Research Organization of Information and Systems

The Institute of Statistical Mathematics

2006

Contents

Cover design
The images of the continents represented by characters symbolize the abstract nature of statistical mathematics and the keywords placed on them indicate the institute's goals. The photo of the super computer in the center symbolizes the importance of computation, while the four belts around the globe express the close link between the four research units of the institute.

Message from Director-General

Last April, the Institute of Statistical Mathematics restructured its research organization and adopted a new research structure comprising a basic research section, a strategic research section and a research support section. In order to embody our basic principles of establishing new statistical methods through challenge to important social tasks, the new research organization adopted a dual structure consisting of basic research and strategic research sections, which cover our activities both horizontally and vertically. In principle, all full-time researchers are assigned to the basic research section, to conduct basic research from a long-range perspective. The strategic research section forms research task forces by flexibly and intensively combining researchers in the basic research section, visiting professors and project researchers.

In the basic research section we have created the three departments of Statistical Modeling, Data Science, and Mathematical Analysis and Statistical Inference, thus establishing an organization able to work on the development and application of important statistical methods. Compared to the basic research section, the strategic research section will tackle the strategically important tasks of the institute in a flexible and intensive manner. We have created a Prediction and Knowledge Discovery Research Center, and a Risk Analysis Research Center in this section. The Prediction and Knowledge Discovery Research Center aims to develop methods and applications for prediction and knowledge discovery based on huge data set, in view of a post-IT society. The Risk Analysis Research Center, on the other hand, aims to develop scientific methods to deal with the increased uncertainty and risks caused by globalization. This research center, which was newly founded in the last fiscal year, comprises three research groups: drug and food safety; environmental risk; and financial risk and insurance. The center has also established a risk research network connecting many research organizations involved in risk research in order to establish a Risk Research NOE (Network of Excellence).

Two years have passed since the Research Organization of Information and Systems was established and its research activities are gathering momentum. In the last fiscal year, a Transdisciplinary Research Integration Center was established within the headquarters of the organization and new research projects were initiated with the cooperation of four research institutes attached to the organization. The Institute of Statistical Mathematics, in particular, has a key leadership role in the Function and Induction Research Project and has also begun research on a new paradigm of scientific inference suitable for the information age.

As stated above, the Institute of Statistical Mathematics aims to serve both as a research institute of methodology by conducting joint research with researchers from various disciplines and to act as a keystone for the exchange of research, thus serving as an Inter-University Research Organization. We believe that the role of the institute has become more important with the rise of the information and risk society. We therefore urge your further understanding and support.

Genshiro Kitagawa
Director-General
The Institute of Statistical Mathematics

Organization of the Institute

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 research on model-based statistical inference methodologies

Research Groups	Research Details
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 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.

Research Groups	Research Details
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, the theory of optimization, and the practice of statistics in science.

Research Groups	Research Details
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 Mathematical Statistics 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 together with mathematical methodologies used for statistical modeling in the sciences.

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.

Research Groups	Research Details
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.
Date Assimilation Research Group	The Data Assimilation Research Group aims at developing new, advanced data assimilation techniques to combine different information from dynamical simulation and observation data.
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 society and the economy. The center is also constructing a network for risk analysis in order to contribute to the creation of a reliable and safe society.

Research Groups	Research Details
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 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.

Unit	Operation
Computing Facility Unit	The Computing Facility Unit is in charge of the management of computer facilities and software for research.
Networking Facility Unit	The Networking Facility Unit is in charge of the management of networking infrastructure used for research and is responsible for network security.
Education and Library Unit	The Education and Library Unit is in charge of planning statistical education courses to popularize research results and is responsible for maintaining an extensive library.
Public Outreach Unit	The Public Outreach Unit is in charge of the publication and editing of research results and is responsible for public relations.

Introduction to Our Research

Strategic Research Projects

The ISM is divided into 3 categories; *Basic Research*, *Research Support*, and *Strategic Research*. The *Basic Research* section provides a framework for fundamental research, accepting original contributions from all staff members, with an emphasis on developing statistical methods that can address current societal issues. *Research Support* acts precisely as its name implies, as a part of the Inter-University Research Organization. Strategic Research also combines the strengths of Basic Research, Research Support, and other universities and research institutes, in order to address important societal issues.

The Strategic Research section has established the *Prediction and Knowledge Discovery Research Center* and the *Risk Analysis Research Center*. These two centers are organized as follows:

Prediction and Knowledge Discovery Research Center (PKDRC)

Molecular Evolution Research Group
Data Assimilation Research Group
Statistical Seismology Research Group
Statistical Genome Diversity Research Group

Risk Analysis Research Center (RARC)

Food and Drug Safety Research Group
Environmental Risk Research Group
Financial Risk and Insurance Research Group

ISM Research Projects

The institute also emphasizes the importance of its own and the exploratory research. Every year we invite researchers from within the institute to propose new research projects. A relativery sizable amount of funding is allocated to approved projects, and strategic research leading to future development is encouraged. In this financial year, we have approved the following ten projects. No limitation was placed on theme or category.

Research Theme	Project Leader
Development of array data analysis	Makio Ishiguro
Probability density estimation with semidefinite programming and related topics	Takashi Tsuchiya
Computational statistics of quantum state estimation	Yukito Iba
Recent developements in information geometry	Shiro Ikeda
Random generation of space group symmetry	Yoshiaki Itoh
Reconstructing functional neuronal circuits from optical imaging data	Yoshiyasu Tamura
Developing predictive models for bycatch in tuna fisheries	Mihoko Minami
New developments of indirect questioning techniques	Takahiro Tsuchiya
A comparative study among survey methods	Tadahiko Maeda

The research activities of each group and a profile of each research project within the Strategic Research Center are as follows.

Molecular Evolution Research Group

Toward Integrative Understanding of Biodiversity

[Methods for phylogenetic inference from molecular sequences]

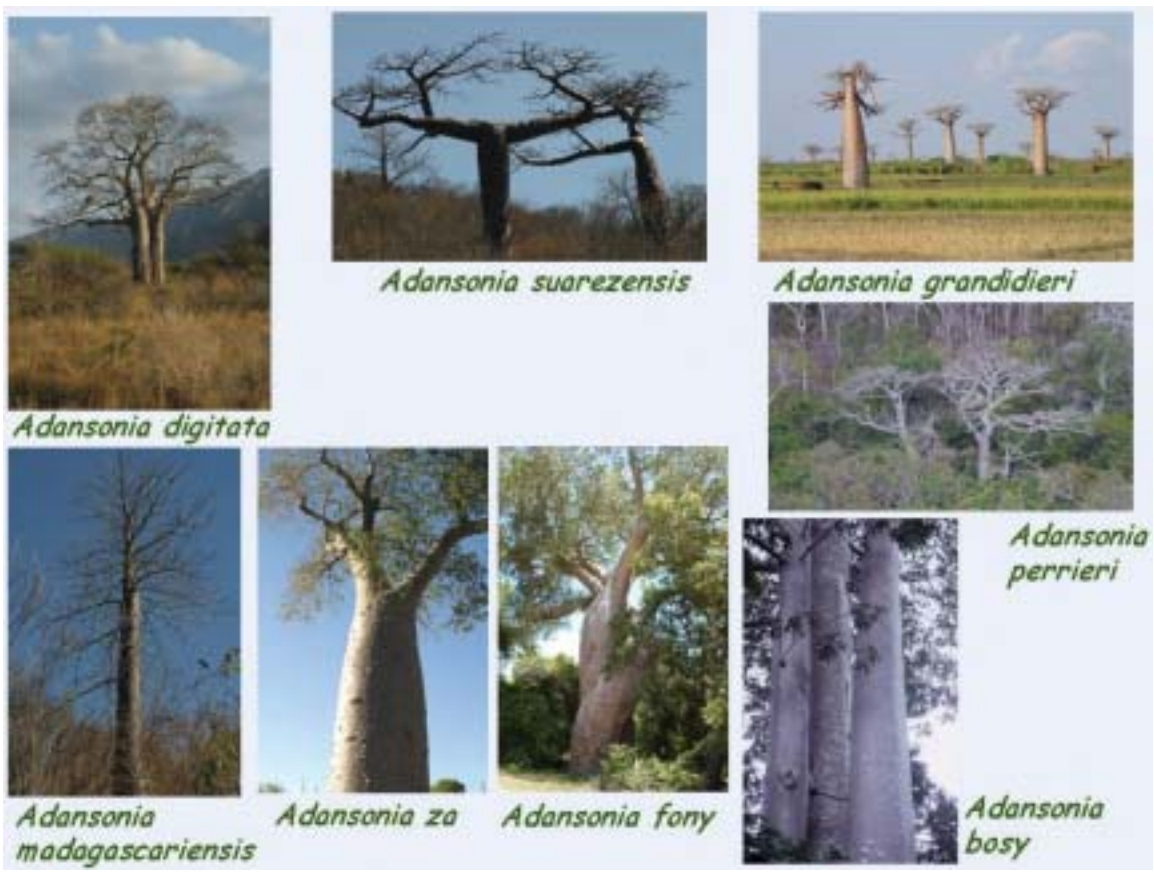
In order to understand the biodiversity, evolutionary view is indispensable, and the method for inferring evolutionary trees from DNA and protein sequence data is becoming an important tool in this field. In this project, we are developing models of molecular evolution and methods for inferring molecular evolutionary trees. We have released the program package MOLPHY for phylogenetic inference from molecular sequences. During the process of developing methods for data analyses, it is important to repeatedly apply the methods to real biological problems in order to develop useful methods.

[Natural history and biodiversity in Madagascar]

Biological problems we are studying include natural history and biodiversity of Madagascar which is an island isolated from continents during a long geological period, and we are studying tenrecs, lemurs and baobabs which present remarkable diversity in Madagascar.

Baobabs (*Adansonia*) are trees adapted to arid environment. In Madagascar 7 species are distributed, while Africa and Australia respectively have only one species. In order to clarify the evolutionary history of baobabs and to understand why baobabs show remarkable diversity only in Madagascar, we are analyzing chloroplast genomes of *Adansonia* as well as several nuclear genes.

Masami Hasegawa



Data Assimilation Research Group

Data Assimilation: Information Fusion Technique of Simulation and Large-scale Observation Data

[What is data assimilation?]

Obtaining an accurate prediction of the upper ocean thermal structure is one of the important issues in modeling studies of the ocean circulation and Earth's environment. A numerical ocean model-based experiment, i.e., simulation study has been conducted for this purpose. Dependent variables of the numerical ocean model can be considered as stochastic variables due to the uncertainty in the initial and boundary conditions and the imperfection of the model. A natural idea to compensate for such insufficient information only via simulations is to combine observations with numerical models. Hence, a reasonable way of blending a numerical model and observation is now becoming a central issue in the earth science community. Data assimilation is a technique for a synthesis of information from a dynamic (numerical) model and observation data. It is an emerging area in earth sciences, particularly in meteorology and oceanography, stimulated by recent improvements in computational and modeling capabilities and the increase in the amount of available observations.

[Data assimilation technique is a time series analysis method!]

In a statistical sense, data assimilation supposes two models: system model and observation model. The system and observation models correspond to large-scale numerical model-based simulations and large-scale observation datasets, respectively. The data assimilation can be therefore formulated in the state space model (SSM). The SSM has given a platform in nonstationary time series and control studies for three decades after Kalman. Past studies for data assimilation employed a linear Gaussian SSM and applied Kalman filter. In the meanwhile, many phenomena in earth sciences have nonlinearity and come along with non-Gaussian fluctuations. A high dimensionality of the state vector from ten thousands up to a few millions causes the numerical problems in computation for the data assimilation. Realization of high performance in prediction ability demands the data assimilation method to evaluate how much the numerical simulation model can describe the real world phenomena. A purpose of our research group is to develop a new non-linear non-Gaussian data assimilation method and propose a framework for evaluating the simulation models in relevance to real data.

[Data assimilation technique can be applicable to any domains!]

The ISM is being proud of demonstrating an international and leading activity in the time series analysis for three decades. These studies promote us to study the nonlinear non-Gaussian data assimilation technique based on the ensemble-based nonlinear filtering and smoothing methods: e.g., the ensemble Kalman filter, the particle filter, and the Monte-Carlo mixture Kalman filter. These methods are examined with applications to geophysical phenomena such as El Niño, Tsunami, and ring current in the earth magnetosphere. A concept of data assimilation is general, and therefore is applicable to any problems in which a numerical simulation model and observation data appear. We are now launching the research project with data assimilation technique applied to several problems in a wide variety of fields.

Tomoyuki Higuchi

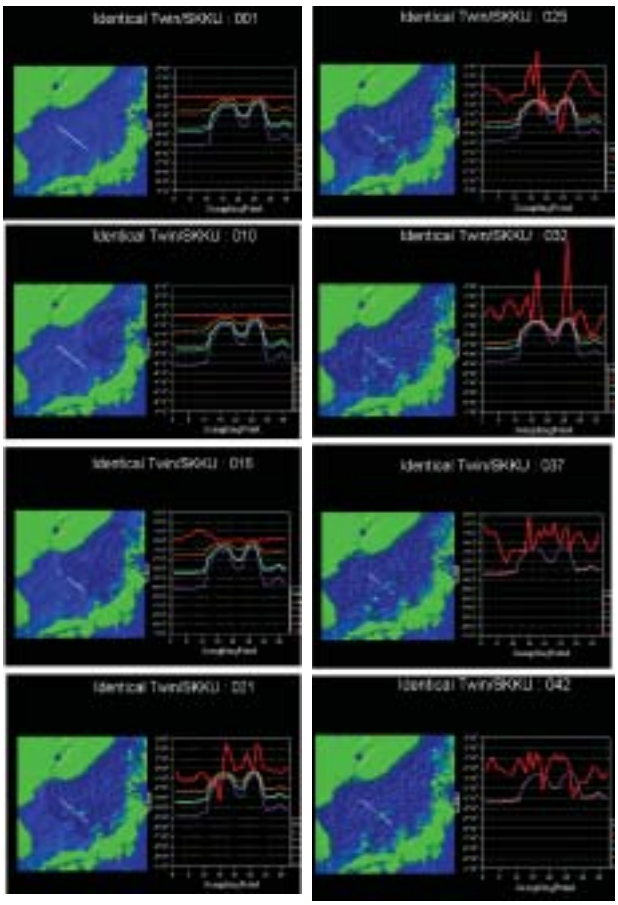


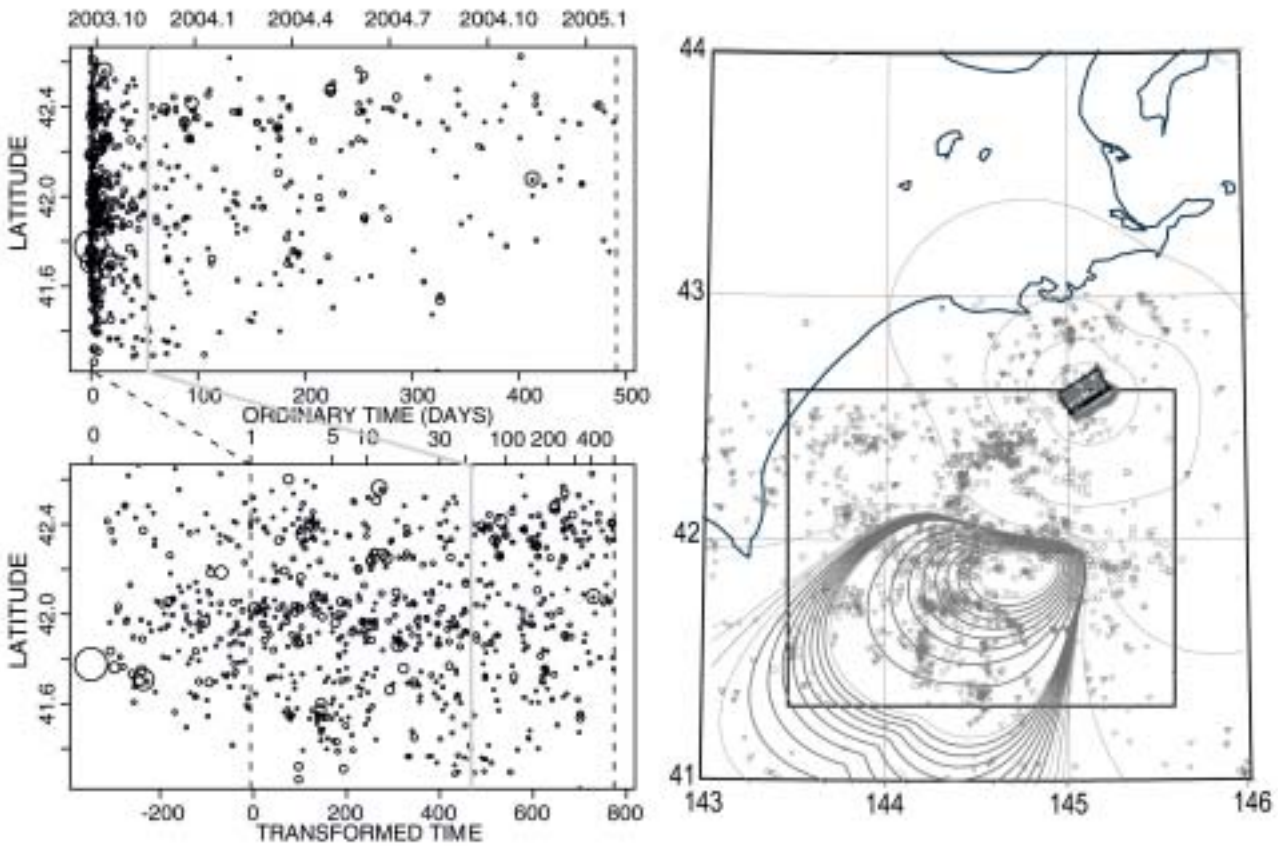
Figure : Result of identical twin experiment in the Sea of Japan. False topography is modified and variety of bottom topography "scenario" decreases as tsunami propagates.

Anomalous Aftershock Activity Relative to that Predicted by the ETAS Model

Seismic quiescence and activation, as the precursors to large earthquakes, have attracted much attention among seismologists. Of particular interest is the hypothesis that the stress-changes transferred from a far-field rupture or silent slip can cause seismic changes in some regions. On the other hand, since a sequence of aftershocks is triggered by complex mechanisms under heterogeneous fractal media, it is difficult to precisely describe the transfer of stresses both within and near to the field. In other words, triggering mechanics within an aftershock sequence are too complex to allow us to calculate the effect of stress changes in detail. Nevertheless, we can use statistical empirical laws as a practical method for describing aftershock triggering. That is to say, fitting and extrapolating a suitable statistical model for normal seismic activity in a situation without exogenous stress changes provides us with an alternative method through which to see the seismicity changes explicitly. Thus, one of the main objectives of this project is to show the possibility that diagnostic analysis based on fitting the ETAS model and its space-time extension to regional seismicity can be helpful in detecting small exogenous stress changes. Indeed, these changes are so slight that one can barely recognize systematic anomalies in the time series of displacement records in the corresponding geodetic records from the GPS network.

In the figure below the left panels show the space-time plot of the aftershocks (M ≧ 3) of the 2003 great Tokachi-Oki earthquake of M8.0 through to January 2005 where the time scale in the left top and bottom panels are the ordinary time and time transformed by the fitted ETAS model, respectively. The data are taken from the rectangular region shown in the right-side panel which shows the associated Coulomb-Failure-Stress increments (ΔCFS) contours for the majority of the Tokachi-Oki aftershocks on the surface of the plate boundary due to the assumed aseismic slip off the coast of Kushiro, as delineated in the panel. The dark gray contour region indicates negative ΔCFS (stress shadow). The portion of space-time in the left bottom panel becomes relatively activated and quiet compared to the seismicity predicted by the ETAS model in the northern and southern half of the aftershock region, respectively, after about 2 months has elapsed since the mainshock as indicated by the vertical gray line. This appears to be consistent with the ΔCFS pattern shown in the right side panel.

Yosihiko Ogata



Genome Polymorphism Analysis – Haplotype-block Identification –

We are producing a greater amount of genomic data on a wider scale than ever before. One of typical genomic data is SNP (Single Nucleotide Polymorphism), which has been detected at several millions of sites. We are studying some associations of SNPs with drug efficacy, adverse effect and disease towards order-made treatments. Standard statistical methods face to difficult situations to extract effective information from these data sets, which motivates a new paradigm in statistics.

[Association study and haplotype-block]

The haplotype-block consists of strongly-linked SNPs. In association study, it has been gradually recognized that the study based on haplotype-blocks is better than that based on a direct application of SNPs (Figure 1). Stimulating discussion with Bioinformatics group of Japanese Foundation for Cancer Research (JFCR) leads us to propose a novel method for identifying haplotype-blocks from the viewpoint of statistical genetics and mathematical statistics. The program package is named ADBlock, which will be downloadable in the internet (Figure 2). The advantageous performance is demonstrated from both the real data and synthetic data sets. (Figures 3 & 4). We are planning a large-scale association study based on haplotype-blocks by the co-operative study with JFCR.

H. Fujisawa and S. Eguchi

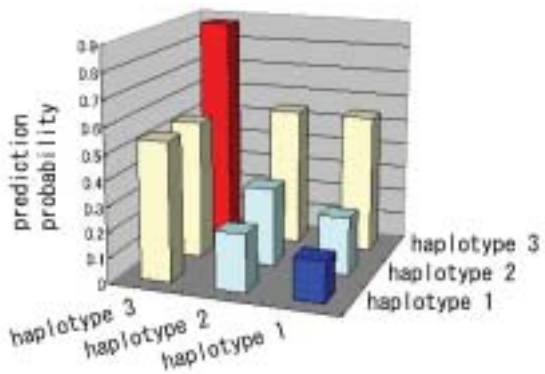


Figure 1: Analysis based on haplotypes (Figure: Genome Center, JFCR).

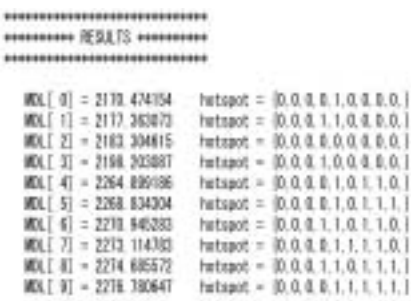


Figure 2: A part of output from ADBlock software.

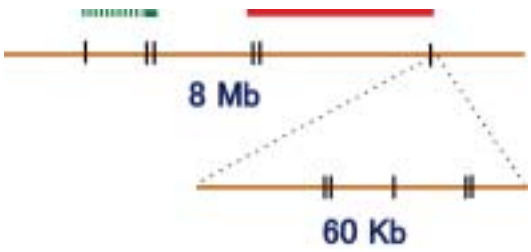


Figure 3: 11 SNPs in TAP2 gene. Red and green colored bands are biologically identified haplotype-blocks; the dotted band is still an unidentified region. (Jeffreys et al., 2000).

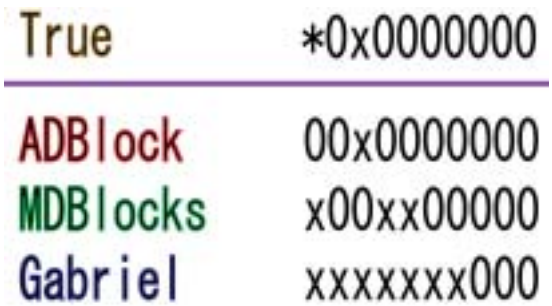


Figure 4: Comparison of various methods based on real data in TAP2 gene. 'True' corresponds to Figure 3. The hotspot, nonhotspot, and unidentified spot are denoted by X, 0, and *, respectively. 'MDBlocks' is given by Anderson and Novembre (2003); 'Gabriel' by Gabriel et al. (2002). (Data: Genome Center, JFCR).

Risk-Benefit Evaluation of Food and Drug

[Mission]

Social responsibility of the food and drug safety program in RARC is to design appropriate databases and statistical methods for the safety evaluation of food and drug. Our researches are based on a cooperative research project with visiting researchers and members from the research group on DM and statistic in JPMA as follows:

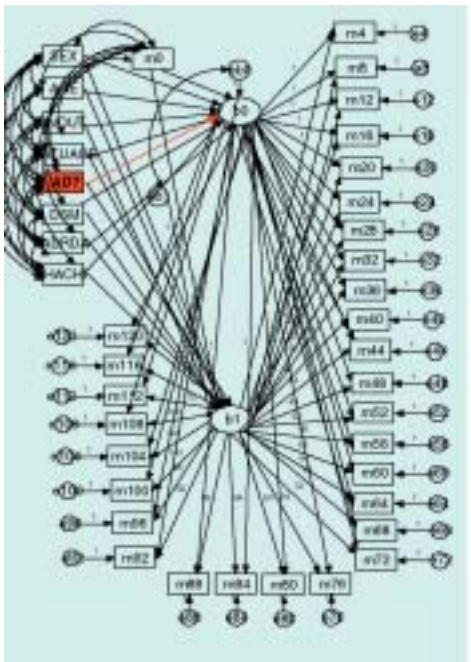
[Significance of the drug safety database from well-controlled clinical trials]

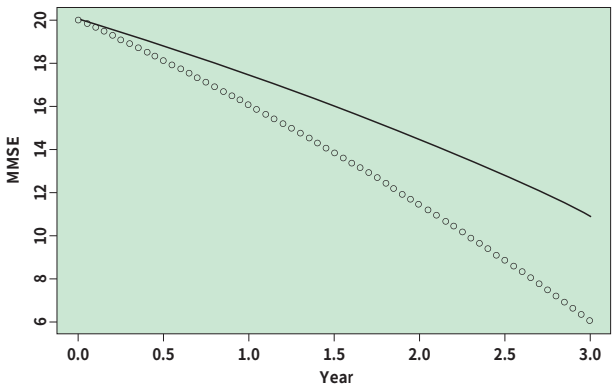
Clinical knowledge from a single clinical trial with less than 400 patients is usually limited to estimate only general drug efficacy, but practical clinical guidelines can be obtained through the exploratory data analysis of a statistical database concatenating data from several controlled clinical trials to improve not only the drug efficacy but its safety.

[Modeling for incomplete data]

Expected natural history of Alzheimer decease (AD) can be estimated by a latent growth curve model after constructing daily clinical database in which the patients visit the hospitals at different time. Thereby hypothetical monthly repeated measurement data include missing data more than 90%, however the significant accelerated factors of AD can be clarified by this model fitting. The techniques for incomplete data will be generally effective in the field of food and drug safety evaluation.

Hiroe Tsubaki





The path diagram of the latent growth curve model and the difference of the natural history between AD and Pseudo SD.

The Effort of the Statistical Science towards Solution of an Environmental Problem

[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.

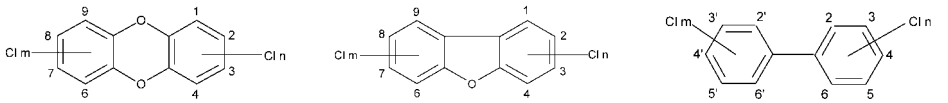
[Source identification of dioxins]

The toxicity of a certain dioxin(Fig.1) is stronger than that of the poison gas, sarin, and it is feared that dioxins threaten human health. The major sources of dioxins are activities of human beings including agricultural chemicals, bleaching and combustion processes. Dioxins emitted into environment are absorbed into the body of a human being through lungs and a food chain. Recently, the environmental contamination caused by dioxins is frequently detected in individual districts. To solve the problem, it is necessary to identify the sources. However, it is not easy to identify the sources, because there are many unknown sources of dioxins. Accordingly, we are developing statistical models which enable us to make inference on unknown sources. Additionally, to improve the accuracy of the inference, we are trying to complete the data of dioxins cooperating with National Institute of Environmental Studies and many environmental laboratories of local governments.

[Error analysis of Retrieved CO_2 column density from the Earth Observation Satellite GOSAT]

There are some errors which are contained to the retrieved CO_2 column density from GOSAT(Greenhouse gases Observing SATellite)(Fig.2). The errors are due to the given condition of the temperature and water vapor amount, the noises which are caused by sensor device, the process from the signal (interferogram) which is observed to spectrum, and so on. The purpose of this study is to obtain the confidence interval of the retrieved CO_2 column density due to these errors. The error models are constructed until now. Fig.3 is indicated the flow from the spectrum which is inputted to sensor to the observed spectrum, and the error factors which are taken into account in this study.

Koji Kanefuji



polychlorinated dibenzo-para-dioxins　polychlorinated dibenzofurans　dioxin-like polychlorinated biphenyls

Fig.1 Dioxins

Fig.2 GOSAT image (photo: JAXA)

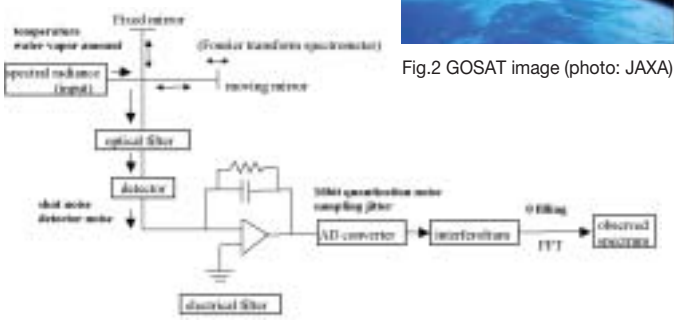


Fig.3 The flow from the spectrum which is inputted to sensor to the observed spectrum, and the error factors (bold letters). *This figure makes under discussion with GOSAT Research Team, National Institute for Environmental Studies, Center for Global Environmental Research.

Fig.4 Water analysis in Mt. Tanigawa
(Courtesy by Prof. Nagafuchi)

Toward Quantitative Analysis of Financial Risk

[Aim of our group]

Financial Risk and Insurance Research Group mainly concerns the theory and practice in the quantitative analysis of risks involved with various financial instruments and insurance products from the view point of statistical modeling. Various research projects are under way not only by ISM researchers but by visiting and post doctoral researchers. This article introduces some of many instances.

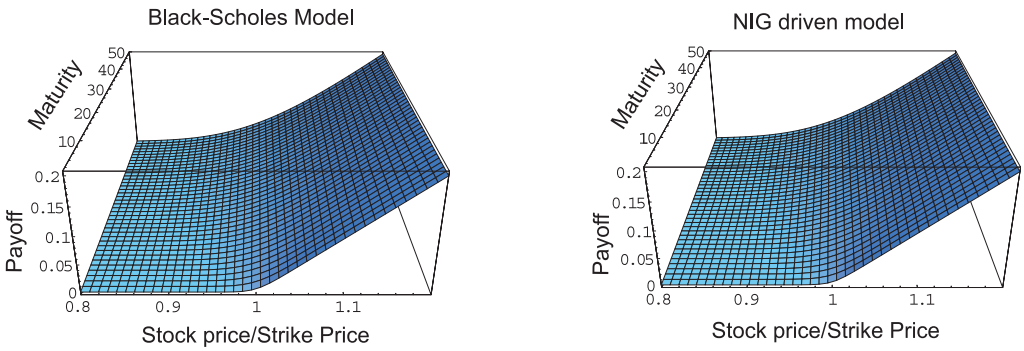
[Modeling market risks]

Quantitative analysis of market risks is usually done by modeling the dynamics of the return time series or the change of some assets. Several projects are in progress on jump diffusion models that dispense with complete markets hypothesis assumed in mathematical finance. Also, it is well known that the distribution of returns of financial assets often looks fat-tailed. That naturally leads to non-Gaussian time series analysis where the time series analysis group of ISM has its long history and hence its strength. Displayed figures show option pricing errors of Black-Scholes model compared to the pricing model using Normal Inverse Gaussian (NIG) distribution.

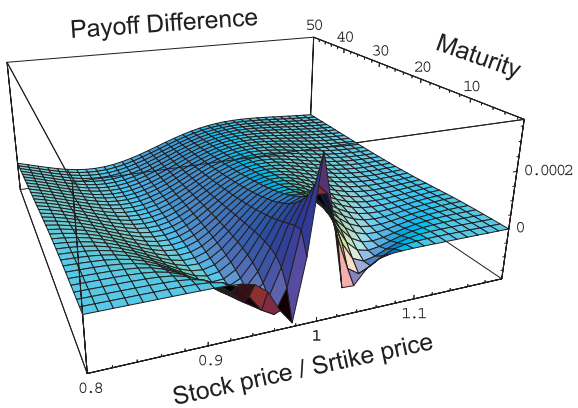
[Credit risks, securitization]

A new international regulation on the capital of banks (so-called Basel II framework) will be in effect at the end of 2006. Accordingly, statistical models to capture credit risks have attracted good deal of public attention. In this connection, project on modeling correlation of default and loss given default, and on the quantitative analysis of debt collection are done. Some are engaged in the measurement of risks emanating from 'structured' products in which derivatives are embedded, and others in the analysis of prepayment risks in mortgage-backed securities. Pushing these works forward, the existing framework of inter-university research cooperation is restrictive, and cooperation with financial industry and regulator is indispensable. Some ISM researchers are appointed as visiting researchers at Financial Services Agency, while ISM invites researchers from banks and financial institutions as visiting researchers.

Yoshinori Kawasaki



Left panel shows option pricing by Black-Scholes model which assumes Gaussian distribution. Right panel exhibits the payoff surface assuming NIG distribution. Apparently there seems to be no difference between them.



Taking a close look at the difference of two payoff surfaces reveals the gap. NIG distribution has a much better empirical goodness of fit for return series than Gaussian distribution. In light of this, option pricing by Black-Scholes model becomes inaccurate as the maturity approaches expiration, especially around 'at-the-money'. (Graphs provided by Dr. Kenichi Kawai (Research Associate, Transdisciplinary Research Center, Research Organization of Information and Systems))

Research Projects

Development of Array Data Analysis Method

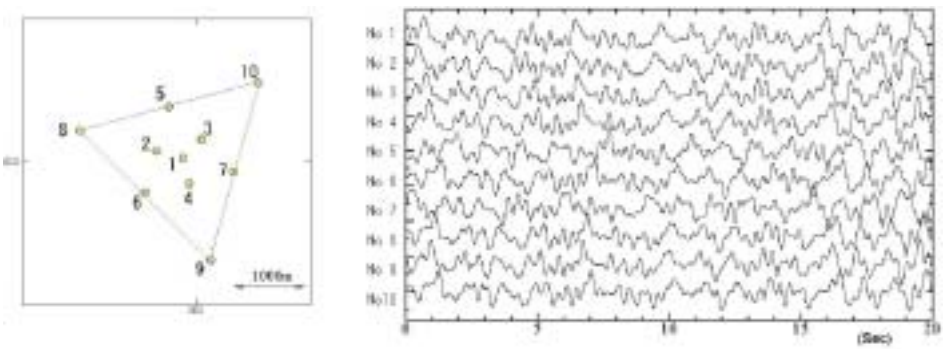
Analysis of time series data obtained from observation device network laid in a space is a common important topic in various fields. For example, VLBI (Vary Long Baseline Interferometer) used in radio astronomy is compounded of parabola antennas placed distantly apart from each other, and catch the feeble radio wave arrived from space simultaneously. We can measure the incident direction of wave or relative positions of antennas precisely from a little time lag of signals between antennas. On the other hand, in seismology, we observe seismic wave using the seismometer observation network that arranged on the ground surface (seismic array), and it possible to determine the position of hypocenter, magnitude, and mechanism of earthquakes. In addition, the measurement of micro-earthquake and microtremor (stationary oscillation of the ground when natural earthquakes does not occur) is used in order to estimate underground structure of the place that developed array.

Array observation data of microtremor are used effectively for the purpose of investigation of earthquake engineering and protection against earthquake disasters.

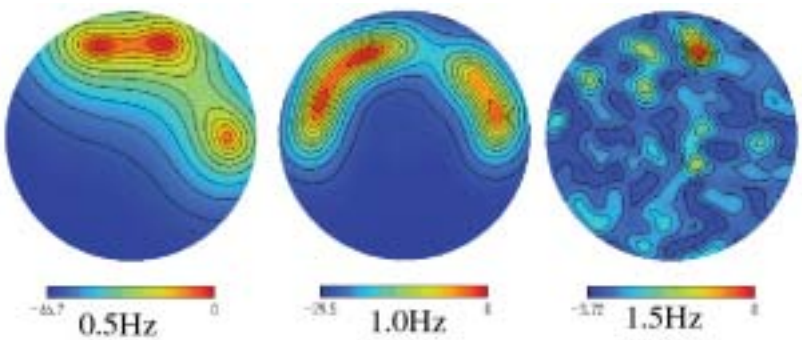
This method estimates array basement structure of under the layer as horizontal layer structure using nature of dispersion of phase velocity (phase velocity varies with a wavelength) of the surface wave contained in microtremor .In real observation, we arrange about 10 or 20 seismometers with triangular or circular formation in range from several dozen meter to several km, the radius of array is according to depth of the basement structure that we wants to estimate, and get time series data for several hours or several minutes. We analyze these data and estimate phase velocity dispersion of a surface wave which pass the array by frequency-wavenumber method (F - K method) or space autocorrelation method (SPAC method), and estimate the basement structure (parameters such as the modules of elasticity or layer thickness) by calculating a reverse problem.

We execute numerical simulations to find an effective method of analysis of these data and make a computer program based on those results. For example, we set parameters such as basement structure, direction of wave propagation, power spectrum, and noise structure, and make simulation waves, and analyze it with the method mentioned above again to estimate the parameter more precisely. Furthermore, based on these results, we are aiming to develop of general computer programs for array data analysis to analyze time series data of other fields (radio astronomy or cerebral nerve science, etc.).

Ken Ishikawa



An example of an arrangement of seismic array (10 observation point) (left), and an example of microtremor (right) time series for 20 seconds.



Examples of frequency-wavenumber spectrums calculated from above array data of microtremor .

Probability Density Estimation with Semidefinite Programming and Related Topics

Density estimation has been one of the fundamental problems in statistical science and informatics. So far, histogram and fininte mixture normal model are two typical major approaches. In this research, we develop a new method based on recent development of optimization. We express a density as “the product of nonnegativity polynomial and normal distribution” and/or “the product of nonnegative polynomial over positive axis and exponential distribution.” We estimate parameters by the maximum likelihood method and choose the best model by AIC. The main difficulty of this method is estimation of parameters. This dificulty is overcome with the new optimizaion technology called semidefinite programming. The maximum likelihood estimation is formulated as maximization of logarithmic determinant problem of a positive semidefinite matrix under linear matrix inequality constraints. With the techniques of semidefinite programming, we can show that this problem is solved efficiently.

An ultimate goal of this research is to develop a software which automatically estimates densities from data. Toward this goal, we study suitable data structure and numerical techniques for efficient and practical implementation. Another important issue is dealing with various types of data. Recently, we extended the standard polynomial-time primal-dual interior-point algorithms for semidefinite programming to the problem of maximizing weighted sum of several logarithmic determinant functions. This algorithm enables us estimation of density from histogram data. The developed algorithm also has other potential applications in various fields of informatics.

Takashi Tsuchiya

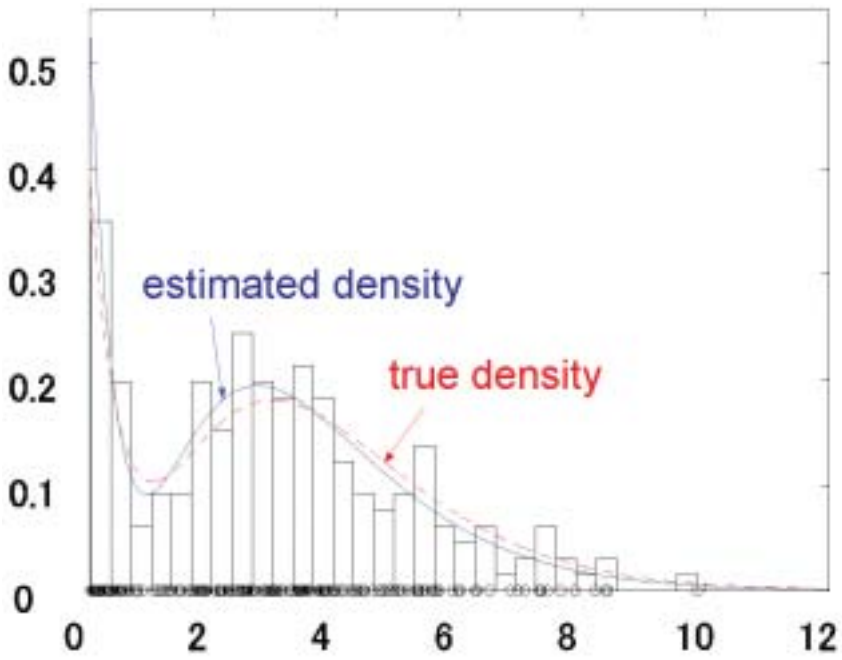


Figure: Estimated density for positive data (simulation)

Computational Statistics of Quantum State Estimation

[Quantum State Estimation]

It was at the end of the 20 century when we first “see” fundamental quantum objects such as wave functions or Wigner functions, reconstructed from experimental data. The technique required for such visualization is called “quantum state estimation” and considered as a basis of any quantum technology, say, quantum computation and quantum cryptography.

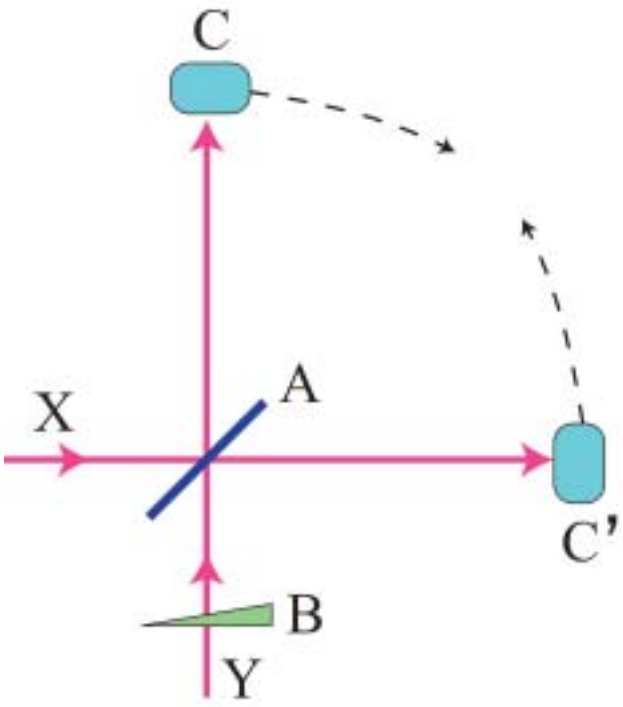
[Quantum Tomography]

A typical example of quantum state estimation is given by the “optical homodyne detection” shown in the figure. Here the laser beam X is the one to be measured, and Y is a reference beam whose phase S is controlled by the device B. X and Y enter the beam splitter A and are mixed. We reconstruct the quantum state of the beam X from the data of the difference of counts at C and C’ measured with a set of phase S. The key of the method is how to solve an inverse problem from the results of the measurement to the quantum state. In this case, the inverse problem can be formulated as a Radon transform. Surprisingly enough, this method is the same as the one in Computer Tomography used in hospitals, and the reconstruction method is called “quantum tomography”.

[Computational Statistics of Quantum State Estimation]

As seen in the above example, the core of quantum state estimation techniques is how to solve improper inverse problems with noisy data. It is a problem of central interest in modern statistical science and also has been well studied by researchers at the Institute of Statistical Mathematics. The computation required for quantum estimation is often reduced to a convex optimization problem, which is also one of the major research topics at the Institute of Statistical Mathematics. We are now studying this new field of statistical science in the collaboration with Prof. Matsumoto at the National Institute of Informatics.

Yukito Iba



Recent Developements in Information Geometry

[Background]

The idea of information geometry emerged in 1980's and is attracting a lot of interests. Initially, it was applied to basic problems of statistics and has built a new mathematical framework of them based on differential geometry. Recently, it is applied to wider fields, such as machine learning, error correction codes, and quantum information theory.

[Aim of the project]

In early years, Japanese researchers including Amari (RIKEN), Nagaoka (Univ. of Electro-Communications), and Eguchi (ISM) contributed to the fundamental developments of information geometry. The committee including them organized the 2nd international symposium of information geometry (IGAIA2) with the support of University of Tokyo, RIKEN BSI, the Institute of Statistical Mathematics, and Waseda University in December 2005 at Univ. of Tokyo. In this project, those who participated in IGAIA2 discussed our results, invited foreign visitors, and investigated further possible developments of information geometry and its applications.

[Result of the project]

The members of the project presented their results at the symposium. They are summarized below. We first summarize the results of statistics. Eguchi discussed the extension of statistical models based on tubular modeling. Kuriki showed the validity of the approximation of the random matrix eigen values' distribution with integral geometrical method (Euler characteristic heuristics). Fushiki showed the analysis of the difference between bootstrap prediction and Bayes prediction. Fujisawa discussed the relation between outliers and bias from information geometrical viewpoint and proposed a new robust estimation method. Fukumizu constructed infinite dimensional exponential family with the use of reproducing kernel Hilbert space, which is widely used in machine learning, and discussed the estimation problem. For the machine learning, we have two results. Eguchi investigated AdaBoost methods based on information geometry, and his co-authors presented recent results. Ikeda has built the information geometrical framework to analyze the belief propagation algorithm which is widely used in various fields such as error correcting codes, artificial intelligence, and statistical physics. These results would be applied to improve the performance of the practical engineering systems in the future. We also organized invited lectures at ISM. We invited G. Pistone (Politecnico of Turin), M. Henmi (Univ. of Warwick), and J. Zhang (Univ. of Michigan). We will continue collaborations with M. Henmi and J. Zhang for further developments of information geometry.

Shiro Ikeda

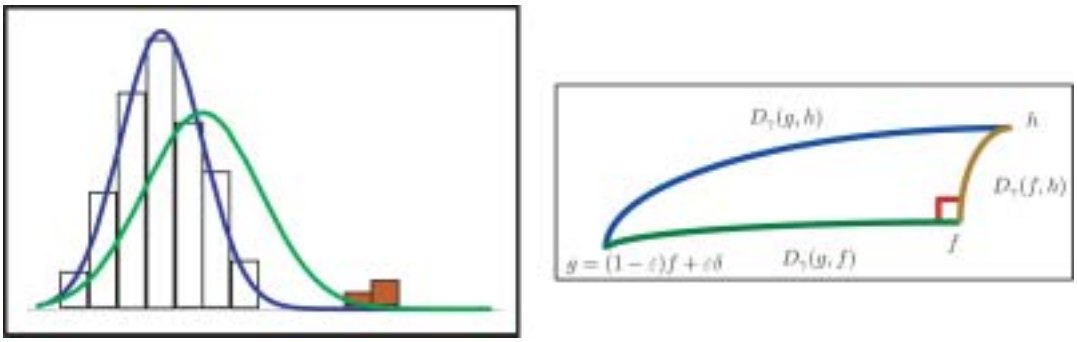


Fig. 1. Robust estimation and information geometry of proposed method

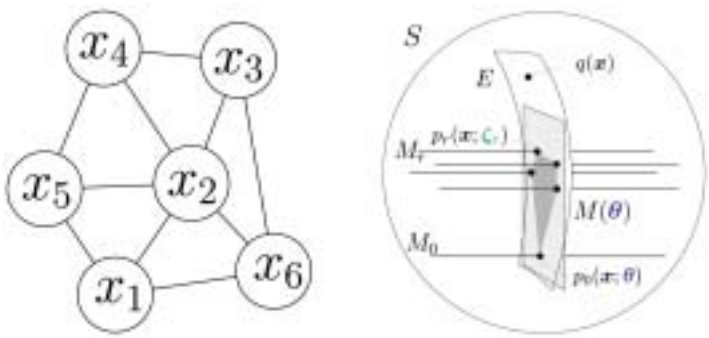


Fig. 2. Graphical model and information geometry of belief propagation

Statistics on Discrete Geometry

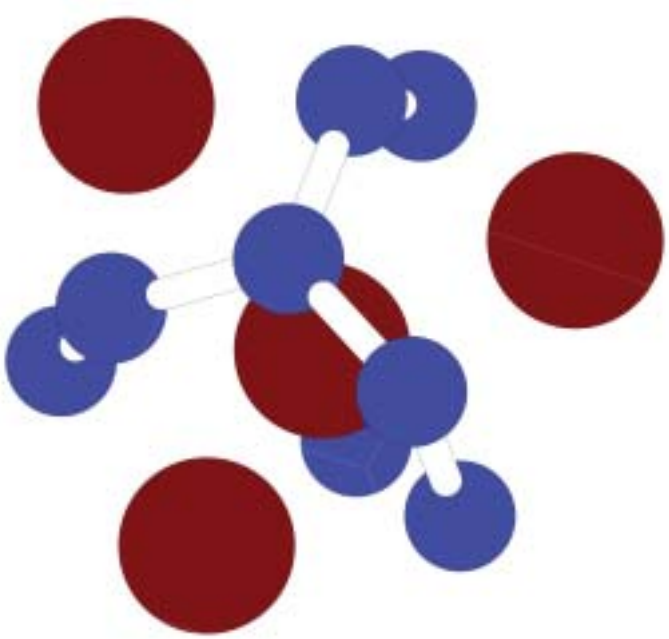
What is the most probable structure in nature?

We introduced a method that defines the species (representatives) of inorganic compounds, and studied the statistical distribution of the defined species among space groups, by using ICSD (Inorganic Crystal Structure Database). We found that the number of formula units in a unit cell gives a natural classification to understand the statistical distribution of symmetry groups. To analyze the distribution, the network of the subgroups and super groups among space groups will be helpful.

We studied discrete random sequential packings. The space group O^7 is generated by a discrete random sequential packing of cubes into torus. The random sequential packing of caps into a sphere helps to understand the geometrical structure of diatoms or pollen.

This project is international with members, Michel Deza (Ecole Normale Superieure, European Academy of Sciences), Nikolai Dolbilin (Steklov Mathematical Institute, Moscow State University), Mathieu Dutour (Rudjer Boscoviz Institute), Hiroshi Maehara (Ryukyu University), Yoshiaki Itoh, Teruhisa Sugimoto, Masaharu Tanemura (The Institute of Statistical Mathematics) .

Yoshiaki Itoh



Reconstructing Functional Neuronal Circuits from Optical Imaging Data

[Introduction]

There are 14 billion neurons in a human brain. When we think or move our body, these neurons are at work. Even when we breathe un-consciously, neurons give a command to breathe. Neurons do their jobs by constituting functional neuronal circuits and mutually exchanging information. Our project is to elucidate the flow of information within the circuits by statistical mathematics.

[Knowing the brain top-down method and bot-tom-up method]

There are two methods to study how the brain works. The first is the top-down method, where we understand the brain by information-processing models that simulate the action of the actual brain. The second, called as the bottom-up method, is to understand the brain by making up the neuronal circuitry from various parts such as neurons, channels, and genomes. Too many parts have been hindering the progress of the bottom-up method, and the top-down method has gained the popularity.

[Understanding the brain by the bottom-up method]

If we want to understand the brain by the bottom-up method, we need to know the diagram of neuronal circuits, showing which neurons are connected to which neurons. To accomplish this, we must record neuronal activities from multiple neurons simultaneously. One of the methods is the optical recording, where changes in absorption or fluorescence corresponding to the changes in membrane potentials are recorded. This method has been applied to the central nervous system since 1980's. A rapid progress in photo-electronics improved both the temporal and the spatial resolution significantly, and now we can challenge to unveil neuronal circuits.

[Exploiting the future of neu-roscience with optical imag-ing and statistical mathemat-ics]

Multiple autoregressive analysis predicts the future behavior from the past that is recorded as multi-channel time-series data. It can estimate the existence of feedback loops and the causality between different channels. Using this technique, we are analyzing which neurons send command signals to which neurons, for example, when the animal breathes. Our goal is to establish the analytical pro-cedure to elucidate information process within neuronal circuits from optical imaging data.

Yoshitaka Oku

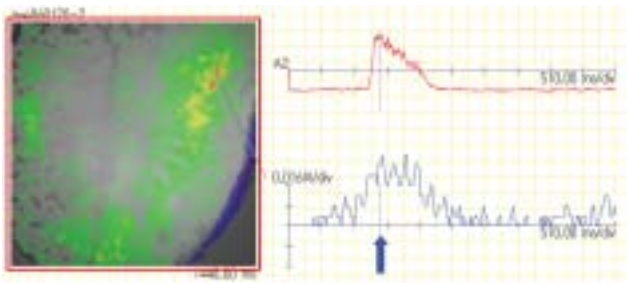


Figure 1: (Left) Optical image of the neuronal activity that commands breathing in a newborn rat. (Top-Right) Respiratory neuronal activity recorded from the spinal cord. (Bottom-Right) Time-series data of a pixel on the optical image.

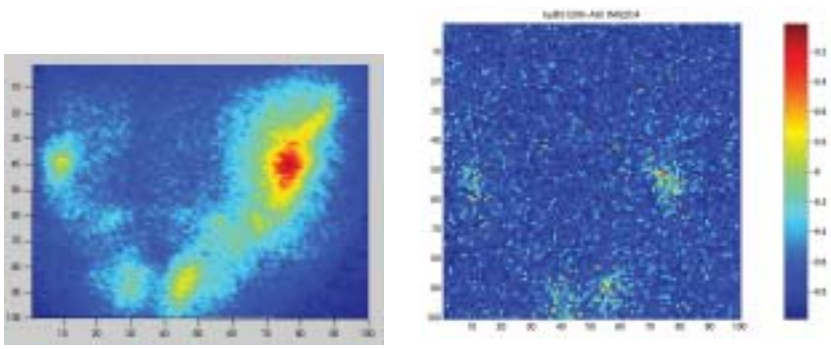


Figure 2: (Left) Respiratory-related brain regions estimated by the cross-correlation method. (Right) Respiratory-related brain regions estimated by the multivariate autoregressive analysis.

(Photographs offered by Hyogo Medical College and Chiba University)

Developing Predictive Models for Bycatch in Tuna Fisheries

Historically, when people have considered the impact of fisheries on marine resources, their concerns have largely focused on the population status of the target species. In the last decade, however, the issue of bycatch reduction has been getting more attention.

[Bycatch problem in tuna fisheries]

In the eastern Pacific Ocean, purse-seine nets are used to catch tunas. In this fishery, tunas are detected in three ways: in association with floating objects ("floating object" sets), in association with herds of dolphins ("dolphin" sets), and as free-swimming schools visible at the surface. Incidental mortality of dolphins, sharks, sea turtles, and other species can occur during fishing operations for tunas. The incidental mortality of dolphins in this fishery was the first bycatch problem that attracted public attention. In 60's, hundreds of thousands of dolphins are estimated to have been killed annually incidental to fishing operations in dolphin sets. With the development of dolphin-release techniques by fishermen, national legislation and international agreements establishing quotas on incidental mortalities, and the implementation of a seminar program designed to educate fishermen on methods for avoiding dolphin mortalities, incidental mortality of dolphins has declined to less than three thousand animals annually since 1998.

[Prediction of shark bycatch]

Although dolphins are rarely killed incidental to fishing operations in floating object sets, large amounts of bycatch of many other species can occur in these sets. We are working with Dr. Cleridy Lennert-Cody of the Inter-American Tropical Tuna Commission to analyze shark bycatch data in floating object sets. Annually, shark bycatch occurs in more than one third of the floating object sets. We are exploring new statistical techniques for the prediction of the occurrence of shark bycatch, including boosting methods, which are recently proposed discrimination methods. Our preliminary results suggest that boosting techniques give more stable predictions than existing discrimination methods for these data.

[Analysis of shark bycatch counts]

One notable characteristic of shark bycatch data is that there are many sets with zero bycatch, yet sets with large amounts of bycatch can also occur. Thus, we are developing a zero-inflated negative binomial regression model for the shark bycatch data. The zero-inflated negative binomial regression model assumes that there are two states: a "complete" state in which bycatch never happens, and an "incomplete" state in which bycatch might occur. In the incomplete state, bycatch counts are assumed to follow a negative binomial regression model. We have fit this model to shark bycatch data from floating object sets. The distribution of the predicted bycatch was found to be quite similar to that of the observed bycatch suggesting that the zero-inflated negative binomial is a reasonable model for these data. We will use this model to explore trends in shark bycatch rates.

Mihoko Minami

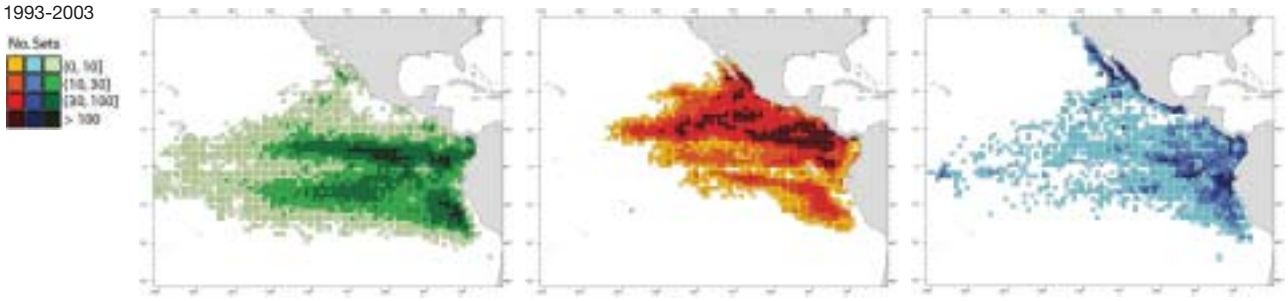


Figure 1. Locations of purse-seine sets

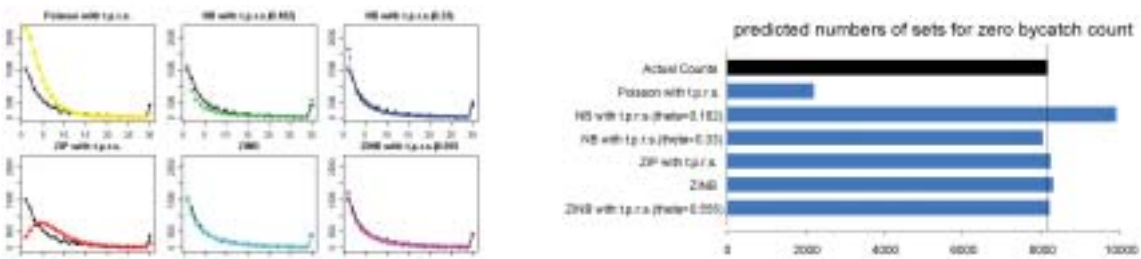


Figure 2. Observed and predicted distributions for shark bycatch counts

New Developments of Indirect Questioning Techniques

[Indirect questioning techniques]

In social survey research, direct questioning technique, in which respondents are requested to answer questions directly, is usually used. However, it is not expected that respondents would give truthful and credible answers when the questions are about private matters or socially undesirable issues. Hence, some indirect questioning techniques, which aim to conceal each respondent's true status and to estimate the proportion of people who have engaged in a stigmatizing behavior, have been developed. Indirect questioning techniques are expected to elicit more truthful answers than the ordinary direct questioning technique because no one could know the respondent's true status. The need for the indirect questioning techniques is supposed to increase in the near future because Japanese people are recently very sensitive about their private information.

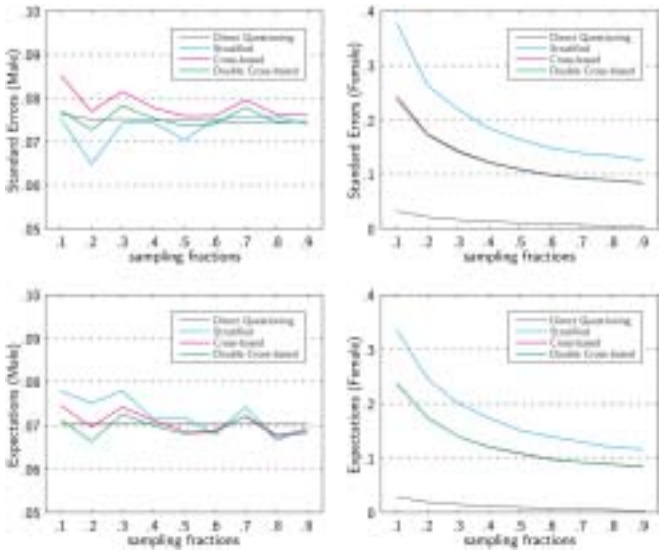
[New developments of IQT]

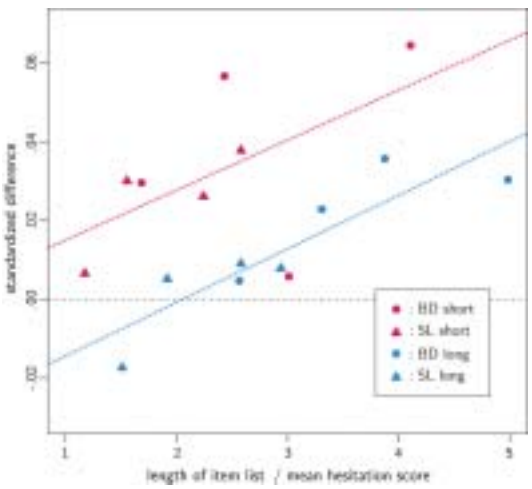
The randomized response technique is one of the well-known indirect questioning techniques. Though the technique is theoretically interesting, it is not a practical one because its procedure is difficult for respondents to understand and the technique is impossible to be implemented except in the interviewer-administered surveys. Recently, the new IC, UC and TC techniques have been developed. Their practical realization is expected as alternatives of the randomized response technique.

[Achievement of research project]

In this research project, we aim to realize new indirect questioning techniques via simulation studies and comparative experimental surveys. First, we succeeded in developing new estimators which have smaller standard errors than traditional estimators. Furthermore, it is observed that the indirect questioning technique occasionally underestimates the true percentages. The cooperative research with psychologists has revealed that the underestimation is partly attributable to a psychological response process, which we named “pooling effect.” We aim to improve the precision of estimators by modeling this response process.

Takahiro Tsuchiya





Research on Information Integration in Socio-economic Systems

– A Comparative Study among Survey Methods –

[The background of research]

Society is a system with a very complex hierarchical structure. It seems to be a common situation in all the domains of modern society where the information acquired through a conventional system is imperfect and the quality is deteriorating, or integrative use of information has not been achieved. Survey research is an important means for capturing social and economic phenomenon correctly, but the situation is the same for survey methodology in that structural change of society demands the reformation of the traditional methods.

[Research on new survey methods]

Survey administrated by face to face interviewing based on a random sample, which is a standard survey procedure, has greeted the crisis in recent years because of the decline in response rate and deterioration of the data quality. On the other hand, new survey methods such as computer-assisted telephone interviewing and web based internet survey, which are more adapted to the information society, has come to be widely used. Establishment of the methodology for integrating the information collected through various new methods and making effective use of such information is now awaited.

[Purpose of this project]

Though this research project can be placed in the broader context described above, the study specifically focus on the survey mode comparison. To be concrete, the purpose of this project is to compare the two survey mode, one is the traditional mail survey, and the other is internet survey where pre-registered monitor respondents answer the questionnaire placed on a web site. For the effective use of results obtained in different survey methods, it is important to know the characteristics of both methods precisely.

[An example of research results]

These three figures illustrate the differences between internet survey and traditional mail survey. In each figure, proportion of answers to the response options of the same questionnaire items in two different survey mode or two subgroups in the same survey mode are plotted as a scatter diagram. If the plots are on the diagonal line, or to be precise, if the plots are scattered within the statistical error shown by the dotted line, we can see that the two results are consistent.

In reality, however, results of the mail survey and the internet survey do not coincide very well (Figure1). Part of the reason is that there are both internet users and non-users in the respondents of the mail survey and response tendency among of the latter is different from the former (Figure2). But even if we restrict our attention to internet users in the mail survey, difference larger than the statistical error still remains between the mail and internet surveys (Figure 3). The reason for the difference should further be investigated.

Tadahiko Maeda

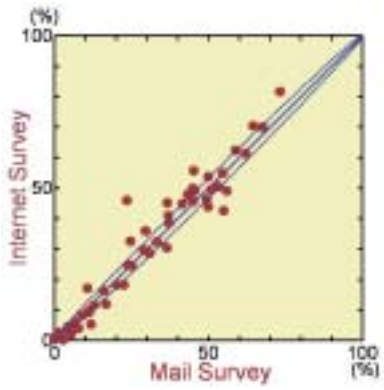


Fig.1. Difference in response percentage between mail survey (horizontal axis) and internet survey (vertical axis).

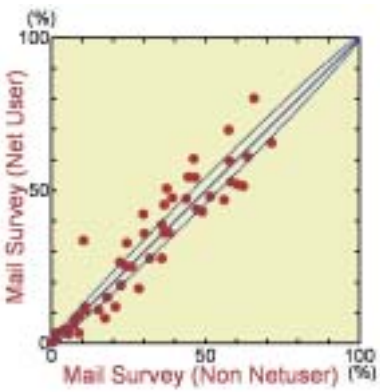


Fig.2. Difference in response percentages between non-internet users (horizontal axis) and internet users (vertical axis) in mail survey.

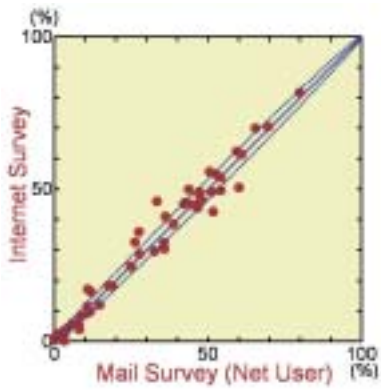


Fig.3. Difference in response percentage between the net users in mail survey (horizontal axis) and internet survey (vertical axis).

Associated Foreign Research Institutes

The Statistical Research Division of the U.S. Bureau of the Census	USA (Washington)	July 27, 1988-
The Stichting Mathematisch Centrum	The Kingdom of the Netherlands (Amsterdam)	May 10, 1989-
Statistical Research Associates Ltd.	New Zealand (Wellington)	October 2001 - October 2006
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-

Academic Exchange Agreement with the Central South University of China

The Institute of Statistical Mathematics has entered into an Academic Exchange Agreement with the Central South University of China. This is the eighth such agreement, following agreements with the US Census Bureau, the Institute of Science of Academia Sinica of the Republic of China, the Institute of Statistical and Econometrics of Humboldt University, and the Institute of Mathematics of the Russian Science Academy, among others. Both parties have agreed to promote active academic exchanges in the future. The signing of the agreement took place at the Central South University in Changsha city, China, on November 18th, 2005.

Signing

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.

Fields of Research Collaboration

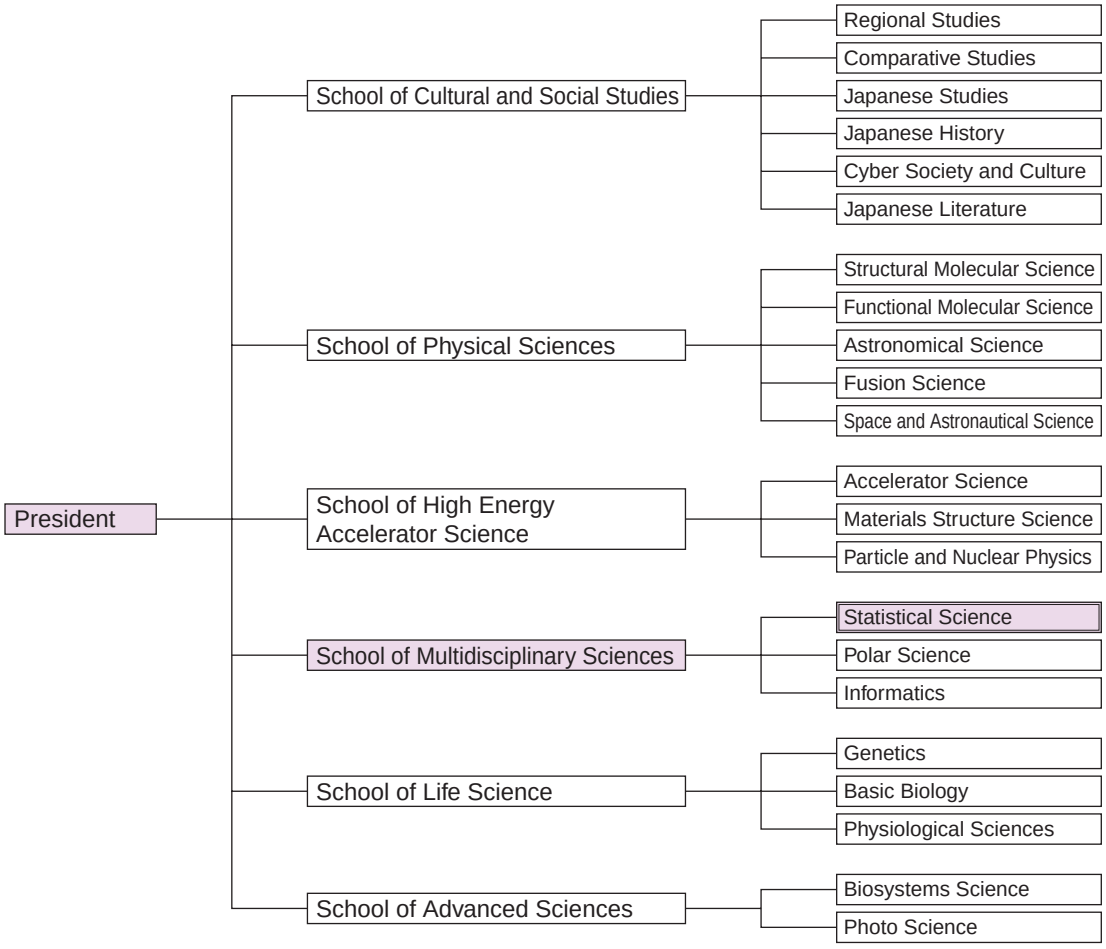
The research collaboration service is categorized into the following fields. Applicants can use the table below to find the most appropriate type of project.

Fields		Major research domains
Theory and Methodology	1. Fundamental theories	Statistical inference theory, applied probability theory, fundamental studies of data analysis, history of statistics, statistics education
	2. Computation and optimization	Optimization, large linear computation, super high dimensional numerical integration, importance sampling, random number, neural netwprls, time series, inference computation
	3. Time series	Modeling, analysis, prediction and control of time series
	4. Survey theories	Acquisition and analysis method of statistical data, studies on the theory and method for statistical proof
Application	5. Science and engineering	Practical use of statistics for science engineering
	6. Space and earth science	Statistical data analysis related to earth, planetary and space sciences
	7. Biology and medicine	Statistical studies in biology, medecine, pharmaceutics, agriculture, life science, etc.
	8. Humanities and social science	Studies of statistical data in humanities or social science
	9. Environment science	Statistical studies on the environment and ecology
	10. Others	Other research fields

Fields		2001	2002	2003	2004	2005
Theory and Methodology	1. Fundamental theories	21	22	18	18	18
	2. Computation and optimization	9	8	7	12	13
	3. Time series	20	16	13	15	14
	4. Survey theories	4	2	3	2	3
Application	5. Science and engineering	11	10	6	10	11
	6. Space and earth science	4	8	5	7	11
	7. Biology and medicine	23	26	25	24	26
	8. Humanities and social science	15	13	10	9	12
	9. Environment science	9	6	10	9	11
	10. Others	4	3	2	2	5
	Total	120	114	99	108	124

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 modeling, forecasting, inference and designing of data-gathering systems 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 Oraganization of Infomation 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.

Enrollment Quota and Number of Students

Doctor's course three years

Year of enrollment	2001	2002	2003	2004	2005	2006
Quota	4	4	4	4	4	3
Actual number of students	1	2 ②	6 ⑤	7 (1) ④	6 ③	2

Doctor's course five years

2006
2
1

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**

Ochanomizu University
Tohoku University (2)
Hokkaido University
Hitotsubashi University (4)
Kyushu University
Chiba University
Osaka University (2)
Osaka City University
University of Tsukuba (2)
Shimane University (2)
The University of Tokyo (12)
Tokyo Gakugei University
Tokyo Institute of Technology (2)
Tokyo University of Marine Science and Technology
Tokyo University of Agriculture and Technology
Fukushima University
Japan Advanced Institute of Science and Technology, Hokuriku
Nagoya University (2)
Kyoto University (2)
Saitama University

▶ **Private universities**

Okayama University of Science
Tokyo University of Science (4)
Kyoto Sangyo University
Keio University (2)
Waseda University (5)
Chuo University (4)
Toyo University
Nihon University (2)
Hosei University (7)

▶ **Foreign universities**

Universidade Estadual of Campinas
University of Colorado at Boulder (2)
University of Dhaka (2)
University of Hawaii
Jahangirnagar University (3)
University of Malaya
Ohio University
University of Rahshahi
Stanford University
Center for Analysis and Prediction, China Seismological Bureau
Northeastern University, China
The Hong Kong University of Science and Technology
University of Science and Technology of China
Chinese Academy of Sciences, Institute of Applied Mathematics

Degrees Awarded

Year	Doctor of Philosophy	Year	Doctor of Philosophy
1993	2	2001	5
1994	7	2002	4
1995	6 [1]	2003	8 [3]
1996	3 [1]	2004	4
1997	1	2005	4
1998	4 [1]		
1999	6		
2000	5		

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

Current Position of Alumni

▶ National and public universities, and public organizations

University of Tsukuba Professor
Saitama University Associate Professor
The University of Tokyo Associate Professor
The University of Tokyo Special Duty Research Fellow
The University of Electro-Communications Associate Professor
University of Hyogo Associate Professor
The Institute of Statistical Mathematics Associate Professor
Kyushu Institute of Technology Associate Professor
University of Tsukuba (2)
Hokkaido University Assistant
Chiba University Assistant
The University of Tokyo Assistant
Tokyo Institute of Technology Assistant
Tokyo University of Marine Science and Technology Assistant
Hiroshima University Assistant
Kyushu University Assistant
University of the Ryukyus Assistant
The Institute of Statistical Mathematics Assistant
The Institute of Statistical Mathematics Research Fellow (2)
Railway Technical Research Institute Research Fellow
Nara Institute of Science and Technology Research Fellow
Tokyo Institute of Technology Research Fellow
Riken Research Fellow
Research and Training Institute of the Ministry of Justice Researcher
Railway Technical Research Institute Research Fellow
Bank of Japan

▶ Private universities

Asahikawa University Professor
Sapporo Gakuin University Professor
Doshisha University Professor
Meiji University Professor
Tokyo Health Care University Associate Professor
Josai University
Tokyo University of Information Sciences
Sapporo Gakuin University (2)
Aoyama Gakuin University Assistant
Tokyo Women's Medical University Research Fellow

▶ Foreign universities

Jahangirnagar University (2)
Victoria University
Hong Kong Baptist University
Massey University Research Fellow
University of Otago Research Fellow
University of Rahshahi Associate Professor
University of California, Los Angeles Research Fellow
Asia-Pacific Center for Security Studies Associate Professor
University of South Carolina Research Fellow
The University of Warwick Research Fellow

▶ Others

Hitachi, Ltd. Central Research Laboratory Research Fellow
NTT Communication Science Laboratories Research Fellow
NLI Research Institute Research Fellow
Mizuho Trust and Banking Research Fellow
Shinshowa Corporation
Sankyo Co.,LTD.
ATR Computational Neuroscience Laboratories Research Fellow
Mitsubishi UFJ Wealth Management, Ltd.
Toyota Motor Corporation, Higashi-Fuji Technical Center Research Fellow
Schlumberger Limited
Statistical Information Institute For Consulting and Analysis

Tutorial Courses

History

In 1944, the year that the Institute of Statistical Mathematics was founded, an education program for employed people was initiated at the 1st Period Numeric Computation Training Center of the Science Research Technical Assistant Training Center of the Ministry of Education. 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 extra 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 employed people. Tutorial courses were therefore initiated. Later statistical methods became more popular and were applied to a wider 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, has run three to four courses annually. In 2005, the number of courses had risen to 13.

Courses

The total number of courses held from 1969 to 2005 was 205, with a total of 16,606 participants. These courses covered a wide range of fields from basic to applied statistics. The following table lists the courses held in the past 5 years:

Year	Category	Title	Month	Number of participants
2001	Basic course	Introduction to Statistics	July	93
	Standard course A	Statistical Analysis for Resource Management	October - November	16
	Standard course B	Introductory Course in Quantification Methods	November	49
	Standard course C	The Latest Theories and Applications on Information Telecommunications concerning Statistical Mathematics	December	15
2002	Basic course	Introduction to Statistics	July	95
	Standard course A	Introduction to Monte Carlo Filter and its Application	October	71
	Standard course B	Frontiers in Statistics, Neural-net, Learning - Part 2	November	64
	Advanced course	How Can New Technologies of Computer Science Promote Statistical Science ?	March	38
2003	Basic course	Introduction to Statistics	July	91
	Standard course A	Introduction to Sampling Methods and Sample Surveys	July	93
	Standard course B	Textual Data Mining and its Applications	November	72
	Advanced course	Markov Chain Monte Carlo —Algorithms and Applications to Statistical Science—	February	82
2004	Basic course	Elementary Statistics	October	93
	Standard course	Recent Topics from Machine Learning	November	91
	Advanced course	Speech Processing —For Development of New Statistical Methods—	December	59
2005	Basic course	Introduction to Statistics	September	85
	Advanced course	A Junction of Informatics —Chordal Graph and its Applications—	September	13
	Standard course	Analysis of Qualitative Data by Quantification Methods	October	50
	Basic course	Nonlinear Time Series Analysis of Financial Data	October	52
	Basic course	Introductory Data Analysis with R	November	98
	Advanced course	Data Processing and LSI Design for Information and Telecommunications with the Latest Technologies	November - December	5
	Basic course	Introduction to Sampling Methods and Sampling Surveys	December	75
	Basic course	Introduction to Reliability Theory and Survival Data Analysis with R	December	39
	Standard course	Theory and Practice Inferring Molecular Phylogenies	January	72
	Basic course	Introduction to Probabilistic Evaluation of Risk	January	45

Year	Category	Title	Month	Number of participants
2005	Standard course	Non-Poisson Regression Models for Count Data	February	39
	Advanced course	Packing and Random Packing	February	7
	Basic course	Introduction to Time Series Analysis	March	72

The schedule of tutorial courses can be found on the website of the Institute of Statistical Mathematics.
http://www.ism.ac.jp/

ISM Seminar

The Institute holds a 1-hour seminar every Wednesday starting at 1:30 PM, in the seminar room on the second floor of the annex building. Teachers of the Institute and other Japanese or foreign researchers will be invited to speak. This seminar may be held in association with other remote universities or academic organizations via a space collaboration system (SCS). On that occasion, it will be held in the lecture hall on the second floor of the main building. The seminar is open to everyone. For details of the seminar schedule and further information, please visit the website of the Institute of Statistical Mathematics. http://www.ism.ac.jp/

Special Lecture

We hold a special lecture during Education and Culture Week every year (November 1 through 7), to introduce an aspect of the Institute's activities and to promote statistical science. Several lecturers will be invited to talk about particular topics, and they will clearly explain up-to-date topics involving statistical science. The topics of 2003 and 2004 were: "Prediction and discovery" and "The history of life and the future of the human race from the perspective of genes - From evolution to medical treatment". In 2005 this special lecture was held at the Hitotsubashi Memorial Hall to mark the opening of the Risk Analysis Research Center. The lecture is open to everyone. For details of the schedule of the special lecture program, please visit the website of the Institute of Statistical Mathematics. http://www.ism.ac.jp/

Statistical Consultation Service

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 consultants 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, about 40% of which are publicized at academic conferences, as being of benefit to society.

Annual Research Report Meeting for 2005

The last Annual Research Report Meeting of the Institute was held on March 16 and 17, 2006. This annual meeting is an opportunity for the Institute's teachers and visiting teachers to present the results of their studies from the previous year. The meeting has been held every year since the foundation of the Institute in 1944. In the early years, there were few staff members and participants were therefore able to have enthusiastic discussions all day long. However, as the number of the staff members has increased, the meeting is now held over two days and each presenter is given 10 minutes to report on the results of his/her own research. A wide variety of topics are covered, ranging from statistical contributions to issues facing today's society to more fundamental studies.

This year's meeting started with the opening address by Yoshiyasu Tamura, and the greetings from Genshiro Kitagawa. A total of 51 research education staff, 9 visiting teachers then gave their presentations. From 2004, we have begun to compile and distribute proceedings in advance. We also host visitors from other organizations. The program for this meeting is available from the website. http://www.ism.ac.jp/

Administration Subsidy and Others

2005

Unit: ¥1,000

Type	Expenditure
Personnel expenses	891,227
Non-personnel expenses	869,621
Total	1,760,848

Accepted External Funds

2005

Unit: ¥1,000

Type	Items	Income
Subcontracted research	3	5,490
Contribution for scholarship	7	7,050
Total	10	12,540

Grant-in-Aid for Scientific Research

2005

Unit: ¥1,000

Research Category	Items	Amount Granted	Research Category	Items	Amount Granted
Fundamental study (A)	4	39,260	Exploratory research	1	1,800
Fundamental study (B)	4	37,800	Research by young researcher (B)	10	9,800
Fundamental study (C)	10	10,800	Special researcher award	6	6,700
			Total	40	101,160

Site and Buildings

As of April 1, 2006

· Site Area ——— 5,033m²
· Area for Buildings (total) — 6,305m²

Name of Building	Floors	Total Area
Office	R3	4,855m²
Information Statistics Research Laboratory	R3	1,024m²
Computation Laboratory	R2	368m²
Gym, etc.	S1	58m²

Facilities and Equipment

Computation Resources

As of April 1, 2006

Since January 2004, “Supercomputer System for Statistical Science” has been in operation and has analyzed a large volume of statistical data. The main components of this system comprise a SGI Altix3700 Super Cluster (a parallel computer system (256 Itanium2 processors and about 2 TB main memory)), a NEC SX-6 (a vector-type computer system (12 vector processors and 128 GB main memory)), and a HITACHI SR11000 (a parallel computer sub-system (64 Power4 + processors, 128 GB main memory)). In January 2006, “System for Computational Statistics” was renewed. The main components of this system consist of a HP XC4000 Cluster system (256 Opteron processors for computing node and 640 GB main memory), a SGI Prism visualization system (16 Itanium2 processors and 32 GB main memory), and a large display system (Multi Opt View).

SGI Altix3700 Super Cluster, a parallel computer

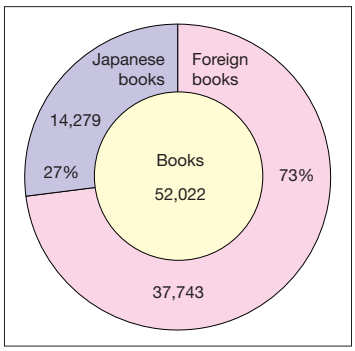
In December 1998, an Ethernet network using 1000Base-SX as a main trunk and 100Base-TX as branches was laid out as a Local Area Network. Workstations, personal computers in researchers' offices, “Supercomputer System for Statistical Science”, and “System for Computational Statistics” were all connected to the network. This Local Area Network enables distributed processing and computation resources and statistical data to be used effectively. The development of programs, which run on “Supercomputer System for Statistical Science” and on “System for Computational Statistics” by operating from workstations and personal computers in researchers' offices, is also underway. 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 SINET. The connection speed of 1.5 Mbps during FY 1999 has risen to 100 Mbps since July 2002. Since October 2003, the network has also been connected to the super SINET with 2.4 Gbps bandwidth. Some machines are able to communicate at a rate of 1 Gbps. Through terminal servers, the network is also accessible from a public line. In addition, comprehensive network security measures have been implemented such as the adoption of anti-virus software as well as a network monitoring system.

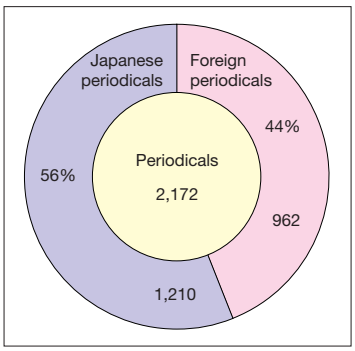
Library and Materials

As of April 1, 2006

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), 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.

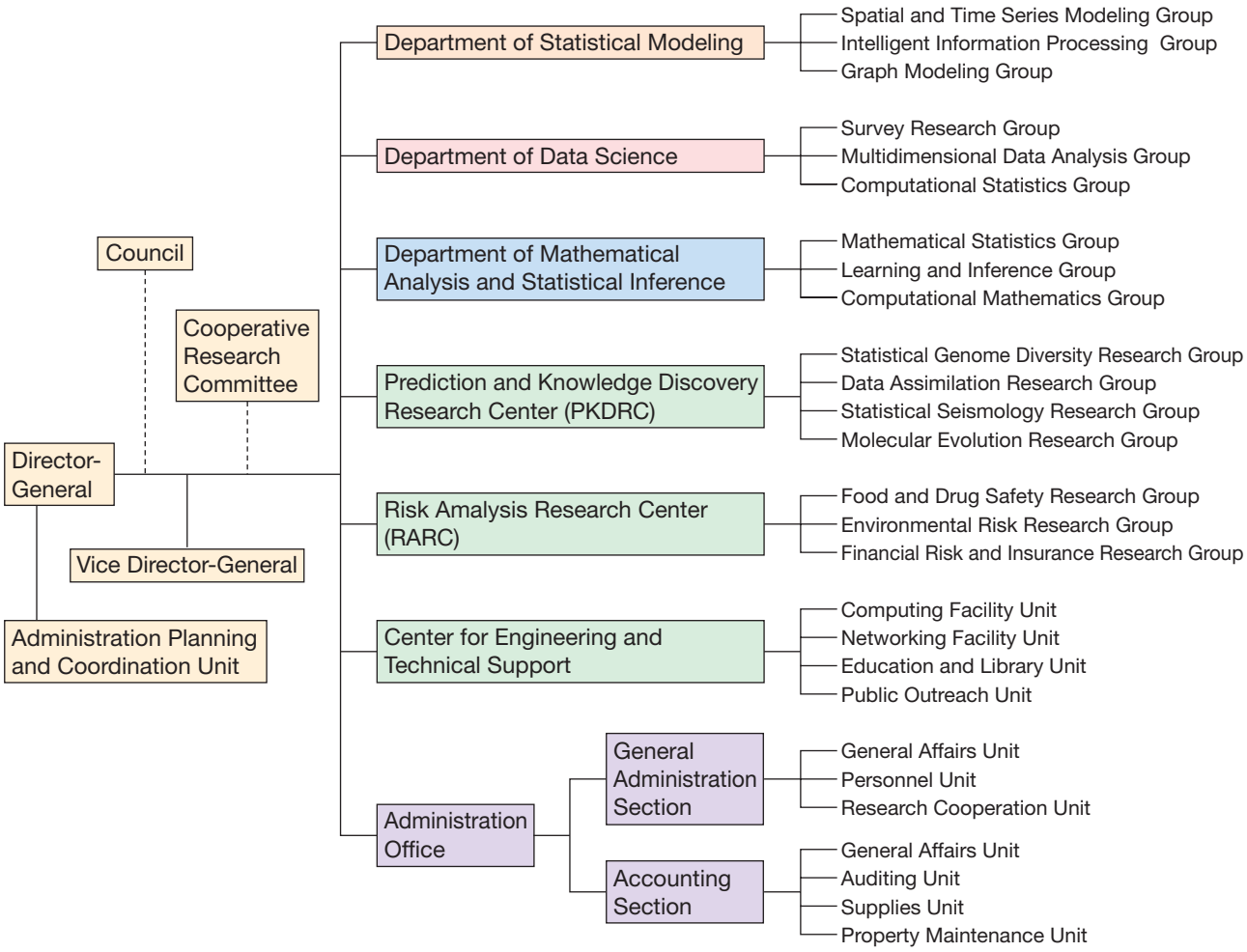




All materials are properly catalogued and can be searched from the web in order to meet the needs of researchers working in a wide of fields. We also accept photocopy requests.

Organization Diagram

As of April 1, 2006



Number of Staff

As of April 1, 2006

Type	Director-General	Professor	Associate Professor	Assistant Professor	Clerk	Technical Staff	Total
Director-General	1						1
Department of Statistical Modeling		6	6	4			16
Department of Data Science		8	8	5			21
Department of Mathematical Analysis and Statistical Inference		5	5	3			13
Center for Engineering and Technical Support				1		10	11
Administration Office					14	2	16
Total	1	19	19	13	14	12	78

Staff

As of August 1, 2006

Director-General

Genshiro KITAGAWA

Vice Director-General

Masaharu TANEMURA
Yoshiyasu TAMURA
Tomoyuki HIGUCHI

Department of Statistical Modeling

Spatial and Time Series Modeling Group

Tohru OZAKI, Prof.
Masaharu TANEMURA (Vice Director-General), Prof.
Yosihiko OGATA, Prof.
Tomoyuki HIGUCHI (Vice Director-General), Prof.
Yoshinori KAWASAKI, Assoc. Prof.
Kenichiro SHIMATANI, Assist. Prof.
Genta UENO, Assist. Prof.

Intelligent Information Processing Group

Makio ISHIGURO (Director), Prof.
Atsushi FUKASAWA, Visiting Prof.
Toshio IRINO, Visiting Prof.
Yukito IBA, Assoc. Prof.
Yumi TAKIZAWA, Assoc. Prof.
Tomoko MATSUI, Assoc. Prof.
Kenji FUKUMIZU, Assoc. Prof.
Hiroshi SOMEYA, Assist. Prof.

Graph Modeling Group

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

Department of Data Science

Survey Research Group

Yoshiyuki SAKAMOTO (Director), Prof.
Takashi NAKAMURA, Prof.
Ryozo YOSHINO, Prof.
Nozomu MATSUBARA, Visiting Prof.
Nicolas Emmanuel SYNODINOS, Visiting Prof.
(2006.8.1 - 2006.9.30)
Hajime IHARA, Assoc. Prof.
Tadahiko MAEDA, Assoc. Prof.
Takahiro TSUCHIYA, Assoc. Prof.
Wataru MATSUMOTO, Assist. Prof.

Multidimensional Data Analysis Group

Takemi YANAGIMOTO, Prof.
Yasumasa BABA, Prof.
Toshiharu FUJITA, Prof.
Masahiro MIZUTA, Visiting Prof.
Nobuhisa KASHIWAGI, Assoc. Prof.
Satoshi YAMASHITA, Assoc. Prof.
Sumie UEDA, Assist. Prof.
Toshio OHNISHI, Assist. Prof.
Toshihiko KAWAMURA, Assist.Prof.

Computational Statistics Group

Yoshiyasu TAMURA (Vice Director-General), Prof.
Junji NAKANO, Prof.
Yoshinari FUKUI, Visiting Prof.
Makoto TAIJI, Visiting Prof.
Makoto MATSUMOTO, Visiting Prof.
Naomasa MARUYAMA, Assoc. Prof.
Koji KANEFUJI, Assoc. Prof.
Seisho SATO, Assoc. Prof.
Tohru ONODERA, Visiting Assoc. Prof.
Takeshi KOSHIBA, Visiting Assoc.Prof.
Nobuo SHIMIZU, Assist. Prof.

Department of Mathematical Analysis and Statistical Inference

Mathematical Statistics Group

Katuomi HIRANO (Director), Prof.
Satoshi KURIKI, Prof.
Takaaki SHIMURA, Assist. Prof.
Yoichi NISHIYAMA, Assist. Prof.

Learning and Inference Group

Shinto EGUCHI, Prof.
Kunio SHIMIZU, Visiting Prof.
Mihoko MINAMI, Assoc. Prof.
Shiro IKEDA, Assoc. Prof.
Hironori FUJISAWA, Assoc. Prof.
Tadayoshi FUSHIKI, Assist. Prof.

Computational Mathematics Group

Yoshiaki ITOH, Prof.
Takashi TSUCHIYA, Prof.
Satoshi ITO, Assoc. Prof.
Yoshihiko MIYASATO, Assoc. Prof.

Prediction and Knowledge Discovery Research Center (PKDRC)

Molecular Evolution Research Group

Masami HASEGAWA (Director), Prof.
Tetsuo HASHIMOTO, Visiting Prof.
Jun ADACHI, Assoc. Prof.
Ying CAO, Assist. Prof.
Masato NIKAIDO, Research Fellow upon JSPS program
Yuriko NISHIMOTO, Project Researcher
Hideya MITSUI, Graduate Student,
The Graduate University for Advanced Studies
Takahiro YONEZAWA, Graduate Student, University of Tokyo
Yumie MURATA, Graduate Student, University of Tokyo

Data Assimilation Research Group

Tomoyuki HIGUCHI (Vice Director-General), Prof.
Masafumi KAMACHI, Visiting Prof.

Takashi WASHIO, Visiting Assoc. Prof.
Genta UENO, Assist. Prof.
Alexandre TERMIER, Project Researcher
Shinya NAKANO, Researcher, JST CREST

Statistical Seismology Research Group

Yosihiko OGATA, Prof.
Shinji TOHDA, Visiting Prof.
David Shamus HARTE, Visiting Assoc. Prof. (2006.7.24 - 2006.9.22)
Yasuaki MURATA, Assoc. Prof., Institute of Geoscience, Geological Survey of Japan, AIST
Takaki IWATA, Researcher upon Grant-in-aid for Scientific Research
Jiancang ZHUANG, Research Associate, UCLA
Kazuyoshi NANJO, Research Associate, ETH
Masatsugu WAKAURA, Graduate Student, The Graduate University for Advanced Studies
Ushio TANAKA, Graduate Student, The Graduate University for Advanced Studies

Statistical Genome Diversity Research Group

Shinto EGUCHI, Prof.
Satoshi KURIKI, Prof.
Hirofumi WAKAKI, Visiting Prof.
Mihoko MINAMI, Assoc. Prof.
Shiro IKEDA, Assoc. Prof.
Hironori FUJISAWA, Assoc. Prof.
Tadayoshi FUSHIKI, Assist. Prof.
Masanori KAWAKITA, Project Researcher

■ Risk Analysis Research Center (RARC)

Food and Drug Safety Research Group

Takemi YANAGIMOTO, Prof.
Toshiharu FUJITA, Prof.
Hiroe TSUBAKI (Director), Visiting Prof.
Toshiya SATO, Visiting Prof.
Kunihiko HAYASHI, Visiting Prof.
Satoshi AOKI, Visiting Assoc. Prof.
Toshimitsu HAMASAKI, Visiting Assoc. Prof.
Yoshimitsu HIEJIMA, Visiting Assoc. Prof.
Takaaki SHIMURA, Assist. Prof.

Environmental Risk Research Group

Yukio MATSUMOTO, Visiting Prof.
Kazuo YAMAMOTO, Visiting Prof.
Yoshiro ONO, Visiting Prof.
Nobuhisa KASHIWAGI, Assoc. Prof.
Koji KANEFUJI, Assoc. Prof.
Hideshige TAKADA, Visiting Assoc. Prof.
Hirokazu TAKANASHI, Visiting Assoc. Prof.
Toshihiko KAWAMURA, Assist. Prof.
Mitsuhiro TOMOSADA, Project Researcher

Financial Risk and Insurance Research Group

Ryozo MIURA, Visiting Prof.
Naoto KUNITOMO, Visiting Prof.
Hiroshi TSUDA, Visiting Prof.
Satoshi YAMASHITA, Assoc. Prof.
Seisho SATO, Assoc. Prof.
Yoshinori KAWASAKI, Assoc. Prof.
Toshinao YOSHIBA, Visiting Assoc. Prof.
Yoko TANOKURA, Project Researcher
Masayuki KUMON, Project Researcher
Ken-ichi KAWAI, Project Researcher

■ Project Researcher

Marco CUTURI, Project Researcher
Tor Andre MYRVOLL, Project Researcher
Shohei SHIMIZU, Researcher Fellow upon JSPS program
Teruhisa SUGIMOTO, Project Research
Yoshiyuki TSUDA, Project Reseacher

■ Center for Engineering and Technical Support

Junji NAKANO (Director), Prof.
Satoshi YAMASHITA, Assoc. prof
Setsuko TERAO, Chief of Supervision Unit (Concurrent)

Computing Facility Unit

Kohichi KATSURA, Chief of Computing Facility Unit

Networking Facility Unit

Kazuhiro NAKAMURA, Chief of Networking Facility Unit

Education and Library Unit

Setsuko TERAO, Chief of Education and Library Unit

Public Outreach Unit

Yuriko WATANABE, Chief of Public Outreach Unit

■ Administration Office

Toshifumi HAGIWARA, Director of Administration Office

General Administration Section

Kuniaki USUI, Head of General Administration Section
Shigeyuki FUJII, Deputy Head of General Administration Section
Fumio SUTŌ, Chief of General Affairs Unit
Masami SAKAO, Chief of Personnel Unit
Tsutomu ISOYAMA, Chief of Research Cooperation Unit

Accounting Section

Tatsuya HITOMI, Head of Accounting Section
Kazue WATANABE, Deputy Head of Accounting Section
Minoru HAGIWARA, Chief of General Affairs Unit
Minoru HAGIWARA, Chief of Auditing Unit (Concurrent)
Yoshiyuki SAKATA, Chief of Supplies Unit
Hirotomo SHIMIZU, Chief of Property Maintenance Unit

Council of The Institute of Statistical Mathematics

As of April 1, 2006

Yutaka KANO	Professor, Graduate School of Engineering, Osaka University
Toshinari KAMAKURA	Professor, Faculty of Science and Engineering, Chuo University
Naoto KUNITOMO	Professor, Graduate School of Economics, the University of Tokyo
Sadanori KONISHI	Professor, Graduate School of Mathematics, Kyushu University
Yoshiharu SATO	Professor, Graduate School of Engineering, Hokkaido University
Makoto TAIJI	Team Leader, Genomic Sciences Center, RIKEN
Katsuto TANAKA	Professor, Graduate School of Economics, Hitotsubashi University
Fumi HAYASHI	Professor, Department of Human Sciences, Toyo Eiwa University
Yoshihiko MIZUMOTO	Chief of Astronomical Data Analysis Center, National Astronomical Observatory of Japan, National Institutes of Natural Sciences
Satoru MIYANO	Professor, Human Genome Center, the Institute of Medical Science of the University of Tokyo
Masaharu TANEMURA	Professor (Vice Director-general, ISM (General Affairs))
Yoshiyasu TAMURA	Professor (Vice Director-general, ISM (Assessment))
Tomoyuki HIGUCHI	Professor (Vice Director-general, ISM (Research Planning))
Makio ISHIGURO	Professor (Director of Department of Statistical Modeling, ISM)
Yoshiyuki SAKAMOTO	Professor (Director of Department of Data Science, ISM)
Katsuomi HIRANO	Professor (Director of Department of Mathematical Analysis and Statistical Inference, ISM)
Masami HASEGAWA	Professor (Director of Prediction and Knowledge Discovery Research Center, ISM)
Junji NAKANO	Professor (Center for Engineering and Technical Support, ISM)
Yosihiko OGATA	Professor (Department of Statistical Modeling, ISM)
Shinto EGUCHI	Professor(Department of Mathematical Analysis and Statistical Inference, ISM)
Satoshi KURIKI	Professor(Department of Mathematical Analysis and Statistical Inference, ISM)

Cooperative Research Committee

As of April 1, 2006

Hiroshi KOJIMA	Chief of the Department of International Research and Cooperation, National Institute of Population and Social Security Research
Toshinari KAMAKURA	Professor, Department of Science and Engineering, Chuo University
Yoshihiro YAJIMA	Professor, Graduate School of Economics, the University of Tokyo
Masahiro MIZUTA	Professor, Information Initiative Center, Hokkaido University
Manabu IWASAKI	Professor, Department of Industrial Engineering and Information Sciences, Seikei University
Takashi NAKAMURA	Professor (Department of Data Science, ISM)
Junji NAKANO	Professor (Chief of Center for Engineering and Technical Support, ISM)
Takashi TSUCHIYA	Professor (Department of Mathematical Analysis and Statistical Inference, ISM)
Yukito IBA	Associate Professor (Department of Statistical Modeling, ISM)

Emeritus Professor

As of April 1, 2006

Hirojiro AOYAMA
Kameo MATUSITA
Sigeki NISIHIRA
Tatsuzo SUZUKI
Hirotugu AKAIKE
Giitiro SUZUKI
Ryoichi SHIMIZU
Noboru OHSUMI
Masakatsu MURAKAMI
Kunio TANABE
Tadashi MATSUNAWA

June, 1944	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.
April, 1947	The affiliated statistical specialists' school was opened.
May, 1947	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).
June, 1949	The Institute was placed under the control of the Ministry of Education because of the enforcement of the Ministry of Education Establishment Law.
September, 1955	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.
October, 1969	A new office building was constructed.
April, 1971	The 4th Research Dept. (informatics theories) was instituted.
April, 1973	The 5th Research Dept. (prediction and control theories) was instituted.
October, 1975	The 6th Research Dept. (statistical theories of human behavior) was instituted.
November, 1979	The Information Research Building was constructed.
April, 1985	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 an 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.
October, 1988	The Dept. of Statistical Science was instituted in the School of Mathematical and Physical Science, part of the Graduate University for Advanced Studies (SOKENDAI).
June, 1989	The Institute was reorganized as an Inter-University Research Institute based on the National School Establishment Law.
April, 1993	The Planning Coordination Chief System was instituted.
April, 1997	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.
September, 2003	The Prediction and Knowledge Discovery Research Center was instituted in the affiliated facility.
April, 2004	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.

April, 2005 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 ResearchCenter was instituted.

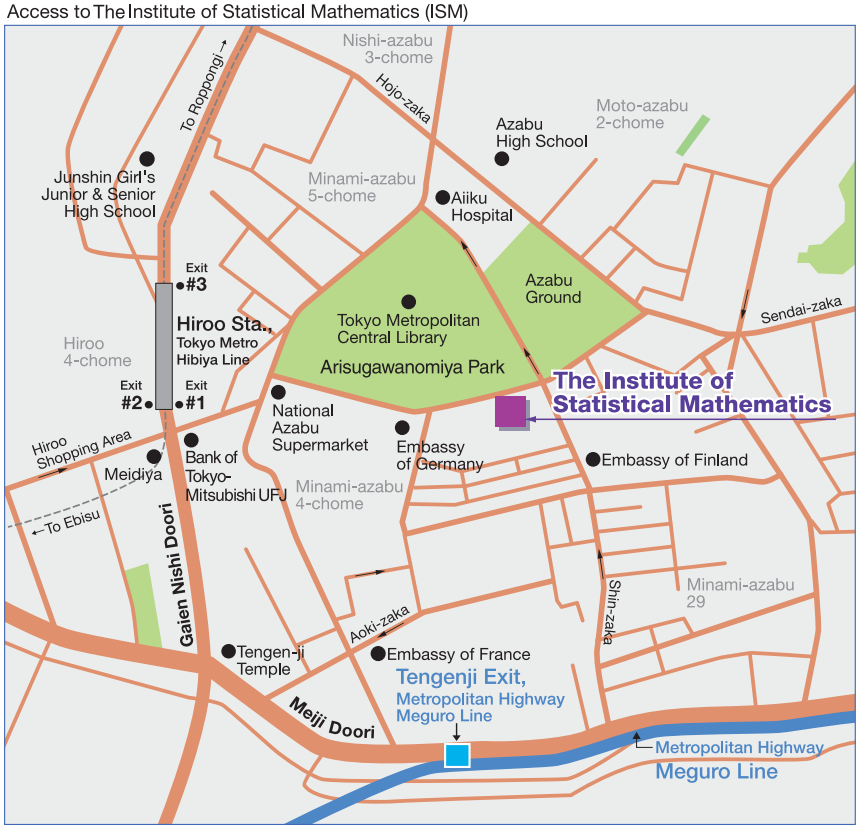
1947

1955

1955

Now

Access to The Institute of Statistical Mathematics (ISM)



7 minutes' walk from Hiroo Sta., Tokyo Metro

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

The Institute of Statistical Mathematics

4-6-7 Minami-Azabu, Minato-ku, Tokyo, Japan
Postal code: 106-8569
Phone: +81-(0)3-3446-1501 (Reception)
Fax: +81-(0)3-3443-3552 (General Affairs)
URL http://www.ism.ac.jp/