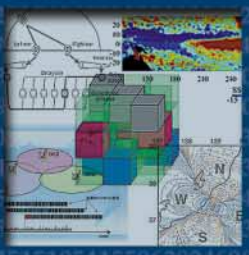
Research Organization of Information and Systems

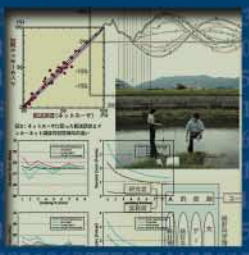
The Institute of Statistical Mathematics

2007-2008

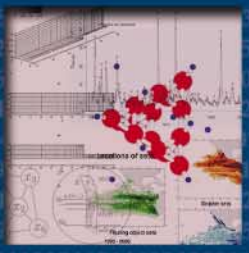
Statistical Modeling



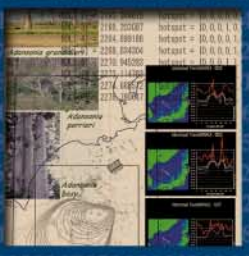
Data Science



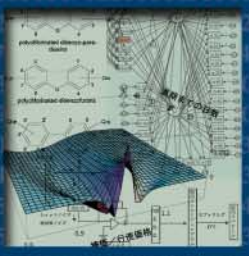
Mathematical Analysis and Statistical Inference



Prediction and Knowledge Discovery



Risk Analysis

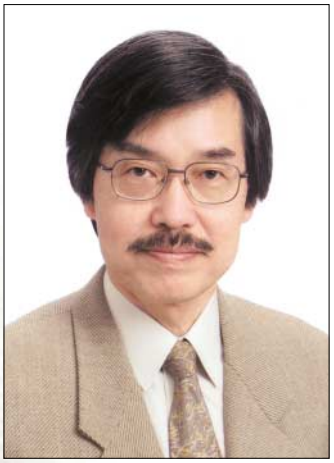


Engineering and Technical Support

ISM

CONTENTS

Message from Director-General



Remarkable advances in information and communication technology, including measuring, telecommunication, information retrieval, and computation technologies, have changed people's lifestyles substantially. It is no exaggeration to say that people can no longer live without information from the Internet. Ironically, it is becoming increasingly difficult to find the essential information from data. The situation is much the same in the field of academic research. The emergence of large scale data and a change in research style have brought about many difficult problems that cannot be solved by traditional methods. However, facing with many challenges like this, we rather think them as good opportunities for innovating statistical science, since new methods of statistical science, such as the one for knowledge acquisition from data, have been developed corresponding to changes in data environment and emergence of new areas of scientific research.

Foreseeing such a new era, the Institute of Statistical Mathematics established the Prediction and Knowledge Discovery Research Center in 2003. With the aim of inventing and applying methods of prediction and knowledge discovery based on large scale data, this center focuses on four research projects: Data Assimilation, Statistical Seismology, Molecular Evolution and Genome Diversity. In 2005, the Risk Analysis Research Center was set up to establish Quantitative Risk Science as a base for scientific risk management. Three research groups, namely, the Food and Drug Safety Research Group, Environmental Risk Research Group and Financial Risk and Insurance Research Group, are engaged in study at the center. In 2004, when our Institute became a corporate body, it formed the Research Organization of Information and Systems together with National Institute of Informatics, National Institute of Genetics and National Institute of Polar Research, and started relevant activities. In particular, as an activity of the Transdisciplinary Research Integration Center, a new research center created within this organization, we actively promote the Function and Induction Research Project in an effort to construct new scientific inference models suitable for the information age.

The goal of the Institute of Statistical Mathematics as an Inter-University Research Organization is to perform fundamental and practical research to address the real-world problems and needs of the information age, while advancing joint research projects with researchers in other fields. Moreover, to provide more systematic graduate education on statistical science, the Department of Statistical Science of the Graduate University for Advanced Studies, for which our Institute serves as the parent organization, began offering a five-year doctoral educational program starting with a graduate course, in academic year 2006. The Institute is also aware of growing concern over the lack of initiatives to promote mathematics and mathematical science in Japan and the need to take measures to foster such initiatives. As a research institute engaging in the development of fundamental methodology, we hope to actively contribute to the advancement of the mathematical science in Japan.

To achieve these goals, I would like to ask for your continuous support for the Institute of Statistical Mathematics.

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 on model-based statistical inference methodologies.

■ Spatial and Time Series Modeling Group

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

■ Intelligent Information Processing Group

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

■ Graph Modeling Group

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

Department of Data Science

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

■ Survey Research Group

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

■ Multidimensional Data Analysis Group

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

■ Computational Statistics Group

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

Department of Mathematical Analysis and Statistical Inference

The Department of Mathematical Analysis and Statistical Inference carries out research into general statistical theory, statistical learning theory, the theory of optimization, and the practice of statistics in science.

■ Mathematical Statistics Group

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

■ Learning and Inference Group

The 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.

■ 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.

■ Data 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.

■ 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.

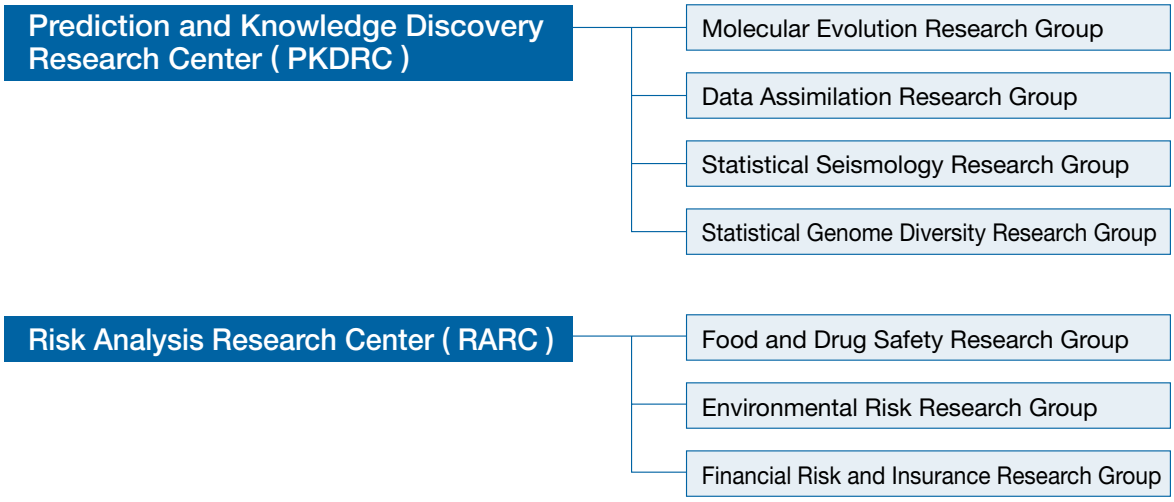
■ Computing Facility Unit	The Computing Facility Unit is in charge of the management of computer facilities and software for research.
■ Networking Facility Unit	The Networking Facility Unit is in charge of the management of networking infrastructure used for research and is responsible for network security.
■ 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

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:



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 relatively sizable amount of funding is allocated to approved projects, and strategic research leading to future development is encouraged. In 2006, we have approved the following ten projects. No limitation was placed on theme or category.

Research Theme	Project Leader
Reconstructing functional neuronal circuits from optical imaging data	Yoshiyasu Tamura
Computational geometry and statistical distribution of symmetry	Yoshiaki Itoh
Estimation of quantum states from observation	Yukito Iba
The estimation of space- and time-spectrum in dispersive wave field	Makio Ishiguro
Organizing the international symposium on stochastic models and discrete geometry	Masaharu Tanemura
Developing statistical models for bycatch in tuna fisheries	Mihoko Minami
Analytic center of the system of linear matrix inequalities and its applications	Takashi Tsuchiya

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

The aim of this project is to understand the biodiversity on Earth from various view points encompassing from molecular level to ecological level. Evolutionary view is indispensable in the integrative understanding of the biodiversity, and the methods for inferring molecular phylogeny are essentially important. In this project, we are developing models of nucleotide substitutions during evolution and methods for phylogenetic inference based on maximum likelihood. In developing the statistical methods, we simultaneously try to solve real problems of biological importance.

The biological problems we are working on include evolution of vertebrates such as mammals and birds, evolution of land plants, and the biodiversity of Malagasy fauna. Madagascar has been isolated from any continents for a long geological time, and has developed a unique fauna with high level of combined species richness and endemism. In Madagascar, we are working on the biogeographic problems of tenrecs and lemurs (mammals) and baobabs (plants). Spiny tenrec is morphologically very similar to hedgehog, and had long been classified in Insectivora together with hedgehogs, moles, and shrews, but molecular phylogenetic analyses clarified that tenrecs belong to Afrotheria which includes elephants, hyraxes, and aardvarks, and that the similarity between spiny tenrec and hedgehog is due to convergent evolution. Estimation of the time-scale of lemurs and baobabs gave important clues in clarifying the origin of these groups of organisms in Madagascar.

Jun Adachi

Lemurs present remarkable diversity in Madagascer

Lemuridae

Cheirogaleidae

Indriidae

Daubentoniidae

Data Assimilation Research Group

Data Assimilation: Time-dependent Information Fusion from Numerical Simulation and Large-scale Observation

Data Assimilation (DA) 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 oceanography, stimulated by recent improvements in computational and modeling capabilities and the increase in the amount of available observations. In statistical methodology, DA can be formulated in the generalized state space model, where the system and observation model correspond to large-scale numerical model-based simulations and large-scale satellite- and/or ground-based measurement systems, respectively. Past studies for DA employed a linear Gaussian state space model and applied Kalman filter. The Kalman filter based methods, however, do not allow for the strong nonlinear and/or non-Gaussian disturbance behaviors. Many phenomena in earth sciences tend to be discussed in terms of a complex system in which the nonlinear non-Gaussian fluctuations (disturbances) play an important role. The nonlinear non-Gaussian DA method needs to be developed in an attempt to improve a performance of prediction ability of our environment. We are therefore constructing new computation methods based on the sequential DA methods and conducting four DA projects. One is done with the ensemble Kalman filter that assimilates the TOPEX/Poseidon altimetry to the coupled ocean-atmosphere simulation model. The second DA is done with a particle filter for Tsunami simulation model to correct bottom topography. The third is the DA project to estimate distributions of ring current ions and electric potential in the inner magnetosphere by assimilating the series of the ENA data obtained by the HENA imager on board of IMAGE satellite into a kinetic ring current model (CRCM). The last project is to apply the DA methodology to combine a simulation model with observed data like microarray gene expression data for understanding biological pathways.

Tomoyuki Higuchi

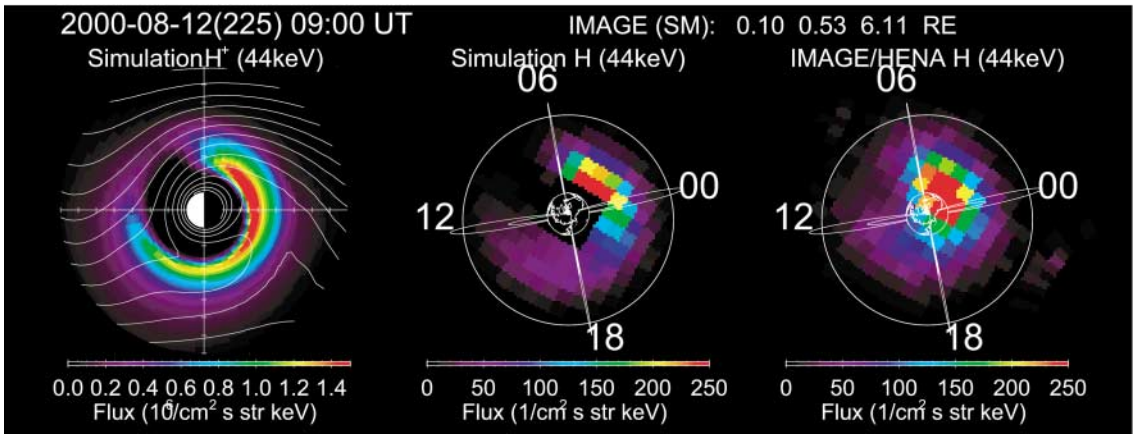


Figure: Numerical experiment to estimate ring current distribution by DA.

Statistical Seismology Research Group

Precursory Seismic and Geodetic Anomalies Detected by Statistical Models

Motivation behind this research

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 rupture or silent slip in one region can cause seismic changes in other regions. However, the clustering feature of earthquakes prevents us from detecting the seismicity change due to stress change transferred from other region because successive earthquakes are triggered by complex mechanisms under heterogeneous fractal media. Nevertheless, we can use the statistical empirical laws as a practical method for predicting earthquake clusters. Thus, the objective of this research is to demonstrate that diagnostic analysis based on fitting the Epidemic Type Aftershock Sequence (ETAS) model to regional seismicity can be helpful in detecting exogenous stress changes there. In particular, the changes due to silent slips are usually so slight that one can barely recognize systematic anomalies in seismicity without the aid of the ETAS model.

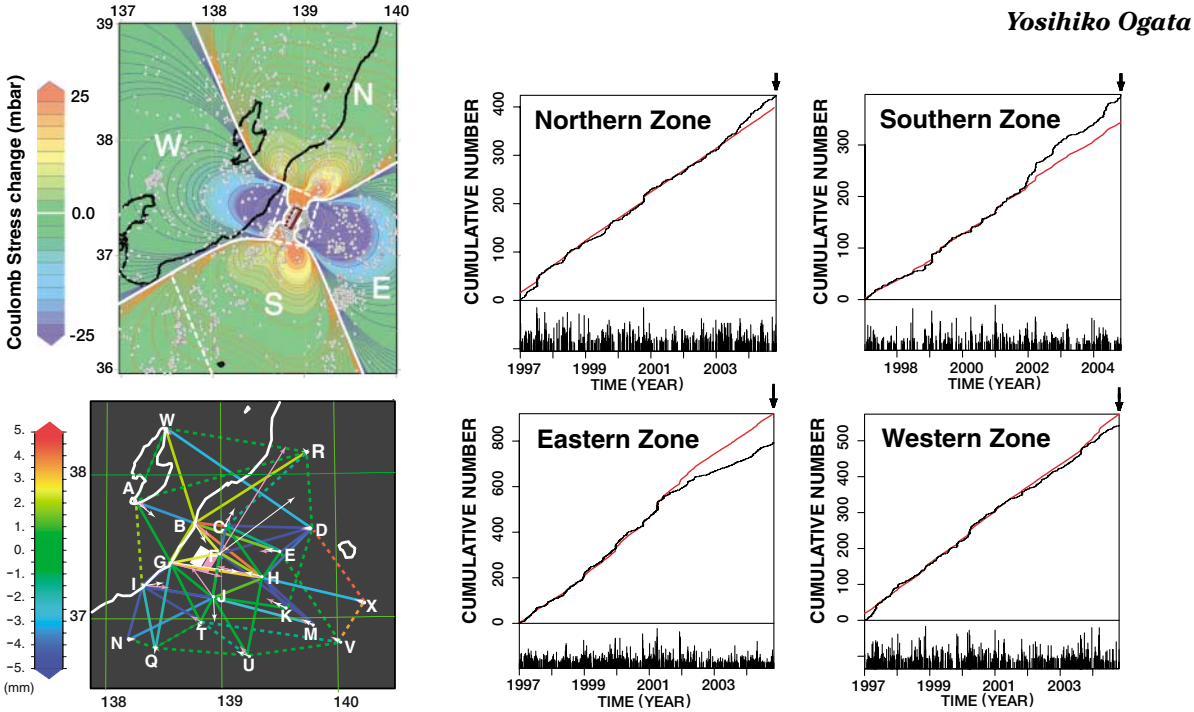
Diagnostic analysis from earthquake sequence

The ordinary short-term occurrence rate of earthquakes in a region is well predicted using the ETAS model of triggering earthquakes. Any anomalous seismic activity, such as quiescence and activation, can be quantified by identifying significant deviation from the predicted rate. Such anomalies are revealed to have occurred during the three year period leading up to the 2004 Chuetsu Earthquake of Magnitude 6.8, central Japan. The quiescence and activation, which took place in the region of negative and positive increments of the Coulomb Failure Stress, respectively, were possibly caused by silent slip on the focal fault plane, or its deeper extension with a lower dip angle.

Residual analysis of geodetic time series records from the GPS network

Such slip is further supported by transient crustal movement around the rupture source. The time series records of many baseline distances between the permanent GPS stations significantly deviated from the predicted linear trends, mostly with the deviations consistent with the coseismic horizontal displacements of the GPS stations due to the Chuetsu Earthquake. Furthermore, a deeper extension of the mainshock fault plane, with a lower dip angle, can explain the more cases of the observed baseline deviations in comparison with the theoretical displacement. The cumulated precursory slip is estimated to be roughly equivalent to M6 in the moment magnitude.

Yosihiko Ogata



Statistical Genome Diversity Research Group

Peak Pattern Recognition from Proteome

Recently a large scale of dataset has been developed and produced from genomic and proteomic experiments with high enhancements. It enables us to analyzing experimental subjects that were previously impossible and to opening a new paradigm in medical and biological sciences. The role of statistics is to discover new knowledge based on given datasets and to validate the confirmation for the discovery. The statistical role on learning genomic and proteomic datasets is not properly established because of the data scales beyond ordinary assumptions. In particular the characteristic point is high-dimension and small sample. For this there are easily exposed false discovery and missing discovery, which dualistically faces to the data understandings.

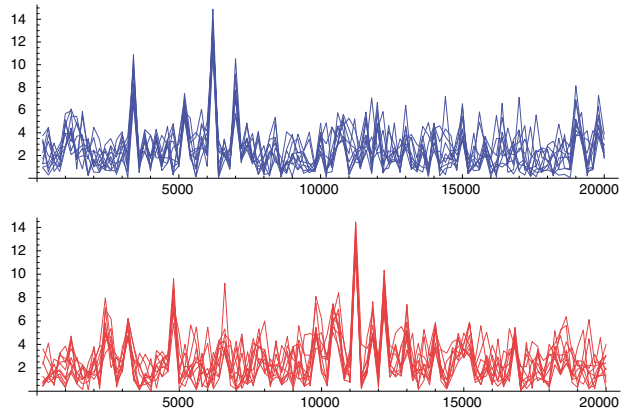


Figure 1: Plots for 100 TOF mass frequency curves for each class label.

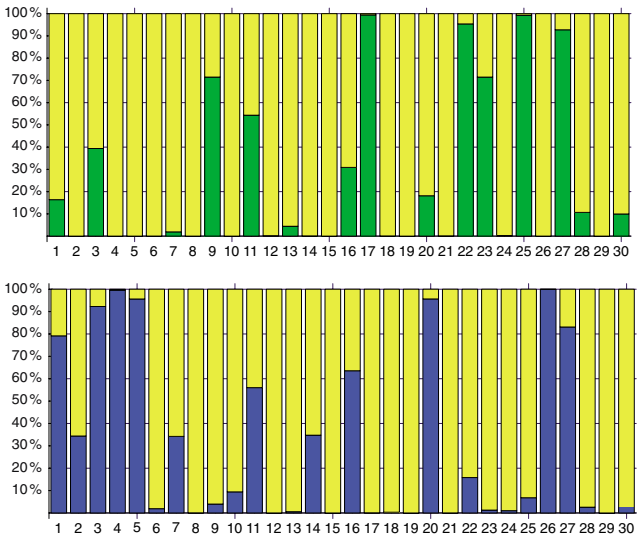


Figure 2: Plots for occupancy percentage at 30 peaks detected for each class label.

For attaining the challenging goals in medicine and biology it is necessary and important to conduct correct knowledge and reasonable decisions induced from genome datasets. The objective of our research group aims at proposing statistical methods to support and extract sensible knowledge discovery from huge amounts of feature information. In particular we are tackling genome datasets in a biological circle which would integrate microarray associated with gene expressions, proteome with protein expressions and SNPs with polymorphism. We challenge to discover any biomarkers for phenotypes including cancer diseases, effects of treatments, adverse effects of drugs and so forth by leaning a combination of genome datasets and other clinical information on the basis of cooperative work with Genome Center of Japan Foundation for Cancer Research.

Our target is to explore only peaks truly associated with the target phenotype in the hull of several thousands of peaks. To the problem our group proposes an idea of “common peaks” in the paper by Fushiki, Fujisawa and Eguchi, BMC Bioinformatics (2006) 7:358. We confirmed a reasonable performance of this prediction method for applying to Ovarian Datasets 8-7-02 that are publicly available from the National Cancer Institute in U.S.A.

Furthermore we are presently analyzing data sets for 65 breast cancer patients in 2003-2004 at Cancer Institute Hospital and making a prediction of the effect for an anti-cancer drug based on the proteomic data. We found that it needed more device than the idea of common peak approach. Hence we improved to assess the common peaks separately in each group of the same class label. See Figures 1 and 2. As a result we concluded that this semi-supervised common peak detection conducted excellent performance with hit rate 14 over 15 for a test dataset.

Shinto Eguchi

Food and Drug Safety Research Group

Benefit-risk Balance 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 benefit-risk balance evaluation of food and drug. Our research is based on cooperative research projects with visiting researchers and members from the research group of data management and statistics in Japan Pharmaceutical Manufacturers Association.

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

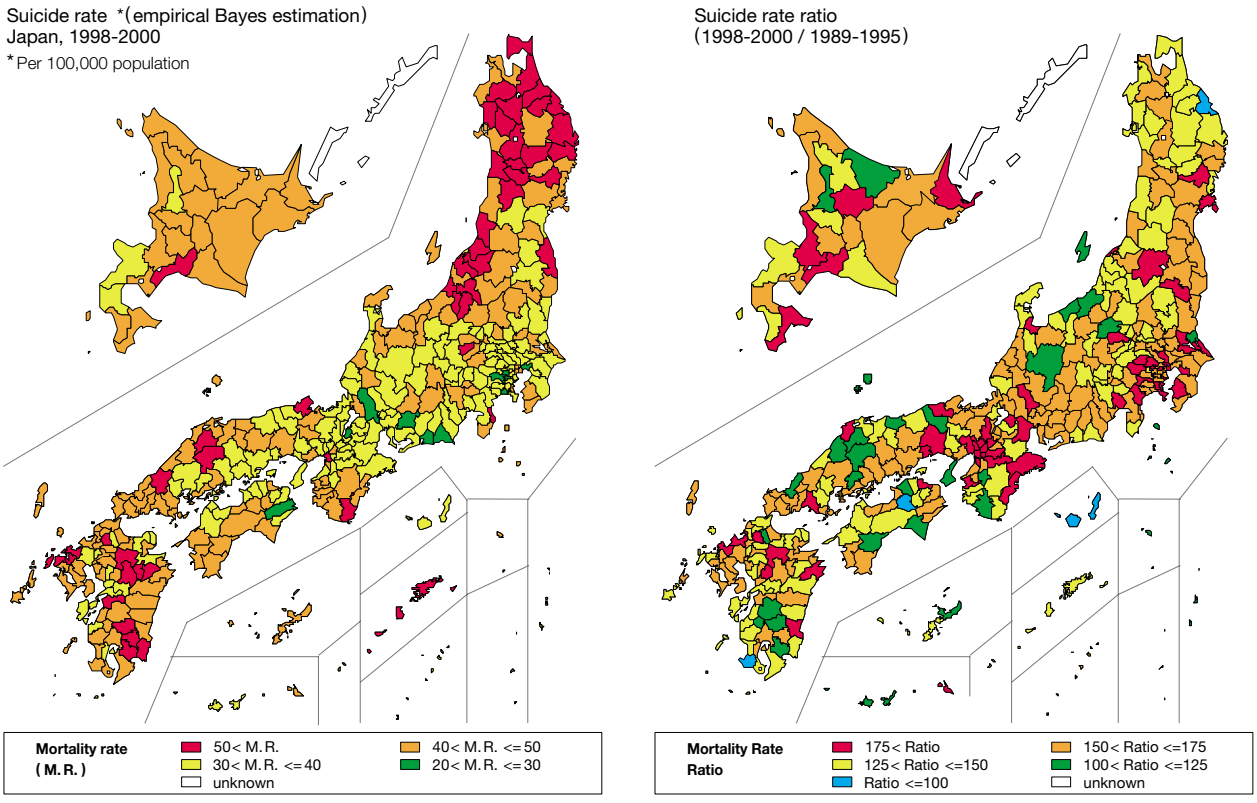
There is no large-scale database available in complementing the spontaneous reporting system in Japan at this moment. To conduct studies to generate hypotheses about drug effects, to strengthen them, and/or to test a priori hypotheses about drug effect, we are under the process of building original databases using data collected from pre-marketing clinical trials and post-marketing Drug Use Investigation conducted for the Drug Re-examination application by pharmaceutical manufacturers, successively. For example, a case-control analysis on the Angiotensin converting-enzyme inhibitor-induced cough was conducted utilizing our post-marketing database of anti-hypertensive drugs.

Ad hoc study on a specific drug safety issue

A safety issue of drug often becomes a social concern, and the immediate scientific elucidation is demanded. An appropriate study design, implementation and statistical analysis are necessary to get an accurate scientific quantitative answer. We participate in an ad hoc study on a specific drug safety issue as experts of statistical science and epidemiology.

The figure below shows the geographic feature of the recent sharp increase in suicide deaths since 1998. This ecological study indicates that the suicide death rate correlates negatively with the amount of SSRIs (Selective Serotonin Reuptake Inhibitors) prescribed.

Toshiharu Fujita



Geographic clustering of suicide mortality among males aged 10 and older

Environmental Risk Research Group

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 the 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

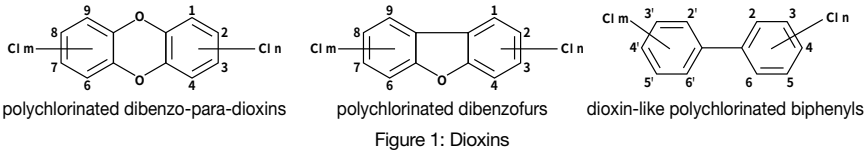


Figure 1: Dioxins

Figure 2: GOSAT image (photo: JAXA)

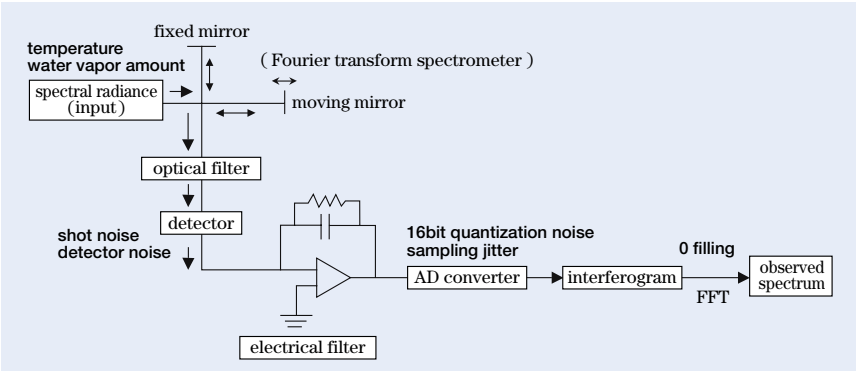


Figure 3: The flow from the spectrum which is inputted to sensor to the observed spectrum, and the error factors (bold letters). This figure makes under discussion with GOSAT Research Team, National Institute for Environmental Studies Center for Global Environmental Research.

Figure 4: Ames Salmonella Mutagenicity Assay
(Courtesy by Prof. Takanashi)

Financial Risk and Insurance Research Group

Quantitative Risk Analysis Based on Credit Derivatives

■ 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 an ongoing project led by Dr. Tanokura, Research Associate.

■ Credit Default Swap

A corporate bond goes below par if the bond offering company causes failure to pay or even goes into bankruptcy. Bond holders can sustain economic damage from such a credit event. Credit Default Swap (CDS) is an insurance contract that protects the buyer against the loss of the par value due to a credit event. The buyer pays a premium to the seller on some regular basis, while the seller promises to compensate the buyer for the loss when a credit event occurs. The premium is quoted as a rate of the notional value, called the CDS price. CDS is used to transfer the credit risk without selling the asset itself, and is a building block for synthetic credit structured products that match investors' requirements effectively. Hence, the CDS market is growing so rapidly in Japan as well as in Europe and the United States.

■ Risk analysis of Japanese CDS market

By analyzing fluctuations of CDS prices, this research project aims to reveal the business environment of an individual company, and of an industrial sector. Finally, we propose the CDS index that elucidates the Japanese economic ambience. Figure 1 shows the temporal transition of the histograms of CDS prices; the price distributions are skewed to the right with many missing values and the numbers of observations are extremely unbalanced among the examined points of time. A state space modeling with appropriate data transformations enables us to construct a CDS index. Figure 2 presents the CDS index with proportions of different credit ratings. The peak in the middle of the graph shows the big influence from downgrading GM and Ford in the US. This illustrates our method succeeds in capturing the increased risk due to credit events quantitatively, and at the same time, the primal source of risk uprush can be expressed.

Yoshinori Kawasaki

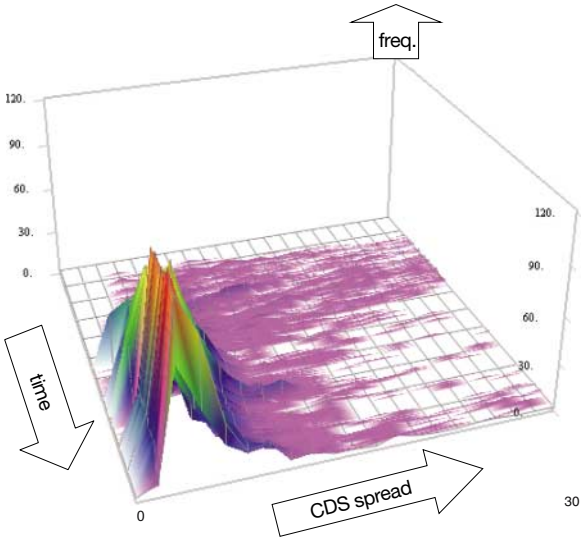


Figure 1: Temporal transition of histograms of CDS prices. (Source: Bloomberg LP)

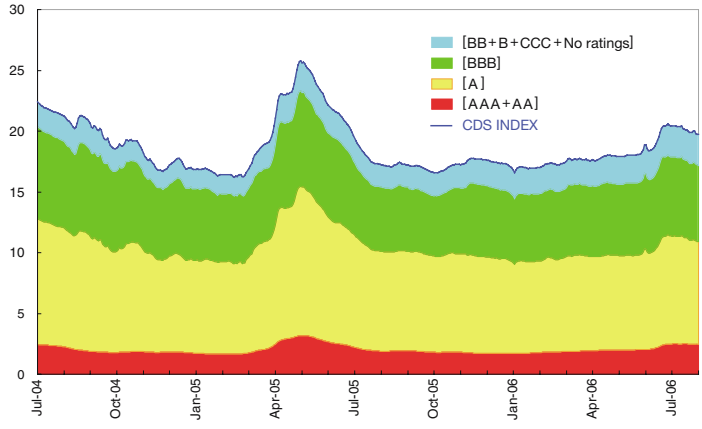


Figure 2: Estimated CDS index with proportions of different ratings.

Both figures are provided by Dr. Yoko Tanokura (Research Associate, Risk Analysis Research Center).

Reconstructing Functional Neuronal Circuits from Optical Imaging Data

Introduction

Even when we breathe unconsciously, neurons give a command to breathe. Neurons do their jobs by constituting functional neuronal circuits and mutually exchanging information. Since the last fiscal year, we have been analyzing neural membrane electric potential image data of rat brainstem related to respiration.

Re-exploration of basic properties of the data

For this purpose, correlation analysis has been used for a limited number of regions, which are known in previous physiological studies to have functions for respiration. However, feedback and causality between regions cannot be extracted by the correlation analysis. Therefore it is needed to develop a new method for this purpose.

Before developing a new method, we re-explored basic properties of the data. In order to investigate distinctive signals in a specific frequency domain, power intensity maps based on FFT were investigated. Then, we found some regions that have relatively higher intensity around 5 Hz oscillations (Fig.1). However, they did not always correspond to physiologically meaningful regions; they were even outside of tissue. After investigating equipments for data recording, we recognized that the 5Hz signal is caused by eigen oscillation of the fluorescent microscope (MVX-10). Then, equipments were improved and replaced to a new system and the eigen oscillation was sensibly reduced. In the current status, more reliable data recording is available.

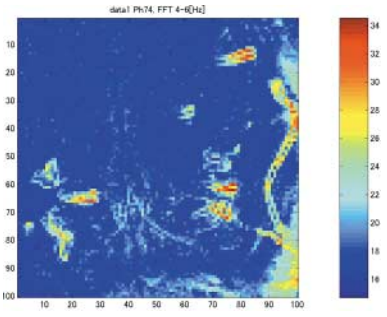


Figure 1:
Intensity map of neural membrane electric potential image data on rat brainstem (around 5Hz)

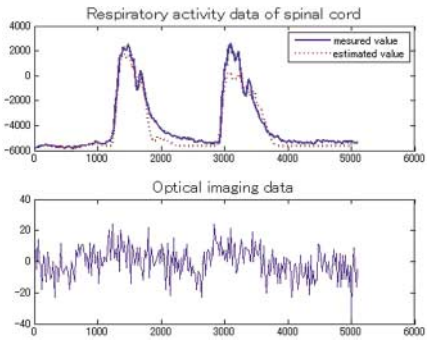


Figure 2:
Comparison between the predicted and the measured respiratory neuronal activities.
(Top): The measured value (the solid line) and the estimated value (the doted line) of the respiratory motor output from C4VR.
(Bottom): Time series data of the pixel, based on which above "predicted value" was composed.

Estimation of the respiratory motor output from the membrane potential imaging data and classification of the respiratory-related neuronal activities

Two respiratory-related brainstem regions, the parafacial respiratory group and the preBötzinger complex, have been recently identified by physiological experiments. However, the dynamical interaction between the two regions and the dynamical process to form the respiratory motor output remain unanswered.

In order to classify the patterns of respiratory-related neuronal activities, we considered a model by which the respiratory motor output from the fourth ventral root of the cervical spinal cord (C4VR) can be predicted using optical recording data. We assumed a simple model consisting of sigmoid function and [first-order delay + dead time] transfer function, and the model parameters were obtained with a non-linear optimization technique (Fig.2). We found that the characteristics of neuronal activities can be classified by cluster analysis using these model parameters.

Mechanism of respiratory rhythm generation

It has not yet shown how respiration rhythm is generated. I thought that the rhythm is generated by communications among neuron groups that locate different regions and play different roles, and hence investigated correlations between various pairs of variables (Fig.3). Each variable has the strongest positive correlation with the preBötzinger Complex and correlations between every pair were not negative. It implies that all locations in an observed region tend to more or less synchronize mutually, and regions that merely inhibit other regions may not exist. (Data offered by Hyogo Medical College and Figure 1 offered by Chiba University)

Seiji Kawai, Fumikazu Miwakeichi, Eiki Tanaka

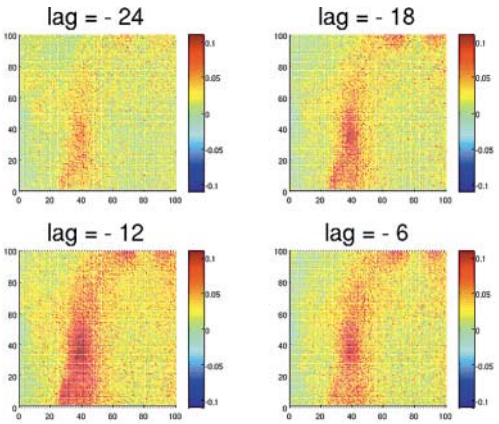


Figure 3:
Map of correlations between membrane potential of each location and the respiratory activity (output of a phrenic nerve) at each lag.

Computational Geometry and Statistical Distribution of Symmetry

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). ICSD has the descriptor 'ANX' (formula type). This descriptor is to describe a chemical structure roughly by its oxidation numbers of the chemical elements (e.g. ANX=AX describes NaCl, ANX=ABX3 describes $CaCO_3$). We found that the number Z of formula units in a unit cell gives a natural classification to understand the statistical distribution of symmetry groups. The statistical distribution strongly depends on the value Z. For the case ANX=ABX3, if Z=1, the point group Oh is frequent while Z=2 the point group D6h is frequent. The case $8 < Z$ is rare and we show the structure Iron Sulfate (IV) ($FeSO_3$) with Z=18 in Figure 1.

We studied the random sequential packing. The random sequential packing of caps into a sphere will help to understand the geometrical structure of diatoms or pollen. The random sequential packing of cubes into torus generates a space group O^7 given by the Figure 2.

Yoshiaki Itoh

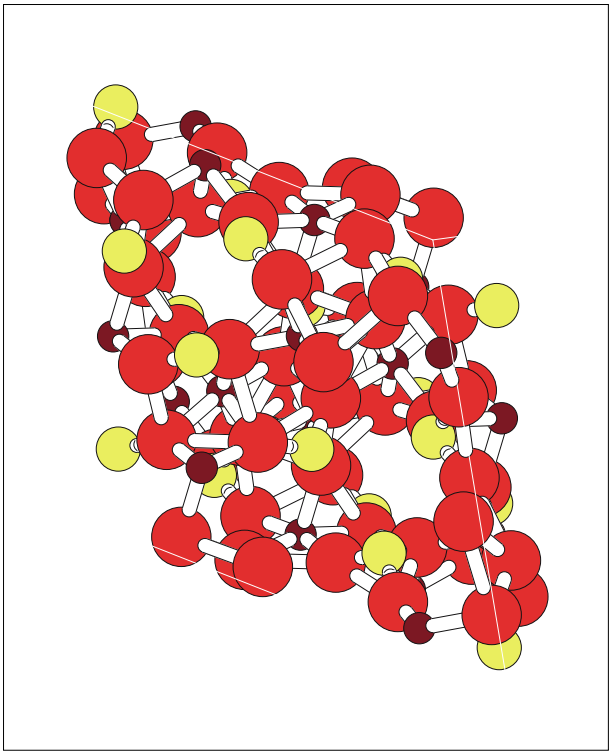


Figure 1

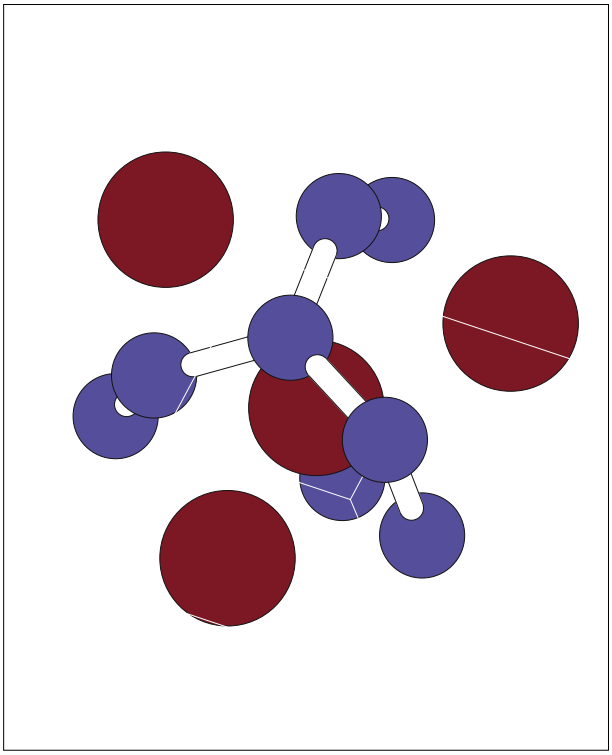


Figure 2

Members: Michel Deza (Ecole Normale Supérieure, European Academy of Sciences)
Nikolai Dolbilin (Steklov Mathematical Institute, Moscow State University)
Mathieu Dutour (Rudjer Boscovic Institue)
Yoshiaki Itoh, Teruhisa Sugimoto, Masaharu Tanemura

Estimation of Quantum States from Observation

Inference on quantum states

In these fifteen years, various types of "quantum information technology" arise, such as quantum computation, quantum cryptography. An art of the estimation of the quantum states realized by experiments is essential in any of these fields. This art is sometimes called "quantum tomography", because a quantum state is reconstructed from a set of observations each of which corresponds to the measurement of a "projection" of the quantum state. It has a close analogy with CT-scan used in hospitals.

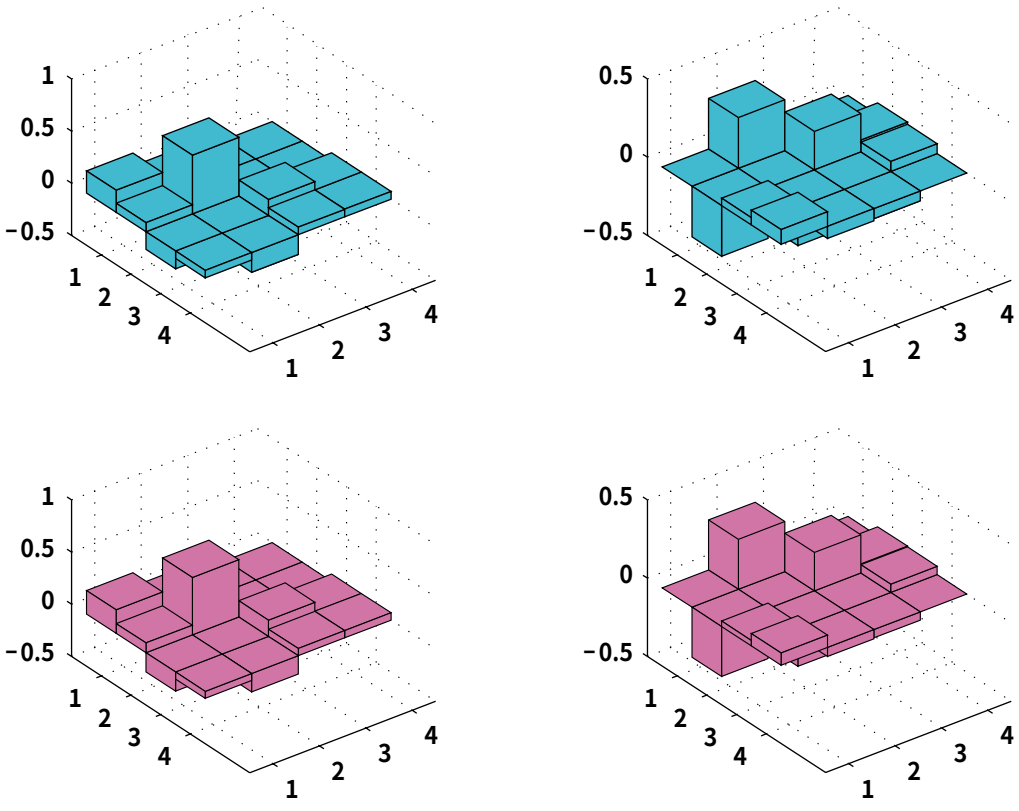
Background and aim

The aim of the project is to develop algorithms for quantum state estimation based on modern numerical and statistical science. Since reconstruction of hidden states from noisy and incomplete observation is a central problem in modern statistical science, development of efficient methods of the estimation of quantum states with error assessment will be a great challenge to statistical scientists. A target of the project is to improve methods of the estimation of density matrices, which is a typical example of large-scale convex programming, a subject extensively studied by researchers in ISM.

Current status

We are collaborating with Keiji Matsumoto (NII) and Mituhiro Fukuda (Tokyo Tech) in this project. We implemented a convex programming algorithm for the maximum likelihood estimation of density matrices and successfully test it with sets of artificial data. We are now trying to apply it to the analysis of real experimental data. The figure shows the result of an numerical experiment with artificial data. In the figure, upper panels (blue) show the original density matrix (each panel corresponds to real and imaginary part respectively), and lower panels (pink) show the reconstructed density matrix from a set of artificial data. Accurate reconstruction is possible in this case.

Yukito Iba



The Estimation of Space- and Time-spectrum in Dispersive Wave Field

When we observe natural wave motion phenomena, for example sound wave, seismic wave, or oceanic wave, we collect the variation at fixed position or the spatial variation at fixed time. When we observe propagation of the complicated waves which consist of a large number of waves which are differ each other in wavelengths on the assumption that the wave field is stationary in time and space domain, the characteristics of the wavefield is represented by "space spectrum" (the relation between power and frequency), and "time spectrum" (the relation between power and wavelength or wavenumber).

The relation of three parameters, wavenumber, frequency, and phase velocity decides relation between time spectrum and space spectrum. When the waves have property of the dispersion (Fig.1), that is, the phase velocity varies depending on wavelength, the space spectrum takes different shape when the waves are not dispersive (Fig.2). There is a relation between the time spectrum, the space spectrum and the dispersion function. The phase velocity dispersion function, which is important in many fields, can be estimated knowing both of the time spectrum and the space spectrum of the wave, in principle.

The surface wave of the earthquake is a typical phenomenon that waves have the properties of dispersion. The relation of wavelength and phase velocity of surface waves depends on crustal structure (the relation of depth and physical properties) beneath the observation spot. Therefore, We can estimate crustal structure by measuring the time and the spatial spectrum.

Generally, for observation of seismic wave, we use the seismic array consist of seismometers developed on a region of land surface. In real observation, there is limitation in number of seismometers to be used, and consequently the resolution of the spatial spectrum is considerably low compared with that of time spectrum. Our purpose of this research is to estimate more accurate space spectrum and phase velocity dispersion function utilizing abundant time spectrum data.

Ken Ishikawa

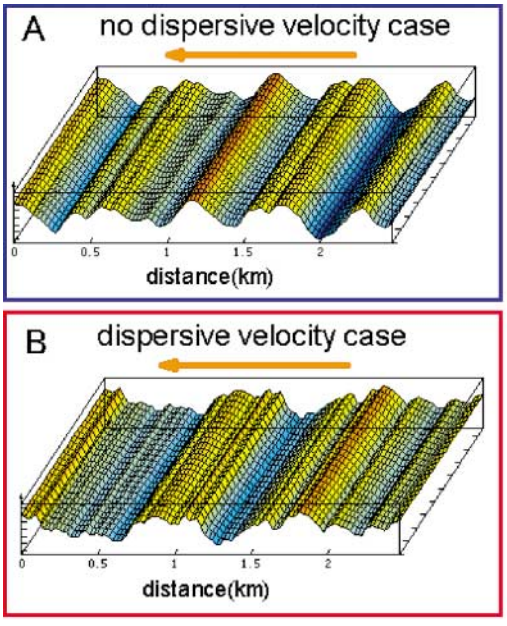


Figure 1: Spatial waves of (A) not dispersive and (B) dispersive phase velocity case.

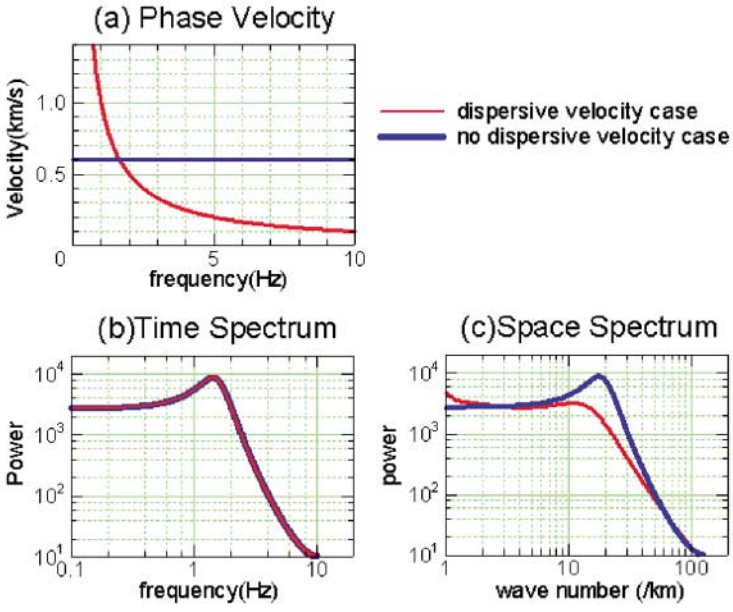


Figure 2: (a) Phase velocity, (b) time spectrum, and (c) space spectrum of dispersive (red line) and not dispersive (blue line) case.

Organizing the International Symposium on Stochastic Models and Discrete Geometry

Discrete geometry is successfully applied to the problems in Crystallography, Chemistry and Physics. Analyses of statistical data on geometrical structure suggest various problems in statistics.

We have been organizing Symposiums whose main theme is "stochastic models and discrete geometry" during these ten years. In recent several years, especially, we have invited a number of distinguished researchers from Europe and United States, and the symposium is obtaining an indisputable unique position inside and outside of Japan. By the occasion of the invitation of foreign researchers, the international cooperative researches on stochastic models and discrete geometry have been substantially performed.

In this fiscal year, the ISM symposium "Stochastic Models and Discrete Geometry" was held during February 26 and 28, 2007 with the aids of Prof. Yoshiaki Itoh and Dr. Teruhisa Sugimoto.

In this symposium, more than 20 lectures are given, including several lectures of foreign researchers invited through the project funds, and the active discussions were exchanged.

Followings are the partial list of speakers and their title of lectures (only those who were invited by the project fund are listed):

Eiichi Bannai	"Cubature formulas in numerical analysis and tight Euclidean designs"
Tetsuyuki Yukawa	"Evolution of simplicial universe"
Hiroshi Maehara	"On a special arrangement of spheres"
Makoto Tagami	"Introduction of Schuette and van der Waerden's paper 'Das Problem der dreizehn Kugeln' "
Motoko Kotani	"Geometric aspect of random walks on a crystal lattice"
Michel Deza	"Zigzag and central circuit structure of two-faced plane graphs"
Nikolai Andreev	"Disposition of points on the sphere and extremal problems of polynomials"

Masaharu Tanemura

Developing Statistical 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. Tunas are detected by fishermen in three different 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 the 1960'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. Although dolphins are rarely killed incidental to fishing operations in other types of purse-seine 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 develop new statistical methods to better model bycatch, and the complex relationships that exist between bycatch and catch species.

Analysis of shark bycatch counts

Annually, shark bycatch occurs in more than one third of the floating object sets. 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. 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 are using this model to estimate temporal trends in shark bycatch rates, an important relative index of population status.

Analysis of species associations

As part of efforts to reduce bycatch in this fishery it is important to identify associations among catch and bycatch species. This is a difficult task because some species are caught only rarely and mostly in small amounts, whereas other species are caught much more frequently, sometimes in very large numbers. To this end, we are developing a new method for measuring association between variables in multivariate data that is based on a Tweedie distribution. The family of Tweedie distributions is a very flexible collection of statistical distributions that can accommodate many of the characteristics of fisheries data. We have applied this method to data from the purse-seine fishery for the year 2000. Preliminary results show that the indices of association obtained with this new method are related to different groupings of catch and bycatch species, and show clear large-scale spatial patterns. These indices also show relationships to environmental variables such as sea surface temperature, chlorophyll-a density and mixed layer depth. Information on relationships between indices of species association and environmental characteristics will help to guide the development of approaches for bycatch reduction.

Mihoko Minami

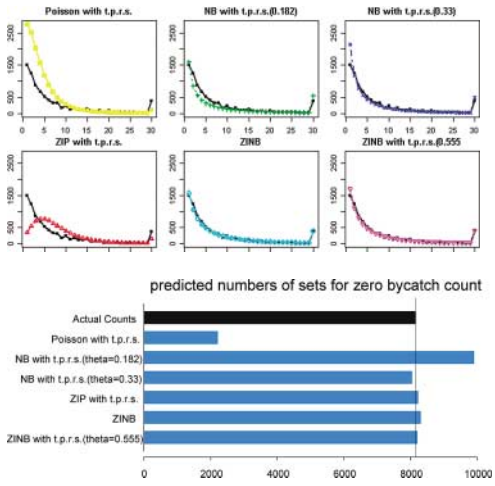


Figure 1: Observed and predicted distributions for shark bycatch counts

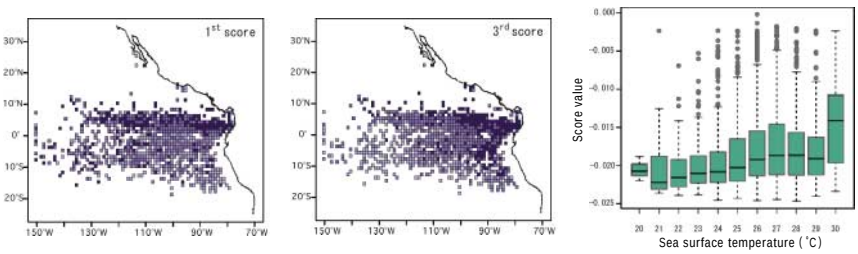


Figure 2:
Spatial distributions of score values and relationship between the first score and sea surface temperature

Analytic Center of the System of Linear Matrix Inequalities and Its Applications

The large-scale problem in computational mathematics has long been regarded intractable if it is "nonlinear."

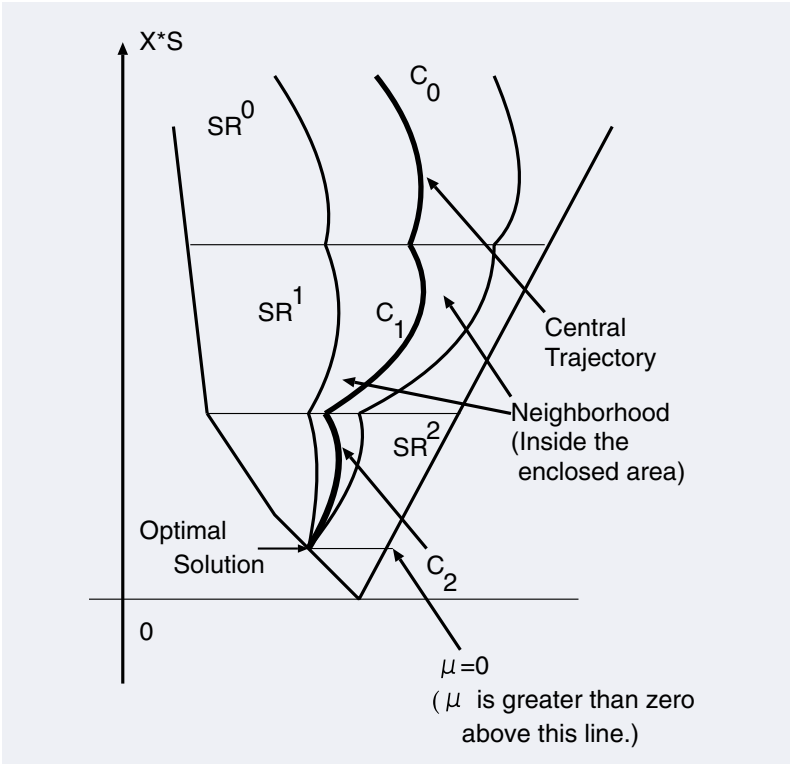
Techniques are mainly developed for individual nonlinear problems and it was difficult to develop a systematic approach. Recently, remarkable progress is made on mathematics and algorithms for treating well-behaved nonlinearlity called "convexity." In particular, there are several practical polynomial-time algorithms for important classes of optimization problems over convex sets. This enables us to introduce new models in statistical science, machine learning, control etc.

The system of linear "matrix" inequalities treated in this research is an extension of the system of linear inequalities. The set of solutions of the system of linear matrix inequalities is curved but is convex. The analytic center of the system of linear matrix inequalities is defined as the point which maximizes the determinant in the solution set. This point is computed efficiently with the interior-point algorithms.

There are many problems in machine learning, knowledge discovery and statistical sciences which reduce to computation of the analytic center of the system of linear matrix inequalities. For example, we can estimate high-dimensional normal distributions by computing analytic centers. New models are also developed for density estimation and estimation of intensity functions of a nonstationary poisson process by computing the analytic center, to which MAIC method can be applied based on the rigorous maximum likelihood estimation.

We developed a polynomial-time primal-dual interior-point algorithm for computing the analytic center. Now we study implementation of the algorithm. Though our algorithm is efficient in theory, there are several issues to be resolved towards a practical fast and robust implementation. This year, we discussed the model class handled in the implementation and studied suitable data structures.

Takashi Tsuchiya



The extended central trajectory traced by the algorithm for computing the analytic center and the neighborhood of the trajectory

Research Cooperation

International Cooperation

Associated Foreign Research Institutes

Organization name	Address	Conclusion day
The Statistical Research Division of the U.S. Bureau of the Census	USA (Washigton)	July 27, 1988 -
Stichting Mathematisch Centrum	The Kingdom of the Netherland (Amsterdam)	May 10, 1989 -
Statistical Research Center for Complex Systems, Seoul National University	The Republic of Korea (Seoul)	October 17, 2002 -
Institute for Statistics and Econometrics, Humboldt University of Berlin	Germany (Berlin)	December 8, 2004 -
Institute of Statistical Science, Academia Sinica	Taiwan (Taipei)	June 30, 2005 -
The Steklov Mathematical Institute	Russia (Moscow)	August 9, 2005 -
Central South University	China (Changsha)	November 18, 2005 -
Soongsil University	The Republic of Korea (Seoul)	April 27, 2006 -
Department of Statistics, University of Warwick	The United Kingdom (Coventry)	January 16, 2007 -

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

A new field classification rule has been introduced in 2007. It has two streams of classification: the ISM field and the major research field. Applicants can use the table below to find the most appropriate type of project.

ISM Fields

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

Major Research Fields

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

Previous Categories (- 2006)

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 networks, 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, medicine, 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

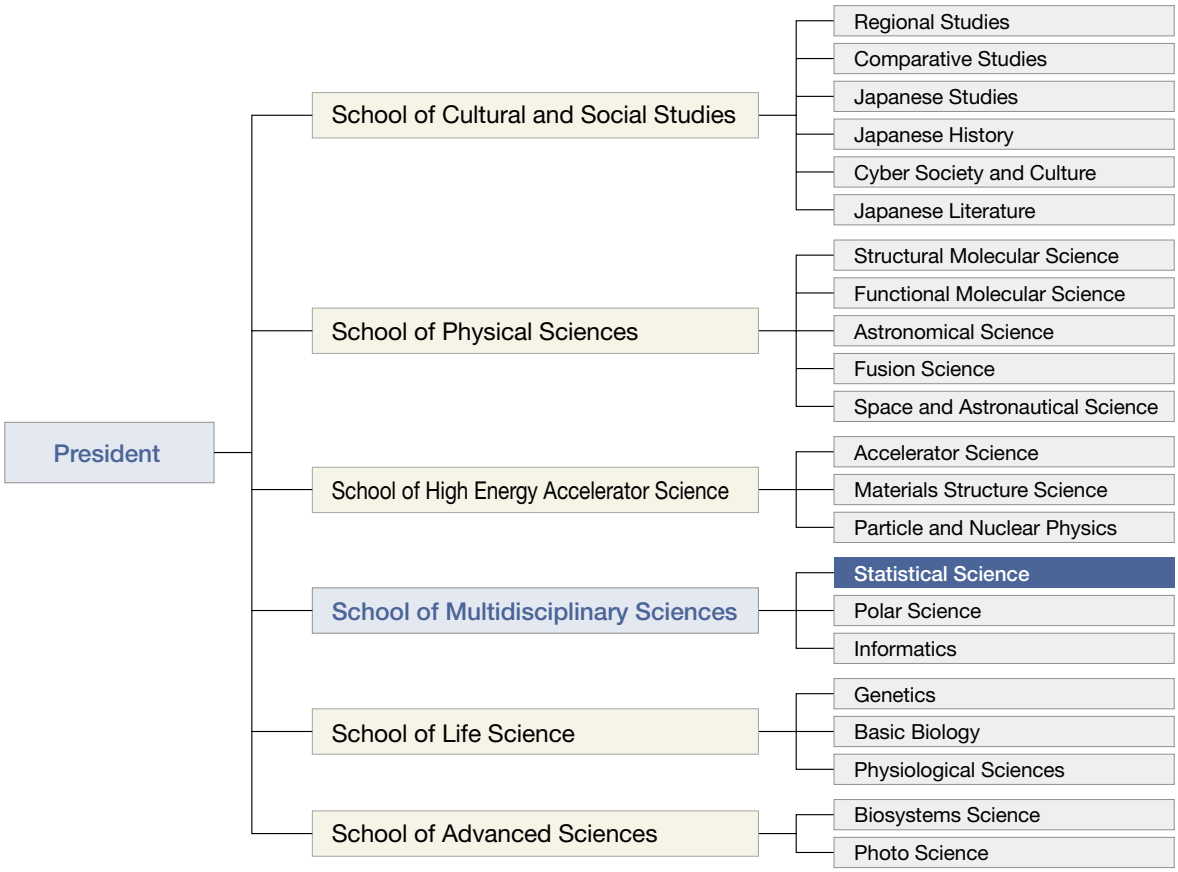
Number of Activities

Fields		2002	2003	2004	2005	2006
Theory and Methodology	1. Fundamental theories	22	18	18	18	19
	2. Computation and optimization	8	7	12	13	8
	3. Time series	16	13	15	14	12
	4. Survey theories	2	3	2	3	3
Application	5. Science and engineering	10	6	10	11	11
	6. Space and earth science	8	5	7	11	10
	7. Biology and medicine	26	25	24	26	34
	8. Humanities and social science	13	10	9	12	12
	9. Environment science	6	10	9	11	9
	10. Others	3	2	2	5	4
	Total	114	99	108	124	122

Graduate School Program

Organization

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



Outline of Education and Research

The course includes 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 Organization of Information and Systems.

Course Requirements and Type of Degree Granted

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

Number of Students (As of April 1, 2007)

Doctor's course three years

Year of enrollment	2002	2003	2004	2005	2006	2007
Number of students	1 ①	2 ②	6 (1) ④	5 ②	3 (1)	5 ②

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

Doctor's course five years

Year of enrollment	2006	2007
Number of students	1	2

University Background of Students

National and public universities

• Hokkaido University • Tohoku University (2) • Fukushima University • University of Tsukuba (5) • Saitama University
• Ochanomizu University • Hitotsubashi University • Chiba University • The University of Tokyo (13) • Tokyo Gakugei University
• Tokyo University of Agriculture and Technology • Tokyo Institute of Technology (2) • Tokyo University of Marine Science and Technology
• Nagoya University (2) • Kyoto University (2) • Osaka University • Okayama University • Shimane University (2) • Kyushu University (2)
• Japan Advanced Institute of Science and Technology, Hokuriku • Osaka City University

Private universities

• Keio University (4) • Chuo University (4) • Tokyo University of Science (4) • Toyo University • Nihon University (2),
• Japan Women's University • Hosei University (7) • Waseda University (5) • Kyoto Sangyo University • Okayama University of Science
• Kurume University

Foreign universities

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

Degrees Awarded

Year	Doctor of Philosophy
1993	2
1994	7
1995	6 [1]
1996	3 [1]
1997	1
1998	4 [1]
1999	6

Year	Doctor of Philosophy
2000	5
2001	5
2002	4
2003	8 [3]
2004	4
2005	4
2006	8 [1]

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

Current Position of Alumni (As of April 1, 2007)

National and public universities, and public organizations

• Obihiro University of Agriculture and Veterinary Medicine, Professor • University of Tsukuba, Professor (2)
• University of Hyogo, Professor • Saitama University, Associate Professor • The University of Electro-Communications, Associate Professor
• The University of Tokyo, Associate Professor • Kyushu University, Associate Professor • Kyushu Institute of Technology, Associate Professor
• The Institute of Statistical Mathematics, Associate Professor • University of Tsukuba, Lecturer • Hokkaido University, Assistant
• Chiba University, Assistant • Tokyo Institute of Technology, Assistant • Hiroshima University, Assistant
• Kyushu University, Assistant Professor • University of the Ryukyus, Assistant • The Institute of Statistical Mathematics, Assistant Professor (5)
• The University of Tokyo, Project Researcher • Tokyo Institute of Technology, Research Fellow
• Nara Institute of Science and Technology, Research Fellow • The Institute of Statistical Mathematics, Project Researcher (3)
• Bank of Japan, Project Post • Financial Services Agency, Financial Research and Training Center, Researcher
• The Institute of Statistical Mathematics, JST CREST Research Fellow • Railway Technical Research Institute, Senior Researcher
• Statistical Information Institute for Consulting and Analysis • Public School, Teacher • The Institute of Statistical Mathematics, Research Fellow (2)

Private universities

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

Foreign universities

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

Private companies, etc.

• Hitachi, Ltd. Central Research Laboratory, Research Fellow • NTT Communication Science Laboratories, Research Fellow
• Seiwa Kikaku • Toyota Motor Corporation, Higashi-Fuji Technical Center, Research Fellow • NLI Research Institute, Chief Researcher
• Sankyo Co., LTD. • Mizuho Trust and Banking, Senior Researcher (2) • JP Morgan Trust Bank Limited, Vice President (Hosei University, Part-Time Lecturer)
• ATR Computational Neuroscience Laboratories, Research Fellow • Schlumberger Limited
• Macquarie Securities, Japan, Quantitative Analyst • Non-Life Insurance Rating Organization of Japan, Staff Member

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 ran three to four courses annually. In 2005, the number of courses rose to 13. In 2006, the number of courses was 15.

Courses

The total number of courses held from 1969 to March, 2007 was 220, with a total of 17,133 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
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
2003	Advanced course	How Can New Technologies of Computer Science Promote Statistical Science ?	March	38
	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
2004	Advanced course	Markov Chain Monte Carlo — Algorithms and Applications to Statistical Science —	February	82
	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
2006	Standard course	Theory and Practice Inferring Molecular Phylogenies	January	72
	Basic course	Introduction to Probabilistic Evaluation of Risk	January	45
	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

Year	Category	Title	Month	Number of participants
	Standard course	A Course on Time Series Analysis for Economics and Finance	June	40
	Standard course	Advances in Kernel Methods: SVM, Nonlinear Data Analysis, and Structured Data	July	73
	Basic course	Basic Medical Statistics Using R	July	20
	Basic course	Introduction to Statistics	July	69
	Standard course	Lectures on Information Theory and Mobile Telecommunication Technologies — Systems and Hardwares for Large-Scale Data Processing —	August-September	13
	Basic course	International Standardization of Statistical Methods — Precision and Trueness of Measurement Methods and Results — Capability of Detection	September	22
	Advanced course	A New Trend of Adaptive and Learning Control Theory	September	14
	Basic course	A Game Theoretic Approach to Mathematical Finance	November	21
	Basic course	Introduction to Quantitative Methods for Social Sciences	November - January	43
	Standard course	Statistical Pattern Recognition	November	65
	Basic course	Introduction to Statistical Data Analysis	November - March	13
	Standard course	Statistical Mathematics of Rock-Scissors-Paper Game	November - December	7
	Standard course	An Introduction to Statistical Analysis Based on the Theory of Martingales	December	38
2007	Basic course	Introduction to Risk Analysis with R — Application of Tree-based and Nonparametric Modelling —	January	49
	Basic course	Introduction to Survey Data Analysis Using R	February	40

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. In 2005 this special lecture was held at the Hitotsubashi Memorial Hall to mark the opening of the Risk Analysis Research Center. The topic of 2006 was "Discovery and analysis of stochastic models". 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 2006

The last Annual Research Report Meeting of the Institute was held on March 15 and 16, 2007. 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, as there were few staff members and participants, they were 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 15 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 Junji Nakano, and the greetings from Genshiro Kitagawa. A total of 47 research education staff, 7 visiting teachers then gave their presentations. In addition poster session was held by 19 research fellows and a research education staff from this year. 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/

Poster session

Finance and Buildings

Administration Subsidy and Others (2006)

Type	Personnel expenses	Non-personnel expenses	Total
Expenditure	981,421	793,042	1,774,463

Unit: ¥1,000

Accepted External Funds (2006)

Type	Subcontracted research	Joint research	Contribution for scholarship	Total
Items	4	5	3	12
Income	16,290	3,313	3,750	23,353

Unit: ¥1,000

Grant-in-Aid for Scientific Research (2006)

Research Category	Items	Amount Granted
Scientific research in priority areas	1	1,500
Scientific research (A)	3	40,560
Scientific research (B)	6	18,200
Scientific research (C)	13	13,100
Exploratory research	3	4,300
Grant-in-aid for young scientists	8	7,200
Grant-in-aid for special purposes	1	1,100
Grant-in-aid for JSPS fellows	3	3,200
Total	38	89,160

Unit: ¥1,000

Site and Buildings (As of April 1, 2007)

Site Area	5,033m^2
Area for Buildings (total)	6,305m^2

Name of Building	Floors	Total Area
Office	R3	4,855m^2
Information Statistics Research Laboratory	R3	1,024m^2
Computation Laboratory	R2	368m^2
Gym, etc.	S1	58m^2

Facilities and Equipment

Computation Resources (As of April 1, 2007)

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 with 256 Itanium2 processors and about 2 TB main memory), a NEC SX-6 (a vector-type computer system with 12 vector processors and 128 GB main memory), and a HITACHI SR11000 (a parallel computer sub-system with 64 Power4+ processors and 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 with 256 Opteron processors for computing node and 640 GB main memory, a SGI Prism visualization system with 16 Itanium2 processors and 32 GB main memory, and a large display system (Multi Opt View).

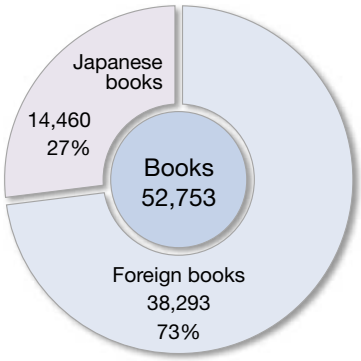
In December 1998, an Ethernet network using 1000Base-SX as a main trunk and 100Base-TX as branches was laid out as a Local Area Network. Workstations, personal computers in researchers' offices, "Supercomputer System for Statistical Science", and "System for Computational Statistics" were all connected 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 April 2007, the network has also been connected to the SINET3 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.

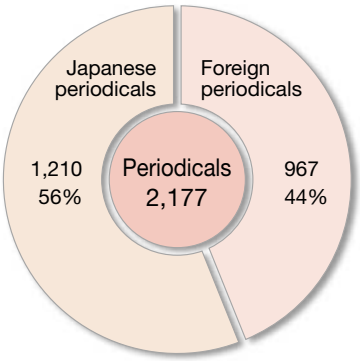
SGI Altix3700 Super Cluster, a parallel computer

Library and Materials (As of April 1, 2007)

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.

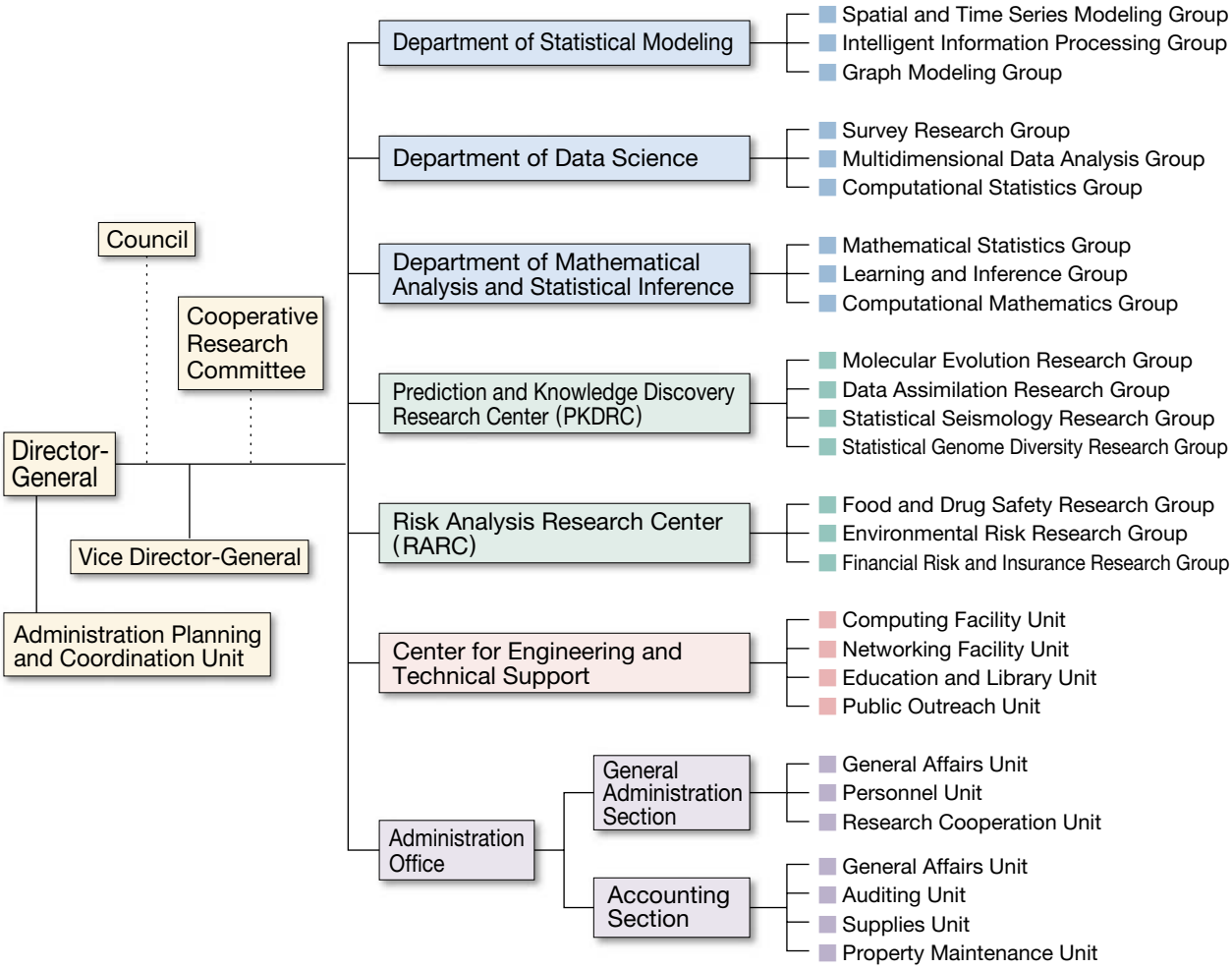




All materials are properly catalogued and can be searched from the web in order to meet the needs of researchers working in a wide of fields. We also accept photocopy requests.

Organization

Organization Diagram (As of April 1, 2007)



Number of Staff (As of July 1, 2007)

Type	Director-General	Professor	Associate Professor	Assistant Professor	Clerk	Technical Staff	Total
Director-General	1						1
Department of Statistical Modeling		5	6	6			17
Department of Data Science		6	7	5			18
Department of Mathematical Analysis and Statistical Inference		4	5	3			12
Center for Engineering and Technical Support						10 (1)	10 (1)
Administration Office					13	2	15
Total	1	15	18	14	13	12 (1)	73 (1)

( ) Staff of reemployment

Staff (As of July 1, 2007)

Director-General	Genshiro KITAGAWA				
Vice Director-General	Masaharu TANEMURA	Vice Director-General	Yoshiyasu TAMURA	Vice Director-General	Tomoyuki HIGUCHI

Department of Statistical Modeling

Director Makio ISHIGURO

Spatial and Time Series Modeling Group

Prof.	Tohru OZAKI	Visiting Prof.	Juan Carlos Jimenez-Sobrino	Assist. Prof.	Kenichiro SHIMATANI
Prof.	Masaharu TANEMURA	Visiting Prof.	Nikolai Petrovich Dolbilin	Assist. Prof.	Genta UENO
Prof.	Yosihiko OGATA	Assoc. Prof.	Yoshinori KAWASAKI	Assist. Prof.	Ryo YOSHIDA
Prof.	Tomoyuki HIGUCHI			Assist. Prof.	Jiancang ZHUANG

Intelligent Information Processing Group

Prof.	Makio ISHIGURO	Assoc. Prof.	Yukito IBA	Assoc. Prof.	Kenji FUKUMIZU
Visiting Prof.	Toshio IRINO	Assoc. Prof.	Yumi TAKIZAWA	Visiting Assoc. Prof.	Arnaud Doucet
Visiting Prof.	Jean-Philippe Vert	Assoc. Prof.	Tomoko MATSUI	Assist. Prof.	Hiroshi SOMEYA

Graph Modeling Group

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

Department of Data Science

Director Takashi NAKAMURA

Survey Research Group

Prof.	Takashi NAKAMURA	Visiting Prof.	Nicolaos Emmanuel SYNODINOS	Assoc. Prof.	Takahiro TSUCHIYA
Prof.	Ryozo YOSHINO	Assoc. Prof.	Tadahiko MAEDA	Assist. Prof.	Wataru MATSUMOTO

Multidimensional Data Analysis Group

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

Computational Statistics Group

Prof.	Yoshiyasu TAMURA	Visiting Prof.	Michiko WATANABE	Visiting Assoc. Prof.	Tohru ONODERA
Prof.	Junji NAKANO	Visiting Prof.	Shigeji FUJITA	Visiting Assoc. Prof.	Takeshi KOSHIBA
Visiting Prof.	Yoshinari FUKUI	Assoc. Prof.	Naomasa MARUYAMA	Assist. Prof.	Nobuo SHIMIZU
Visiting Prof.	Makoto TAIJI	Assoc. Prof.	Koji KANEFUJI		
Visiting Prof.	Makoto MATSUMOTO	Assoc. Prof.	Seisho SATO		

Department of Mathematical Analysis and Statistical Inference

Director Katuomi HIRANO

Mathematical Statistics Group

Prof.	Katuomi HIRANO	Assist. Prof.	Takaaki SHIMURA	Assist. Prof.	Yoichi NISHIYAMA
Prof.	Satoshi KURIKI				

Learning and Inference Group

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

Computational Mathematics Group

Prof.	Takashi TSUCHIYA	Assoc. Prof.	Satoshi ITO	Assoc. Prof.	Yoshihiko MIYASATO
Visiting Prof.	Leonid Faybusovich				

Prediction and Knowledge Discovery Research Center (PKDRC)

Director Shinto EGUCHI

Molecular Evolution Research Group

Assoc. Prof.	Jun ADACHI	Assist. Prof.	Ying CAO	Research Fellow upon JSPS Program	Takeshi SASAKI
				Project Researcher	Atsushi MATSUI

Data Assimilation Research Group

Prof.	Tomoyuki HIGUCHI	Assist. Prof.	Genta UENO	Researcher, JST CREST	Shinya NAKANO
Visiting Prof.	Takashi WASHIO	Assist. Prof.	Ryo YOSHIDA	Researcher, JST CREST	Kazuyuki NAKAMURA
		Project Researcher	Alexandre TERMIER	Researcher, JST CREST	Daisuke INAZU

Statistical Seismology Research Group

Prof.	Yosihiko OGATA	Assist. Prof.	Jiancang ZHUANG	Assoc. Prof.	Yasuaki MURATA Institute of Geoscience, Geological Survey of Japan, AIST
Visiting Prof.	Shinji TOHDA	Project Researcher	Takaki IWATA		
Visiting Assoc. Prof.	Jeffrey J. McGuire	Project Researcher	Ushio TANAKA		

Statistical Genome Diversity Research Group

Prof.	Shinto EGUCHI	Assoc. Prof.	Mihoko MINAMI	Project Researcher	Takayuki SAKAGUCHI
Prof.	Satoshi KURIKI	Assoc. Prof.	Shiro IKEDA	Project Researcher	Md Nurul Haque Mollah
Visiting Prof.	Hirofumi WAKAKI	Assoc. Prof.	Hironori FUJISAWA		
Visiting Prof.	Su-Yun Huang	Assist. Prof.	Tadayoshi FUSHIKI		

Risk Analysis Research Center (RARC)

Director Hiroe TSUBAKI

Food and Drug Safety Research Group

Prof.	Toshiharu FUJITA	Visiting Prof.	Toshiya SATO	Visiting Assoc. Prof.	Toshimitsu HAMASAKI
Visiting Prof.	Hiroe TSUBAKI	Visiting Prof.	Kunihiko HAYASHI	Visiting Assoc. Prof.	Yoshimitsu HIEJIMA
Visiting Prof.	Manabu IWASAKI	Visiting Assoc. Prof.	Satoshi AOKI	Assist. Prof.	Takaaki SHIMURA

Environmental Risk Research Group

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

Financial Risk and Insurance Research Group

Visiting Prof.	Tata Subba Rao	Assoc. Prof.	Seisho SATO	Project Researcher	Masakazu ANDO
Visiting Prof.	Naoto KUNITOMO	Assoc. Prof.	Yoshinori KAWASAKI	Project Researcher	Masayuki KUMON
Visiting Prof.	Hiroshi TSUDA	Visiting Assoc. Prof.	Toshinao YOSHIBA	Project Researcher	Ken-ichi KAWAI
Assoc. Prof.	Satoshi YAMASHITA	Project Researcher	Yoko TANOKURA		

Postdoctoral Researchers

Project Professor	Atsushi FUKASAWA	Project Researcher	Satoko KAWARASAKI	Project Researcher	Teruhisa SUGIMOTO
Project Researcher	Masahiro OKABE	Research Fellow upon JSPS Program	Shohei SHIMIZU	Project Researcher	Yoshiyuki TSUDA

Center for Engineering and Technical Support

Director Junji NAKANO　Vice Director Satoshi YAMASHITA　Deputy Manager (Concurrent) Setsuko TERAO

Head of Computing Facility Unit	Saeko TANAKA	Head of Education and Library Unit	Setsuko TERAO
Head of Networking Facility Unit	Kazuhiro NAKAMURA	Head of Public Outreach Unit	Yuriko WATANABE

Administration Office

General Manager Toshifumi HAGIWARA

General Administration Section

Manager of General Administration Section	Yoshifumi KUROKAWA	Chief of Personnel Unit	Masami SAKAO
Deputy Manager of General Administration Section	Shigeyuki FUJII	Chief of Research Cooperation Unit (Concurrent)	Shigeyuki FUJII
Chief of General Affairs Unit	Fumio SUTŌ		

Accounting Section

Manager of Accounting Section	Toyokichi KITAHARA	Chief of Auditing Unit (Concurrent)	Minoru HAGIWARA
Deputy Manager of Accounting Section	Tetsuya KUMAZAWA	Chief of Supplies Unit	Yoshiyuki SAKATA
Chief of General Affairs Unit	Minoru HAGIWARA	Chief of Property Maintenance Unit	Hirotomo SHIMIZU

Council of The Institute of Statistical Mathematics (As of April 1, 2007)

Yutaka KANO	Professor, Graduate School of Engineering Science, 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 Information Science and Technology, 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 Astronomy Data Center, National Astronomical Observatory of Japan, National Institutes of Natural Sciences
Satoru MIYANO	Professor, Human Genome Center, the Institute of Medical Science, 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)
Takashi NAKAMURA	Professor (Director of Department of Data Science, ISM)
Katsuomi HIRANO	Professor (Director of Department of Mathematical Analysis and Statistical Inference, ISM)
Shinto EGUCHI	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)
Satoshi KURIKI	Professor (Department of Mathematical Analysis and Statistical Inference, ISM)
Takashi TSUCHIYA	Professor (Department of Mathematical Analysis and Statistical Inference, ISM)

Cooperative Research Committee (As of June 1, 2007)

Manabu IWASAKI	Professor, Faculty of Science and Technology, Seikei University
Hidetoshi KONNO	Professor, Graduate School of System and Information Engineering, University of Tsukuba
Masahiro MIZUTA	Professor, Information Initiative Center, Hokkaido University
Michiko WATANABE	Professor, Faculty of Economics, Toyo University
Makio ISHIGURO	Professor (Department of Statistical Modeling, ISM)
Takashi NAKAMURA	Professor (Department of Data Science, ISM)
Shinto EGUCHI	Professor (Department of Mathematical Analysis and Statistical Inference, ISM)
Takashi TSUCHIYA	Professor (Department of Mathematical Analysis and Statistical Inference, ISM)

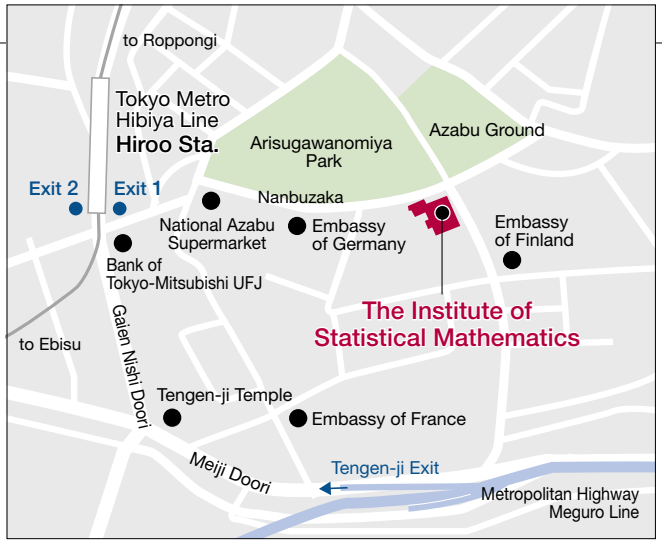
Professor Emeritus (As of April 1, 2007)

Hirojiro AOYAMA	Hirotugu AKAIKE	Masakatsu MURAKAMI	Yoshiyuki SAKAMOTO
Kameo MATUSITA	Giitiro SUZUKI	Kunio TANABE	Takemi YANAGIMOTO
Sigeki NISIHIRA	Ryoichi SHIMIZU	Tadashi MATSUNAWA	Yoshiaki ITOH
Tatsuzo SUZUKI	Noboru OHSUMI	Masami HASEGAWA	

History

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, 1999	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 Research Center was instituted.

The Institute of Statistical Mathematics



Access to the ISM

◎ Tokyo Metro Hibiya Line, Hiroo Sta.
About 7 min on foot

◎ Tokyo Metro Namboku Line, Azabu-jūban Sta.
Toei Ōedo Line, Azabu-jūban Sta.
About 20 min on foot

Inter-University Research Institute Corporation
Research Organization of Information and Systems
The Institute of Statistical Mathematics
4-6-7 Minami-Azabu, Minato-ku, Tokyo 106-8569, Japan
Tel: +81-(0)3-3446-1501 (Reception) Fax: +81-(0)3-3443-3552 (General Affairs)
http://www.ism.ac.jp/