pollution by persistent organic pollutants (POPs), this study is developing statistical methods to make inference on pollution sources besides organizing POPs data. Further, this study is making contribution to the development of technology to reduce the risk of POPs in vegetable farming. (Photo 1, Fig 2)

Risk-hedge oriented optimization system against natural and managerial disaster toward sustainable forest resource management

After the Kyoto protocol entered into force, reduction of carbon dioxide in the atmosphere is promised to slow down the degree of global warming. Among the proposed mechanisms under the Kyoto protocol, forest resources are regarded as a source of carbon sequestration, where forestation, deforestation and reforestation are the main human-induced activities. Housing and furniture manufacturing is also contributing to carbon mitigation indirectly. Despite of these facts, unfavorable current economic situation for forestry business discourages forest owners to abandon forestry practice in mountainous regions. Besides, typhoon disaster and snow damage on forest stands is accelerating abandoning phenomena. In our research project, we construct a risk-hedge oriented optimization system toward sustainable forest resource management. In the system, we try to predict events of natural disaster and managerial disaster spatially and temporally, and control themanagement scheme to avoid these disasters with a view of these phenomena. (Photo 2, Fig 3)

Koji Kanefuji

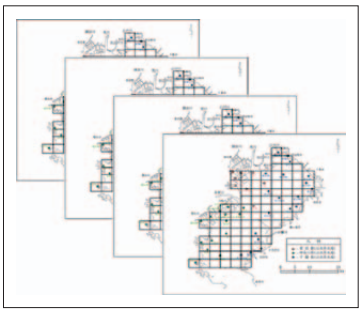


Fig.1:
Tokyo Bay environmental baseline survey

Photo 1: Growing experiment of cucumbers
(Niigata Agricultural Research Institute)

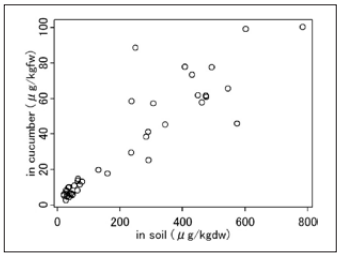


Fig.2: Relation between concentrations of dieldrin

Photo 2:
Scheme to avoid windstorm in Denmark

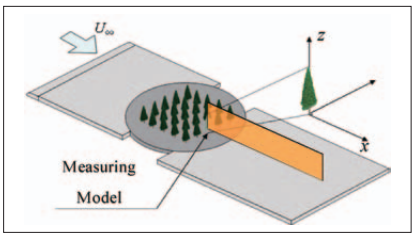


Fig.3: Experiment for wind tolerance
(Provided by Dr. H. Ishikawa, Tokyo Univ. of Sci.)

Automatic Speech Recognition Using Logistic Regression

Difficulties in discriminative approaches

Although discriminative approaches like the support vector machine or logistic regression have had great success in many pattern recognition applications, they have achieved only limited success in speech recognition. Two of the difficulties often encountered are 1) speech signals typically have variable lengths and 2) speech recognition is a sequence labeling problem, where each spoken utterance corresponds to a sequence of words or phones.

New framework using logistic regression

We solve the problem of variable-length speech signals by including a mapping in the logistic regression framework that transforms each speech signal into a fixed-dimensional vector. The mapping is defined either explicitly with a set of hidden Markov models (HMMs) for use in penalized logistic regression or implicitly through a sequence kernel to be used with kernel logistic regression, as shown in Figure 1. Unlike previous work that has used HMMs in combination with a discriminative classification approach, we jointly optimize the logistic regression parameters and the HMM parameters using a penalized likelihood criterion.

In experiments on phone classification using the TIMIT database, the phone accuracy increased from 70.6% to 79.9%. The joint optimization improves the recognition accuracy significantly.

Two-step approach for handling the sequence labeling problem

A two-step approach is used to handle the sequence labeling problem. In the first step, a set of HMMs is used to generate an N-best list of sentence hypotheses for a spoken utterance. In the second step, these sentence hypotheses are rescored using logistic regression on the segments in the N-best list (Figure 2). A garbage class is introduced in the logistic regression framework to get reliable probability estimates for the segments in the N-best lists.

The two-step approach was tested on a connecteddigit recognition task. The baseline conventional approach achieved sentence accuracy of 96.9%. Rescoring 5-best lists with logistic regression improved the accuracy to 98.3%.

Tomoko Matsui

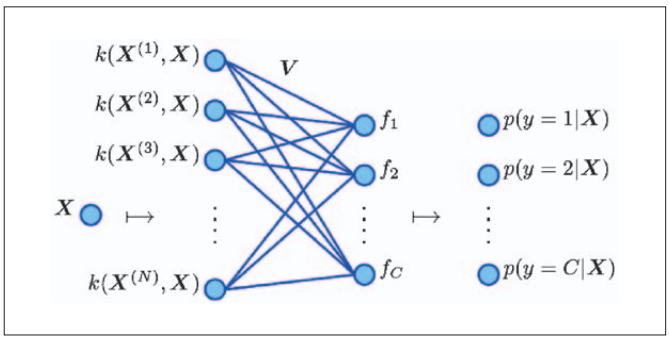


Figure 1: The kernel logistic regression model

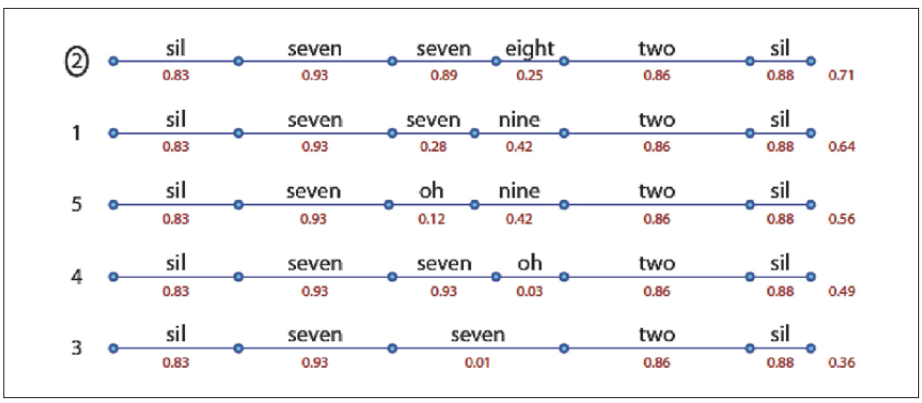


Figure 2:
The 5-best list after rescoring using penalized logistic regression with HMM likelihoods as regressors. The hypotheses have been reordered according to sentence probabilities computed from geometric means of the segment probabilities. Sil means silence.

Joint work with ***Oystein Birkenes*** (TANDBERG), ***Kunio Tanabe*** (Waseda U.), ***Sabato Marco Siniscalchi*** (U. of Palermo), ***Tor Andre Myrvoll*** (SINTEF), and ***Magne Hallstein Johnsen*** (NTNU)

Development of Inference Techniques Based on Optimization Methodology

Outline of our research

Computational inference is essential for understanding various phenomena from given data, and mathematical methodologies for computational inference are always asked to be adaptable to changeable data both in quality and in quantity. Our research focuses on optimization methodology as a fundamental tool for computational inference and aims to develop new inference techniques in statistical applications. We are studying several topics including the estimation of large-scale graphical models and the 3-dimensional structure of proteins as well as the following two.

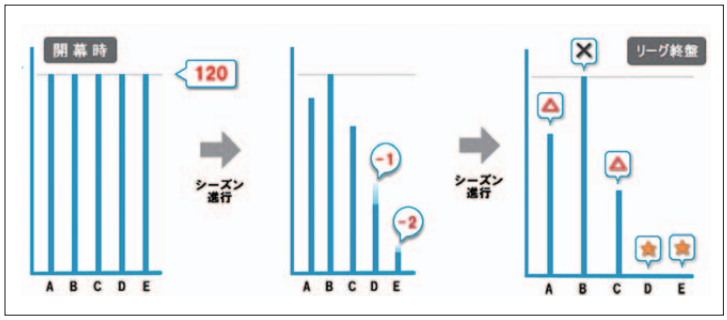


Figure 1: CS clinch numbers (Courtesy of Kyodo News)

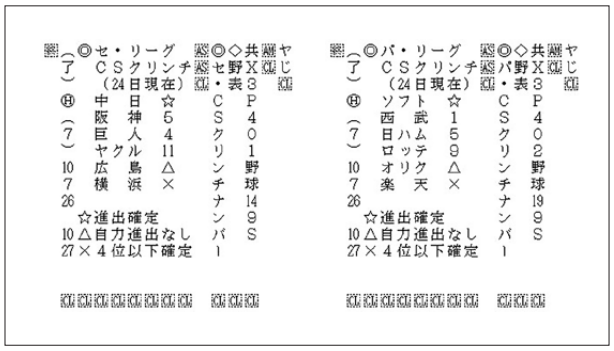


Figure 2: Distributed samples (Courtesy of Kyodo News)

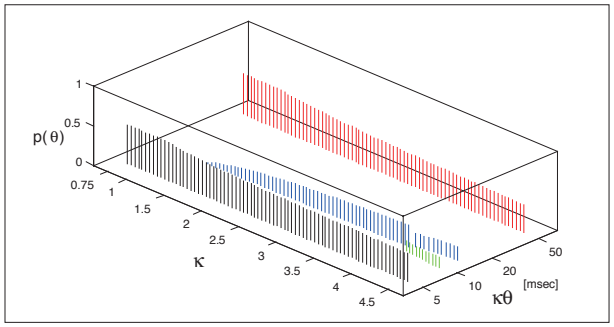


Figure 3: Discrete distributions achieving the capacity of a single spiking neuron (Ikeda and Manton, 2009)

Discrete optimization and service sciences

Discrete or combinatorial optimization is becoming increasingly important in our present society. For instance, optimal arrangement of human resources is a typical and common issue in service sciences. Thinking of the future contribution of statistical mathematics in various fields of service sciences, we must advance the study of discrete optimization as an important discipline. As an example of such problem solving, we developed computational algorithms for clinch and elimination numbers in league sports. The clinch (elimination) number is the minimal number of future wins (losses) needed to clinch (to be eliminated from) a specified place or higher in a league. The algorithms were applied to play-off spots of Japanese professional baseball leagues, and the Kyodo News started distributing the result numbers named the CS clinch numbers to its member companies during the 2010 season (Figs. 1 and 2).

Optimization of measure and information theory

Our group is also developing the theory and algorithms for estimation of distributions based on optimization in the space of measures. The problem of communication channel capacity in information theory is an example of nonlinear convex optimization in the space of measures. The capacity of a noisy communication channel is the tightest upper bound on the amount of information that can be transmitted in a unit time over the channel, and is given by maximizing the mutual information defined with the probability measure of an input signal and the communication channel itself with respect to the measure under some constraints. It is extremely interesting that the capacity-achieving probability measure has shown to be discrete in many cases as in Fig. 3. We are trying a semi-infinite optimization approach in order to account for the discreteness of the optimal measure and its extension to vector channels.

Satoshi Ito

From Simulation to Data Assimilation (DA)

DA solves your troubles

Even if it took you a lot of hard work to program a numerical simulation, you may still fail to obtain results that reproduce the reality as expected. Considering that the time consumed is not negligible and that the basic idea of the simulation model is reliable, it is only natural that you would like to manage to solve the problem. But what should be done concretely? Data assimilation (DA) gives you a key to the solution. After calm consideration you will find that the unexpected results are probably due to insufficiency of the simulation model. The usual suspects might be initial and/or boundary conditions you attached ad hoc, neglected phenomena in the model, a finite difference approximation of a derivative, empirically used relations and parameters. DA is a process for modifying a simulation model with reference to data and aims to precisely reproduce and predict a targeted phenomenon. Methodology and applications of DA have been used in studies of numerical weather forecasting and ocean state monitoring, and DA is being applied in various other fields.

DA is time-series analysis

DA allows for two types of uncertainties. One is for the deficiency of the simulation model, and the other is for the disagreement between the model and observations. Due to the uncertainties, whereas the original simulation model brings a single solution, DA provides multiple candidates of the solutions and their probabilities. If we represent the uncertainties by system noise and observation noise, DA can be formulated with a state space model, which is well-known in the field of time-series analysis. For the state space model constructed from the simulation model, we obtain probability distribution of the state variables, namely the simulation variables, on the basis of data.

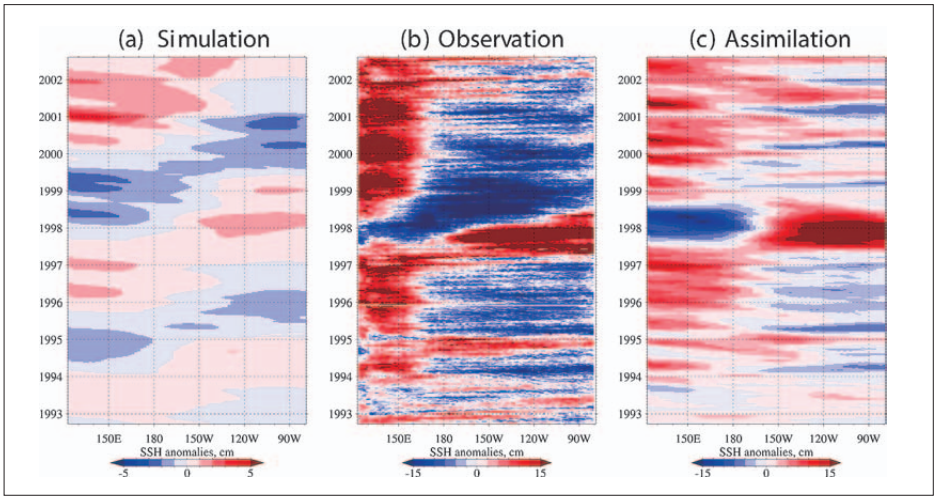


Figure 1:
A data assimilation result for sea surface height in the equatorial Pacific:
(a) simulation
(b) altimetry observation
(c) data assimilation

Figure 2: A supercomputer at the Institute of Statistical Mathematics

Practice of DA and supercomputers

We are now ready to start DA. We'll soon be faced with a computational burden. If the original simulation model is well constructed, DA with the model requires substantial computational resources. The Institute of Statistical Mathematics owns supercomputers which boast the foremost specifications for the use of statistical sciences. We are carrying out large-scale computations of DA and developing algorithms for parallel computing.

Genta Ueno

Data Assimilation Technology Pioneers New Scientific Methods based on Biomodeling and Simulation

Rapid advance of biotechnology and data assimilation

Cutting-edge biotechnology has resulted in ever-increasing amounts of information disseminating within our society. The advent of high speed DNA sequencers is now bringing into reality a new era of personal genome and personalized medicine. Within the next several years, this technological breakthrough could cause significant changes in entire research fields of life science, involving every -omics studies, in terms of both quantity and quality. To uncover a complex world of cellular systems from such a vast amount of information, Research and Development Center for Data Assimilation (RDCDA) aims to create a new research infrastructure of life science data assimilation systems involving experimental bioscience, bio-modeling, simulation, and state-of-art statistical science.

Whole gene transcription simulation of human lung cancer systems

The invention of DNA microarray chip has enabled us to measure transcript levels of more than 20,000 genes in human genome, simultaneously. Our collaborators (Professor Miyano and his research team at Institute of Medical Science, the University of Tokyo) successfully monitored temporal change of all genes in two phenotypes of human lung cancers under the treatment with an anticancer agent; one demonstrating exquisite sensitivity to the drug treatment and the other being resistant (Figure 1). Recently, several studies have advocated relatively rapid acquisition of resistance within a few years after initiation of the anticancer drug treatment. The experimental data obtained now will certainly be vital to uncovering molecular basis of maintaining the viability of drug resistant cancer population. For the first time in the world, RDCDA succeeded in the development of whole gene transcription simulators that are highly reproducible to the observed gene expressions of the drug sensitive and resistant cancer cells (Figure 1). The developed simulation models will be utilized in the discovery of key molecules that are promising for pharmacological treatment to improve drug efficacy, and a principle of action in maintaining the viability of the acquired drug resistance.

Biomodeling and HPC

High-throughput generations of large-scale simulators so as to reproduce observed data on 20,000 endogenous variables would be a quite hard challenge, computationally and statistically, to be addressed with state-of-the art supercomputer systems. Some researchers in RDCDA are now developing a new life science data assimilation system as members involved in a national project on the Next Generation of Supercomputer. RDCDA also has many experts on high performance computing (HPC), who advise on the actual implementation of data assimilation codes using massively parallel supercomputers and on the developments of new parallel computing technologies.

Ryo Yoshida

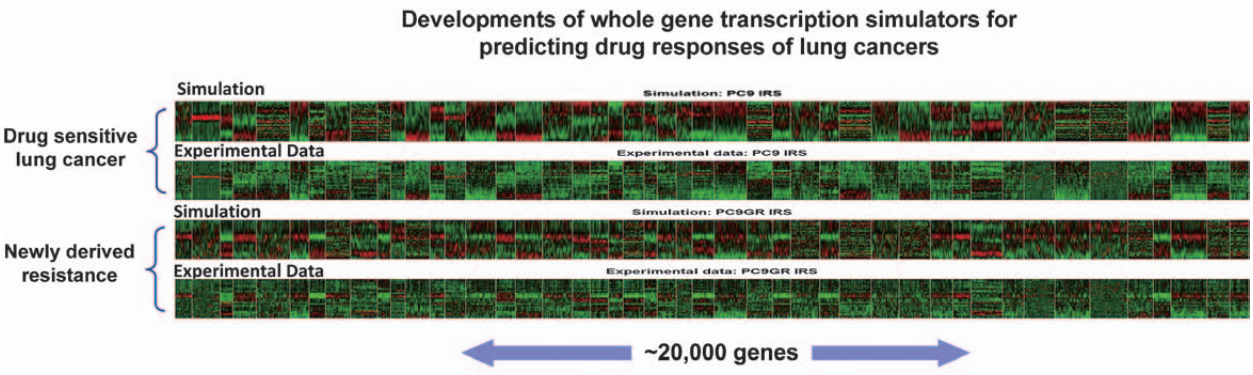


Figure 1: Gene expression profiling of drug sensitive and resistant lung cancer cells, and whole gene transcription simulations

Research on Survey Methodology and Planning of Cooperative 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 surveys mainly consist 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.Since ensuring good quality control on each step in figure 1 is crucial for valid survey operation, each step has its own methodological subjects to be studied.

Practice of survey research by ISM

Formerly ISM's surveys 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 many 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 starting point, we conducted a nationwide survey on "Social Stratification and Social Psychology" (SSP survey) in 2010 with Osaka University. We operated sampling or interviewing process of 30 survey locations by ourselves (figure 2). More than twenty graduate and undergraduate students participated as interviewers.

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

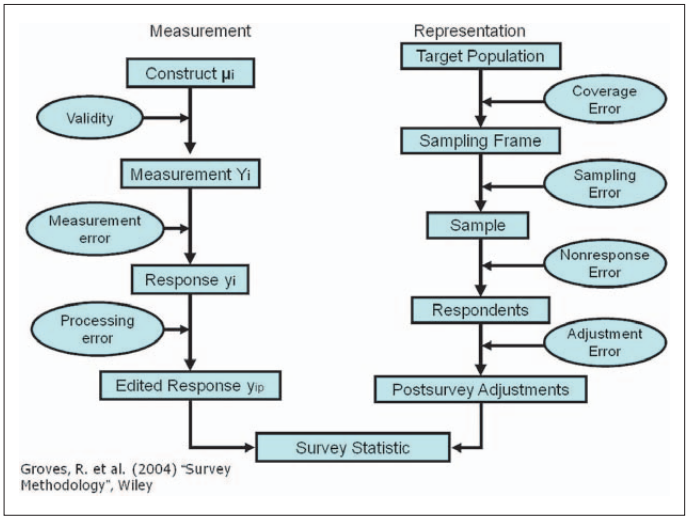


Figure 1: Process of social survey and subject of research on survey methodology

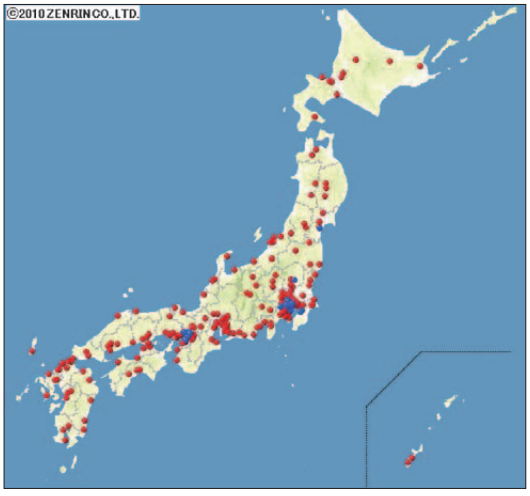


Figure 2: 250 locations of SSP 2010 Survey: Blue dots indicate 30 locations where sampling or interviewing were operated by ISM

Building a Database of Social Survey Results

Objective of the social survey information research project

The Social Survey Information Research Project at the Survey Science Center has been collecting social survey results with the aim of building a database of social surveys. A single survey provides limited information, particularly in the recent deteriorated survey environment. Multidimensional analysis using various types of social surveys is essential for comprehending the complicated aspects of modern society. This research project studies the methodologies for building a database and develops statistical methods for analyzing data. The group also intends to make the database available for public use.

A comprehensive report of a survey on the Japanese national character

The core data used to develop the database is obtained from a survey on the Japanese national character, which is conducted on a regular basis by the Institute of Statistical Mathematics. This survey has been conducted every five years since the first 1953 survey. The most recent was its twelfth survey and was conducted in the autumn of 2008. The questionnaire items in the survey concerned the attitudes of the participants toward life, environment, religion, politics, race, the Japanese people, and so forth. The results of this longitudinal survey, which are crucial for evincing the transition of Japanese character, are already available on the Internet. More comprehensive results, including cross-tabulation tables and graphs, are also provided on the Internet.

Database of related surveys

The survey on the Japanese national character is by no means the only survey conducted by the Institute. Various interrelated comparative surveys and experimental surveys have also been conducted. One of them is public opinion survey in Tokyo conducted since 1953 to 1982. The results of these surveys are also included in the database and made accessible to the public one at a time. The potential users of this database, including not only researchers but also the general public, will be able to analyze the data from various perspectives.

Takahiro Tsuchiya

Figure: Browsing survey results on the web

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 -

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

2005	2006	2007	2008	2009	2010
124	122	120	138	154	135

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

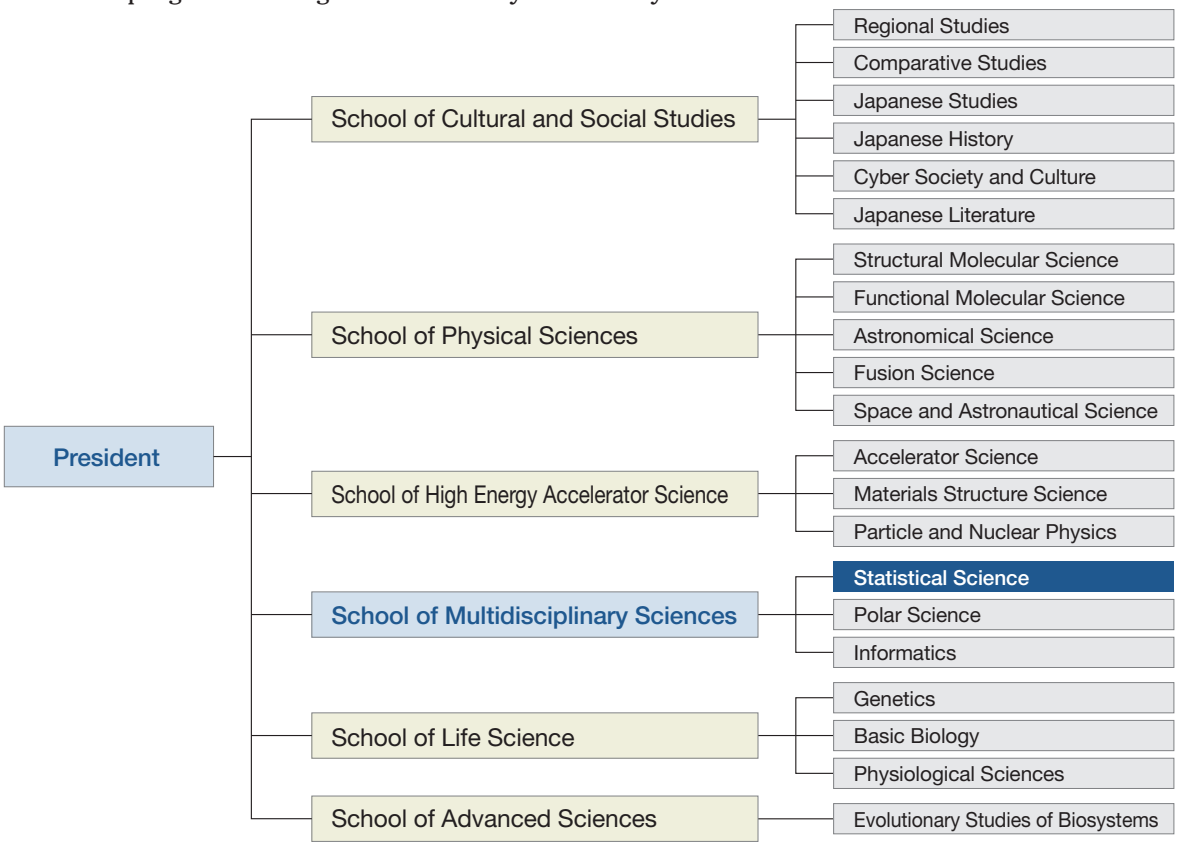
Major Research Fields

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.
- The library holds an extensive collection of books and journals, being one 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, 2011)

■ Doctor's course three years

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

■ Doctor's course five years

Year of enrollment	2007	2008	2009	2010
Number of students	1	2 ①	1 (1)	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 Gakugei University (1) • Tokyo University of Agriculture and Technology (1) • Tokyo Institute of Technology (4) • Tokyo University of Marine Science and Technology (1) • Shizuoka University (1) • Nagoya University (2) • Toyohashi University of Technology (2) • Kyoto University (4) • Osaka University (2) • Okayama University (2) • Shimane University (3) • Kyushu University (2) • Oita University (1) • Japan Advanced Institute of Science and Technology, Hokuriku (1) • Osaka City University (1)

University Background of Students

Private universities

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

Foreign universities

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

Degrees Awarded

Year	Doctor of Philosophy
1996	3 [1]
1997	1
1998	4 [1]
1999	6
2000	5

Year	Doctor of Philosophy
2001	5
2002	4
2003	8 [1]
2004	4
2005	4

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

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

Current Position of Alumni (As of April 1, 2011)

National and public universities, and public organizations

• Obihiro University of Agriculture and Veterinary Medicine, Professor (1) • University of Tsukuba, Professor (2) • University of Hyogo, Professor (1) • Saitama University, Associate Professor (1) • The University of Electro-Communications, Associate Professor (1) • The University of Tokyo, Associate Professor (1) • Kyushu University, Associate Professor (1) • Kyushu Institute of Technology, Associate Professor (1) • The Institute of Statistical Mathematics, Associate Professor (1) • University of Tsukuba, Lecturer (1) • Hokkaido University, Assistant (1) • Chiba University, Assistant • Tokyo Institute of Technology, Assistant (1) • Hiroshima University, Assistant (1) • Kyushu University, Assistant Professor (1) • University of the Ryukyus, Assistant (1) • The Institute of Statistical Mathematics, Assistant Professor (5) • The University of Tokyo, Project Researcher (1) • Kyoto University, Project Researcher (1) • Tokyo Institute of Technology, Research Fellow (1) • Nara Institute of Science and Technology, Research Fellow (1) • The Institute of Statistical Mathematics, Project Researcher (10) • Bank of Japan, Project Post (1) • Japan Broadcasting Corporation (1) • Financial Services Agency, Financial Research and Training Center, Researcher (1) • The Institute of Statistical Mathematics, JST CREST Research Fellow (1) • JST Basic Research Programs Doctoral Research Fellow (1) • Railway Technical Research Institute, Senior Researcher (1) • Statistical Information Institute for Consulting and Analysis (1) • Government Pension Investment Fund (1) • Public School, Teacher (1) • The Institute of Statistical Mathematics, Research Fellow (2)

Private universities

• Sapporo Gakuin University, Professor (1) • Meiji University, Professor (1) • Doshisha University, Professor (1) • Tokyo Health Care University, Associate Professor (1) • Nihon University, Associate Professor (1) • Tokyo University of Information Science, Lecturer (1) • Josai University, Lecturer (1) • Sapporo Gakuin University, Full-Time Lecturer (1) • Tokyo Women's Medical University, Postdoctoral Fellow (1) • Shibaura Institute of Technology, Lecturer (1)

Foreign universities

• Asia-Pacific Center for Security Studies Department, Associate Professor (1) • Central South University, Professor (1) • Hong Kong Baptist University, Lecturer (1) • Jahangirnagar University, Professor (1) • Jahangirnagar University, Associate Professor (2) • Massey University, Research Fellow (1) • The University of Warwick, Research Fellow (1) • University of Otaga, Research Fellow (1) • University of Rajshahi, Associate Professor (1) • University of South Carolina, Research Fellow (1) • Victoria University, Senior Lecturer (1)

Private companies, etc.

• Hitachi, Ltd. Central Research Laboratory, Research Fellow (1) • NTT Communication Science Laboratories, Research Fellow (1) • Seiwa Kikaku (1) • Toyota Motor Corporation, Higashi-Fuji Technical Center, Research Fellow (1) • NLI Research Institute, Chief Researcher (1) • Sankyo Co., LTD. (1) • Mizuho Trust and Banking, Senior Researcher (2) • JP Morgan Trust Bank Limited, Vice President (Hosei University, Part-Time Lecturer) (1) • ATR Computational Neuroscience Laboratories, Research Fellow (1) • Schlumberger Limited (1) • Macquarie Securities, Japan, Quantitative Analyst (1) • Non-Life Insurance Rating Organization of Japan, Staff Member (1) • Open Technologies Corporation (1) • Yamaha Corporation (1) • CLC bio Japan,Inc (1) • Pfizer Japan Ink (1) • Bank of Tokyo-Mitsubishi UFJ (1) • Goldman Sachs Asset Management L.P. (1)

Outreach Activities

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 in the Institute. In 1947, the affiliated Statistical Technician Training Center was opened as an educational organization for statistical technicians and instructors, in order to improve the levels of staff training within the statistical organizations of the government and to supply statisticians.

As social needs have changed, the purpose of the education program has gradually shifted away from the initial aim of supplying well qualified statistical technicians for the government, towards statistical education for working people. Tutorial courses were therefore initiated. Later, statistical methods became more widely used across a broad range of fields. Consequently, more extensive and sophisticated statistical education was required. To meet this demand, tutorial courses were expanded to cover a wider range of statistical topics. From 1965 to 1985, six to eight courses were held annually, not only in Tokyo, but also in provincial cities such as Osaka, Okayama and Fukuoka.

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 2010, the number of courses was 13.

Courses

The total number of courses held from 1969 to March, 2011 was 272, with a total of 20,006 participants. These courses covered a wide range of fields from basic to applied statistics. The following table lists the courses held in the past 3 years:

Year	Category	Title	Month	Number of participants
2008	Basic course	Statistical Causal Analysis by Structural Equation Modelling	February	58
	Standard course	Regression Models for Count Data and Their Extension	February	63
	Basic course	Data Analysis and Simulation with R	May	69
	Basic course	The Grammar of Science and Descriptive Statistical Methods	June	47
	Basic course	Introduction to Statistics	July	79
	Standard course	Spatial Point Pattern Analysis — Introduction from Biological Examples	August	46
	Standard course	Statistics of Extremes	August	48
	Standard course	An Introduction to Statistical Analysis by the Theory of Martingales	September	48
	Basic course	Analysis of Sample Surveys with R	September	41
	Basic course	Introduction to Multivariate Analysis	October	71
	Standard course	Data Assimilation: State Space Model and Simulation	October	72
	Basic course	Quality Control, Quality Engineering (Taguchi Method)	November	17
	Basic course	Introduction to Pharmacoepidemiology	November	71
	Standard course	Understanding of Evolutionary Computation: Statistical Viewpoint	December	56
2009	Standard course	Markov Chain Monte Carlo : Basics and Examples	February	78
	Standard course	Data Assimilation Methodology in Practice	April	77
	Basic course	Introduction to Sampling Methods and Survey Data Analysis	May	71
	Standard course	Introduction to Multivariate Descriptive Data Analysis by R	May	47
	Basic course	Statistical Data Visualization	June	75
	Basic course	Introduction to Pharmacoepidemiology	June	73
	Basic course	Data Analysis for Marketing	June-July	74

Tutorial Courses

Year	Category	Title	Month	Number of participants
	Basic course	Akaike Information Criterion and Statistical Modeling: Introduction from Field Biological Data	July	73
	Basic course	Introduction to Statistics	July	78
	Standard course	Regularization and Estimation — LASSO and Related Topics, Basic Theory and Applications —	August	44
	Basic-Standard course	Elementary of Multivariate Analysis	August	76
	Basic course	Statistics Literacy for the Law Court — For the Base on the Rational Discussion —	November	36
	Basic course	Introduction to Text Mining with R	November	51
2010	Standard course	Markov Chain Monte Carlo : Basics and Examples / 2010	February	97
	Basic course	Introductory Time Series Analysis with R	April	66
	Standard course	Robust Inference	June	93
	Basic course	Analysis of Sample Surveys with R	June	38
	Basic course	Introduction to Multivariate Analysis	August	97
	Standard course	Statistics of Extremes	August	40
	Basic course	Statistical Mathematics for Diversity: Current Topics in Biodiversity of Ecological Communities	August	37
	Basic course	Introduction to Statistical Quality Control	November	44
	Standard course	Mathematical Optimization and Its Application	November	50
	Basic course	Bayesian Designs in Clinical Trials: Principles and Applications	December	98
2011	Standard course	Statistical Data Analysis with Positive Definite Kernels — Basics and Advances of Kernel Method	January	64
	Standard course	Introduction to High Performance Computing by Using R	January	52
	Basic course	Introduction to Statistics	February	93
	Standard course	Markov Chain Monte Carlo : Basics and Examples/2011	February	96

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

Statistical Mathematics Seminar Series

Starting in 2011, the Institute has changed the format for our weekly seminar series on statistical mathematics, which is held every Wednesday. The seminars are led by our academic staff or by outside researchers from Japan and abroad. Previously, the seminars began at 4:00 p.m. and ran for one hour. The new format now features two separate lectures, each lasting 40 minutes. 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/

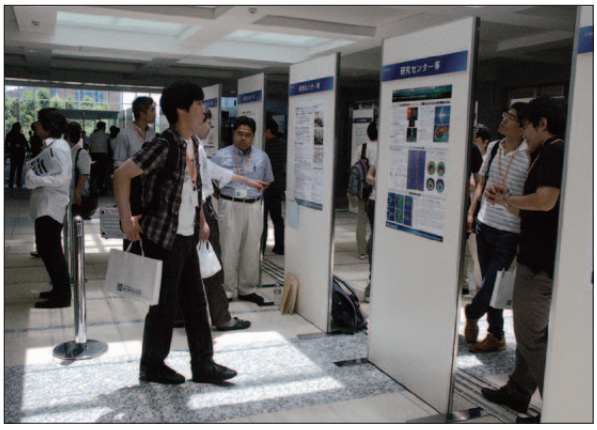
Consultation about Statistical Science

The Institute provides a consultation service on statistical science for the general public and researchers as a means of actively sharing the benefits of our research with society. This service operates throughout the year. Please contact the Center for Engineering and Technical Support. The consultation service covers a variety of topic ranging from the basics of statistics to more specialized issues. Half of the advice receivers are from the private sector, and the rest are staff from public organizations, university teachers, and students. Each teacher at the Institute directly takes charge of about 20 specialized cases annually, some of which are publicized at academic conferences, as being of benefit to society.

Annual Research Meeting

The Annual Research Meeting is a tradition that has continued since the Institute was established in 1944 as a way for researchers to orally present their research results. Starting in the 2011 academic year, the annual event changed format to become an open house program held every summer, with professors and project researchers of the Institute exhibiting poster presentations that describe their research results from the past year. The Institute piloted the new format in 2010 by organizing an event featuring poster presentations from all of the researchers of the Institute. The event was held on July 14, 2011 in the spacious entrance foyer and featured posters from 77 researchers in total, covering diverse subjects ranging from basic research to the impact of statistical science on modern problems. Twenty-two postgraduate students in statistical science from the Graduate University for Advanced Studies also participated and contributed posters. For a list of the poster presentations in 2011, please visit our Open House website.

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



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).

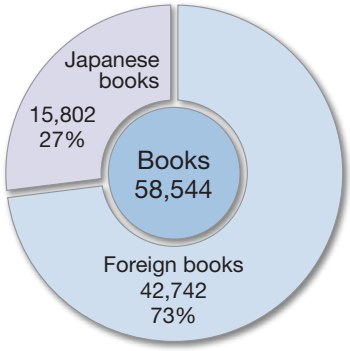
In the office building, the primary Local Area Network (LAN) consists of an Ethernet network using 10GBASE-SR for the main trunk and 1000Base-T for branches. The personal computers in researchers' offices, the Supercomputer System for Statistical Science are all connected to this network. A wireless 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).

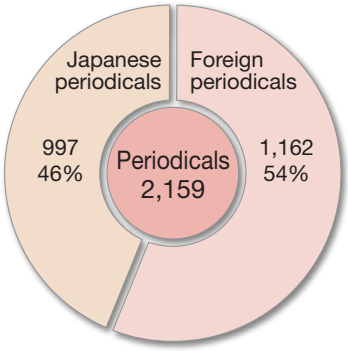
Supercomputer System for Statistical Science

Library and Materials (As of April 1, 2011)

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 (2010)

Type	Personnel expenses	Non-personnel expenses	Total
Expenditure	768,946	852,545	1,621,491

Unit: ¥1,000

Accepted External Funds (2010)

Type	Subcontracted research	Joint research	Contribution for scholarship	Total
Items	12	1	4	17
Income	121,598	1,100	4,600	127,298

Unit: ¥1,000

Grant-in-Aid for Scientific Research (2010)

Research Category	Items	Amount Granted
Grant-in-Aid for Scientific Research (S)	1	34,060
Grant-in-Aid for Scientific Research (A)	6	56,160
Grant-in-Aid for Scientific Research (B)	3	11,310
Grant-in-Aid for Scientific Research (C)	16	17,160
Grant-in-Aid for Challenging Exploratory Research	1	600
Grant-in-Aid for Young Scientists (B)	8	8,840
Grant-in-Aid for Research Activity Start-up	1	1,118
Grant-in-Aid for JSPS Fellows	1	600
Total	37	129,848
Grant-in-Aid for Scientific Research, Ministry of Health, Labour and Welfare	1	3,000

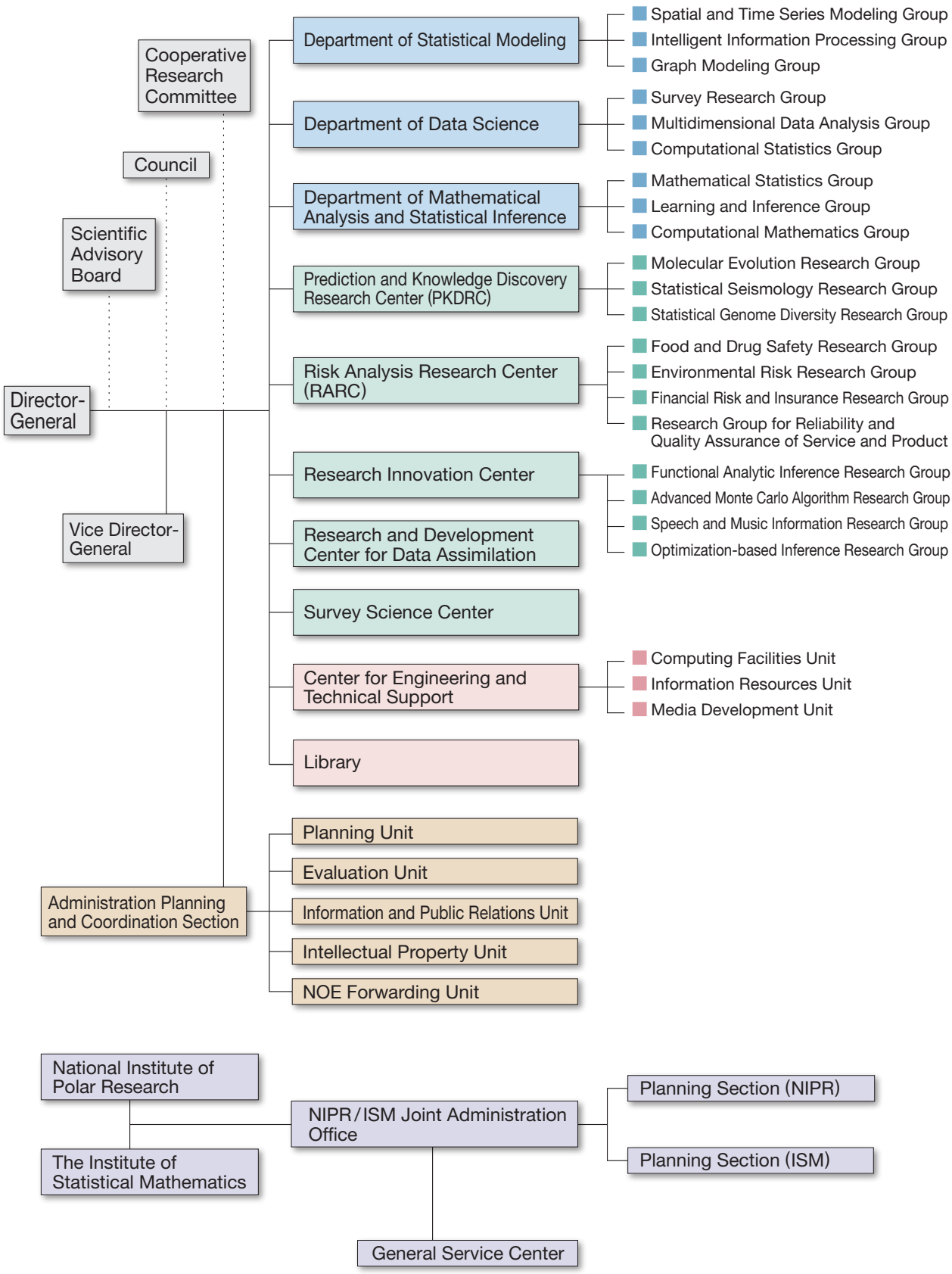
Unit: ¥1,000

Site and Buildings (As of April 1, 2011)

Site Area	62,450m^2
Area for Buildings (total)	16,026m^2

Organization

Organization Diagram (As of April 1, 2011)



Number of Staff (As of April 1, 2011)

Type	Director-General	Professor	Associate Professor	Assistant Professor	Administ-rative Staff	Technical Staff	Total
Director-General	1						1
Department of Statistical Modeling		4	10	3			17
Department of Data Science		9	4	3			16
Department of Mathematical Analysis and Statistical Inference		5	5	5			15
Center for Engineering and Technical Support						9	9
Administration Planning and Coordination Section					1		1
NIPR/ISM Joint Administration Office					12 (26)	1 (2)	13 (28)
Total	1	18	19	11	13 (26)	10 (2)	72 (28)

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

Staff (As of April 1, 2011)

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.	Yosihiko OGATA	Assoc. Prof.	Kenichiro SHIMATANI	Assoc. Prof.	Ryo YOSHIDA
Prof.	Tomoyuki HIGUCHI	Assoc. Prof.	Genta UENO	Assoc. Prof.	Jiancang ZHUANG
Assoc. Prof.	Yoshinori KAWASAKI	Assoc. Prof.	Fumikazu MIWAKEICHI	Assist. Prof.	Shinya NAKANO

Intelligent Information Processing Group

Prof.	Hiroshi MARUYAMA	Assoc. Prof.	Yukito IBA	Assist. Prof.	Hiroshi SOMEYA
Prof.	Tomoko MATSUI	Assoc. Prof.	Yumi TAKIZAWA	Visiting Prof.	Koji TSUDA
Prof.	Kenji FUKUMIZU	Assoc. Prof.	Daichi MOCHIHASHI		

Graph Modeling Group

Assoc. Prof.	Jun ADACHI	Assist. Prof.	Ying CAO

Department of Data Science

Director Takashi NAKAMURA

Survey Research Group

Prof.	Takashi NAKAMURA	Assoc. Prof.	Tadahiko MAEDA	Assist. Prof.	Koken OZAKI
Prof.	Ryozo YOSHINO	Assoc. Prof.	Takahiro TSUCHIYA		

Staff

Department of Data Science

Multidimensional Data Analysis Group

Prof.	Hiroe TSUBAKI	Prof.	Shigeyuki MATSUI	Assist. Prof.	Toshihiko KAWAMURA
Prof.	Nobuhisa KASHIWAGI	Prof.	Satoshi YAMASHITA	Project Researcher	Hei CHAN

Computational Statistics Group

Prof.	Yoshiyasu TAMURA	Assoc. Prof.	Seisho SATO	Visiting Prof.	Kazunori YAMAGUCHI
Prof.	Junji NAKANO	Assist. Prof.	Nobuo SHIMIZU	Visiting Assoc. Prof.	Norikazu IKOMA
Prof.	Koji KANEFUJI	Adjunct Prof.	Yutaka TANAKA	Project Researcher	Hayato TAKAHASHI
Assoc. Prof.	Naomasa MARUYAMA	Visiting Prof.	Michiko WATANABE		

Department of Mathematical Analysis and Statistical Inference

Director Satoshi KURIKI

Mathematical Statistics Group

Prof.	Satoshi KURIKI	Assist. Prof.	Takaaki SHIMURA	Visiting Assoc. Prof.	Hisayuki HARA
Assoc. Prof.	Yoichi NISHIYAMA	Assist. Prof.	Kei KOBAYASHI	Project Researcher	Toshihiro ABE
Assoc. Prof.	Shuhei MANO	Assist. Prof.	Shogo KATO	Project Researcher	Shigeki NAKAGOME

Learning and Inference Group

Prof.	Shinto EGUCHI	Assoc. Prof.	Hironori FUJISAWA	Assist. Prof.	Tadayoshi FUSHIKI
Assoc. Prof.	Shiro IKEDA	Assoc. Prof.	Masayuki HENMI	Assist. Prof.	Shinsuke KOYAMA

Computational Mathematics Group

Prof.	Yosihiko MIYASATO	Prof.	Satoshi ITO
Prof.	Atsushi YOSHIMOTO	Project Researcher	Ryo AKAISHI

Prediction and Knowledge Discovery Research Center (PKDRC)

Director Shinto EGUCHI

Molecular Evolution Research Group

Assoc. Prof.	Jun ADACHI	Assist. Prof.	Ying CAO	Adjunct Prof.	Masami HASEGAWA

Statistical Seismology Research Group

Prof.	Yosihiko OGATA	Assoc. Prof.	Jiancang ZHUANG	Visiting Prof.	Shinji TODA

Statistical Genome Diversity Research Group

Prof.	Shinto EGUCHI	Assoc. Prof.	Hironori FUJISAWA	Visiting Prof.	Masaaki MATSUURA
Prof.	Satoshi KURIKI	Assist. Prof.	Tadayoshi FUSHIKI	Project Researcher	Osamu KOMORI
Assoc. Prof.	Shiro IKEDA	Assist. Prof.	Shogo KATO		

Risk Analysis Research Center (RARC)

Director	Hiroe TSUBAKI	Coordinator	Koji KANEFUJI
Vice Director/Coordinator	Satoshi YAMASHITA	Coordinator	Yoshinori KAWASAKI
Coordinator	Shigeyuki MATSUI	Coordinator	Toshihiko KAWAMURA

Food and Drug Safety Research Group

Prof.	Hiroe TSUBAKI	Project Assist. Prof.	Takafumi KUBOTA	Visiting Assoc. Prof.	Satoshi TERAMUKAI
Prof.	Shigeyuki MATSUI	Visiting Prof.	Yoichi KATO	Visiting Assoc. Prof.	Makoto TOMITA
Assoc. Prof.	Masayuki HENMI	Visiting Prof.	Manabu IWASAKI	Project Researcher	Kazuhiko SHIBUYA
Assist. Prof.	Takaaki SHIMURA	Visiting Prof.	Tosiya SATO		

Environmental Risk Research Group

Prof.	Nobuhisa KASHIWAGI	Visiting Prof.	Yoshiro ONO	Visiting Assoc. Prof.	Yoshiyuki NINOMIYA
Prof.	Atsushi YOSHIMOTO	Visiting Prof.	Mihoko MINAMI	Project Researcher	Tomoko IMOTO
Prof.	Koji KANEFUJI	Visiting Assoc. Prof.	Toshihiro HORIGUCHI	Project Researcher	Masaki OKUDA
Visiting Prof.	Kunio SHIMIZU	Visiting Assoc. Prof.	Takashi KAMEYA		
Visiting Prof.	Kazuo YAMAMOTO	Visiting Assoc. Prof.	Hiroshi SYONO		

Financial Risk and Insurance Research Group

Prof.	Satoshi YAMASHITA	Assoc. Prof.	Yoichi NISHIYAMA	Visiting Prof.	Nakahiro YOSHIDA
Assoc. Prof.	Seisho SATO	Visiting Prof.	Naoto KUNITOMO	Visiting Prof.	Toshio HONDA
Assoc. Prof.	Yoshinori KAWASAKI	Visiting Prof.	Hiroshi TSUDA	Visiting Assoc. Prof.	Toshinao YOSHIBA

Research Group for Reliability and Quality Assurance of Service and Product

Prof.	Hiroe TSUBAKI	Visiting Prof.	Kazuo TATEBAYASHI	Visiting Assoc. Prof.	Manabu KUROKI
Assist. Prof.	Toshihiko KAWAMURA	Visiting Prof.	Sadaaki MIYAMOTO	Visiting Assoc. Prof.	Hideki KATAGIRI
Visiting Prof.	Kakuro AMASAKA	Visiting Prof.	Shusaku TSUMOTO	Visiting Assoc. Prof.	Yukihiko OKADA

Research Innovation Center

Director Kenji FUKUMIZU

Functional Analytic Inference Research Group

Prof.	Kenji FUKUMIZU	Project Researcher	Yu NISHIYAMA
Assist. Prof.	Kei KOBAYASHI	Project Researcher	Yusuke WATANABE

Advanced Monte Carlo Algorithm Research Group

Assoc. Prof.	Yukito IBA	Visiting Prof.	Makoto KIKUCHI	Visiting Assoc. Prof.	Koji HUKUSHIMA

Speech and Music Information Research Group

Prof.	Tomoko MATSUI	Assist. Prof.	Shinsuke KOYAMA	Visiting Prof.	Masataka GOTO

Optimization-based Inference Research Group

Prof.	Satoshi ITO	Visiting Prof.	Atsuko IKEGAMI	Visiting Assoc. Prof.	Yuji SHINANO
Assoc. Prof.	Shiro IKEDA	Visiting Prof.	Takashi TSUCHIYA		
Assoc. Prof.	Genta UENO	Visiting Prof.	Tadashi WADAYAMA		

Staff

Research and Development Center for Data Assimilation

Director Tomoyuki HIGUCHI　Vice Director Yoshiyasu TAMURA

Prof.	Tomoyuki HIGUCHI	Assoc. Prof.	Ryo YOSHIDA	Visiting Assoc. Prof.	Toru ONODERA
Prof.	Yoshiyasu TAMURA	Assist. Prof.	Shinya NAKANO	Project Researcher	Masaya SAITO
Prof.	Junji NAKANO	Project Assoc. Prof.	Hiromichi NAGAO	Project Researcher	Kenta HONGO
Assoc. Prof.	Seisho SATO	Project Assist. Prof.	Christopher Andrew ZAPART		
Assoc. Prof.	Genta UENO	Visiting Prof.	Yoichi MOTOMURA		

Survey Science Center

Director Ryozo YOSHINO

Prof.	Ryozo YOSHINO	Assist. Prof.	Koken OZAKI	Project Researcher	Kiyohisa SHIBAI
Prof.	Takashi NAKAMURA	Visiting Assoc. Prof.	Toru KIKKAWA	Project Researcher	Kosuke NIKAIDO
Assoc. Prof.	Tadahiko MAEDA	Visiting Assoc. Prof.	Takahito ABE		
Assoc. Prof.	Takahiro TSUCHIYA	Project Researcher	Yutaka UJIIE		

Project Researchers

Project Researcher	Motoi OKAMOTO	Project Researcher	Eiki TANAKA	Project Researcher	Hitoshi MOTOYAMA
Project Researcher	Satoko SAITA	Project Researcher	Xiaoling DOU		

Center for Engineering and Technical Support

Director	Junji NAKANO	Adjunct Prof.	Makio ISHIGURO
Vice Director	Yoshinori KAWASAKI	Deputy Manager	Yuriko WATANABE
Adjunct Prof.	Yasumasa BABA	Senior Specialist	Saeko TANAKA

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

Library

Head Junji NAKANO

Administration Planning and Coordination Section

Director Tomoyuki HIGUCHI

Head of Planning Unit	Hiroe TSUBAKI	Head of Intellectual Property Unit	Hiroshi MARUYAMA
Head of Evaluation Unit	Yoshiyasu TAMURA	Head of NOE Forwarding Unit	Hiroe TSUBAKI
Head of Information and Public Relations Unit	Hiroshi MARUYAMA	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 Yoshiki HAMA

Deputy Head	Mitsuaki OGAWA	Team Leader	Motoyoshi URANO	Team Leader	Akihiko NAKAMURA
Specialist	Fumio SUTO	Team Leader	Hiroaki ARAI		

Planning Section (NIPR)

Head of Planning Section Seiko TOBE

Deputy Head	Yasuyuki EDURE	Team Leader	Nobutaka IRIE
Team Leader	Motokazu TOYODA	Team Leader	Hiromi OBAMA

General Service Center

Deputy Head	Takashi KOSAKA	Team Leader	Tomoe HIRANUMA	Team Leader	Tomoko IIDA
Deputy Head	Koji SAKAMOTO	Team Leader	Kazuyoshi ASO	Team Leader	Kuniyasu YOKOI
Deputy Head	Toru HAYASHI	Team Leader	Yoji ISHII		

Council of The Institute of Statistical Mathematics (As of April 1, 2011)

Masanori IYE	Professor, Optical and Infrared Astronomy Division, National Astronomical Observatory of Japan, National Institutes of Natural Sciences
Yutaka KANO	Professor, Graduate School of Engineering Science, Osaka University
Toshinari KAMAKURA	Professor, Faculty of Science and Engineering, Chuo University
Koji KURIHARA	Executive Vice Director / Professor, Graduate School of Environmental Science, Okayama University
Kunio SHIMIZU	Professor, Faculty of Science and Technology, Keio University
Kazuo SEIYAMA	Professor, Graduate School of Humanities and Sociology, The University of Tokyo
Makoto TAIJI	Core Director, Computational Biology Research Core, Quantitative Biology Center (QBiC), RIKEN Advanced Institute for Computational Science
Nobuhiko TERUI	Professor, Graduate School of Economics and Management, Tohoku University
Yoshihiro YAJIMA	Professor, Graduate School of Economics, The University of Tokyo
Takashi WASHIO	Professor, The Institute of Scientific and Industrial Research, Osaka 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 Statistical Modeling, ISM)
Yosihiko OGATA	Professor (Department of Statistical Modeling, ISM)
Nobuhisa KASHIWAGI	Professor (Department of Data Science, ISM)

Cooperative Research Committee (As of June 1, 2011)

Akifumi OIKAWA	Professor, The Graduate University for Advanced Studies
Masayuki UCHIDA	Professor, Graduate School of Engineering Science, Osaka University
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, 2011)

Specialist on epidemiology and social research	Michio UMINO	President, Miyagi Gakuin Women's Unversity
Specialist on epidemiology and social research	Yoshihiko MIURA	President, School of Health and Social Service, Saitama Prefectural University
Person in citizen's position	Yutaka KURIKI	Principal, Tachikawa City Daiichi Elementary School
Specialist in the field of ethics and law	Hitomi NAKAYAMA	Lawyer, Kasumigaseki-Sogo Law Offices
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)

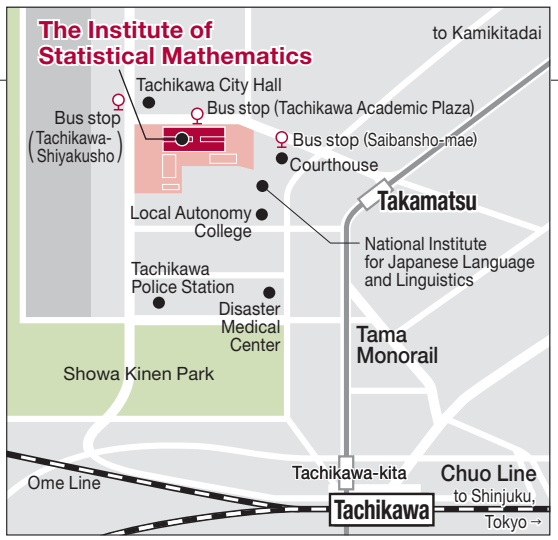
Professor Emeritus (As of April 1, 2011)

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

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	Reorganized as an Inter-University Research Institute owing to the revision of the Order for the Enforcement of the National School Establishment Law. The revised law required that the Institute would, as a National Inter-University Research Institute, 1) conduct studies on statistical mathematics and its application, 2) provide opportunities for university teachers or other researchers majoring in this field to utilize the facility, and 3) contribute to the development of academic studies in universities. At the same time, the 6 research departments were reorganized into 4 research departments (Fundamental Statistical Theory, Statistical Methodology, Prediction and Control, and Interdisciplinary Statistics). The Statistical Data Analysis Center and the Statistical Education and Information Center were instituted, and the affiliated Statistical Technician Training Center was abolished.
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).
1999	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 in the affiliated facility.
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 affiliated facilities were reorganized as research departments, and the Risk Analysis Research Center was instituted.
2008	April	The Research Innovation Center was instituted in the affiliated facility. The Intellectual Property Unit was instituted.
2009	October	The ISM 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 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.

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/