The Institute of Statistical Mathematics

ACTIVITY REPORT

2013.4 — 2015.3

Tokyo, Japan

The Institute of Statistical Mathematics

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October 2015
Center for Engineering and Technical Support
The Institute of Statistical Mathematics
Research Organization of Information and Systems
Inter-University Research Institute Corporation

Contents

Foreword

The Institute of Statistical Mathematics (ISM) has engaged in comprehensive research concerning statistical mathematics for more than 70 years. ISM was established in June 1944 as a research institute under the direct control of the Ministry of Education, Science and Culture. Subsequently, it was reorganized as the National Inter-University Research Institute in 1985 and the Inter-University Research Institute in 1989, and became part of the Inter-University Research Institute Corporation Research Organization of Information and Systems (ROIS) in 2004. A strong orientation toward research grounded in reality has been handed down through generations of ISM researchers as a hands-on approach to research.

In 2015, the final year of the second medium-term plan of ROIS, ISM has moved forward with research activities with the objectives of "establishing and practicing research methods that utilize big data (data-centric science)", "the establishment of an Network Of Excellence (NOE)-type cooperative research system with statistical mathematics at its core and the pursuit of project research in five areas (risk science, next-generation simulation science, survey science, statistical machine learning, and service science)", "the pursuit of integrated research through the development of 'T-type personnel' endowed with statistical thinking capabilities", and "the construction and provision of the world's most advanced statistical computation platform". We are achieving results in areas such as the strengthening of cooperative use and cooperative research through high-performance facilities, expansion and upgrading of programs to foster and promote statistical thinking, and globalization of statistical mathematics through cooperation with institutes in Japan and overseas and recruitment of overseas researchers, focusing on two major projects: the NOE Project and the Project for Fostering and Promoting Statistical Thinking. In this way, we are steadily laying the foundation to fulfill the role expected of the Inter-University Research Institute in preparation for the third medium-term plan.

During the period of the third medium-term plan, every Inter-University Research Institute Corporation is expected to play three key roles: 1) contribute to the researcher community as a whole, 2) contribute to the functional strengthening of universities, and 3) contribute to society. To fulfill the role of contributing to the researcher community, the institutes are focusing efforts

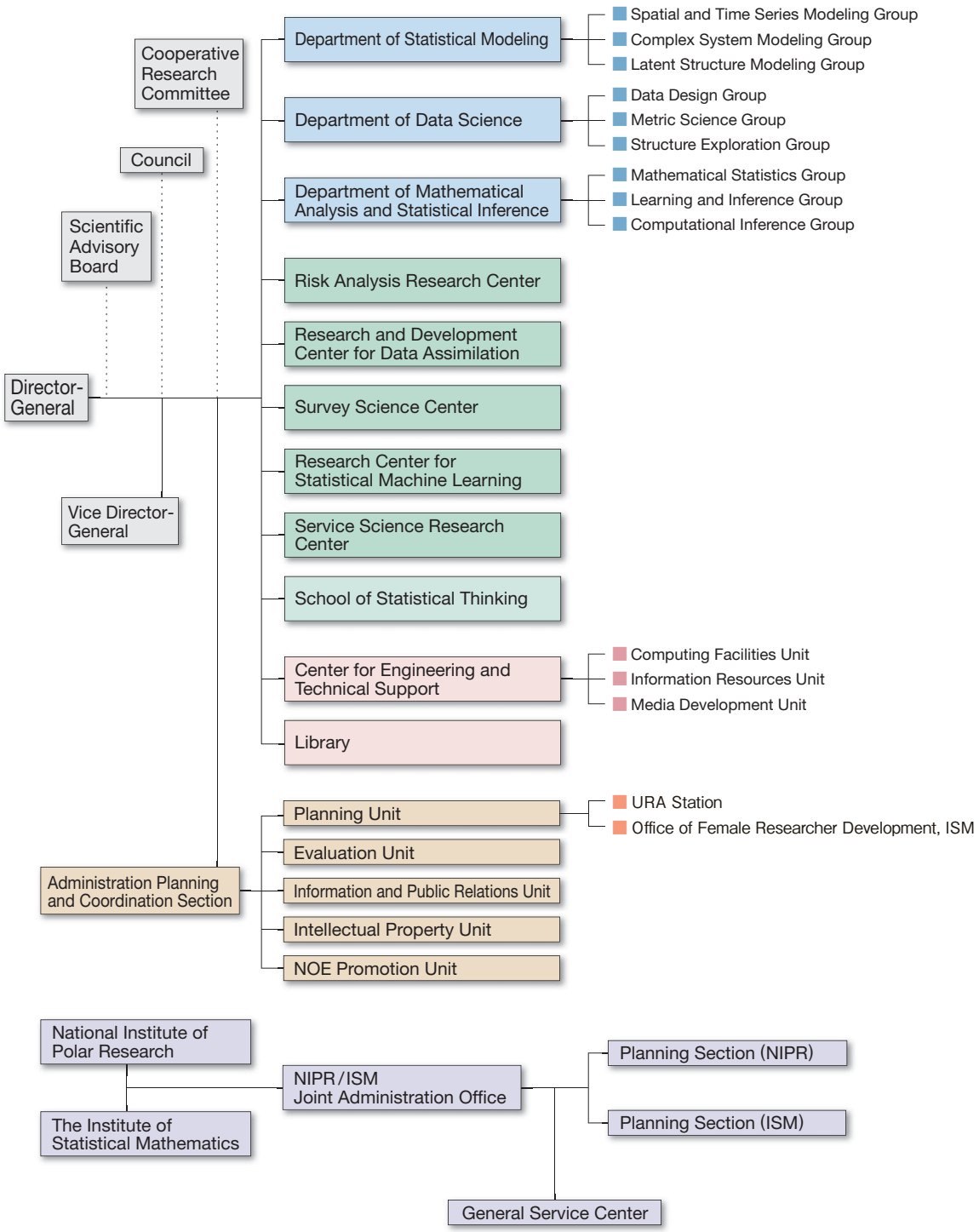
on the provision of an environment for the nurturing and participation of young researchers, which is also a government policy. ISM will also provide particular support for restructuring of the NOE Project and the emergence of young researchers, including URA (University Research Administrators), in the research community. To contribute to the functional strengthening of universities, we plan to engage in the sustained development of open-type cooperative use and cooperative research that takes advantage of the connectivity that is the academic characteristic of the field of statistical mathematics and advanced facilities as exemplified by the ISM's supercomputer systems (The Supercomputer System for Data Assimilation, nicknamed "A"; The Supercomputer System for Statistical Science, nicknamed "I"; and the Communal Cloud Computing System, nicknamed "C") and, recently, to strengthen and offer the Project for Fostering and Promoting Statistical Thinking to enable researchers to acquire the broad statistical thinking capabilities required within and beyond the scientific and mathematical research community. To contribute to society, ISM will seek to expand industry–academic–government collaboration in line with institute size on the basis of recognition of the connective role that is the academic characteristic of statistical mathematics. One characteristic of the Tama area, which is the Western part of Tokyo around Tachikawa, is that it is home to a mixture of numerous research institutions, educational institutions, and the research divisions of private-sector companies, and we will devise and realize measures to contribute to their further mutual development. 2015 is also the fourth year of the Coop-with-Math Program and the third year of the Data Scientist Training Network, projects sponsored by the Ministry of Education, Culture, Sports, Science and Technology (MEXT). Through these programs and initiatives, we plan to implement specific collaborative policies and measures with research institutes and centers attached to national universities, national research and development agencies, private-sector companies, and academic and educational institutions.

To achieve these objectives, ISM will push forward with research activities and intends to continue meeting the expectations of academia and society, and delivering wide-ranging accomplishments. We look forward to your continuing understanding and support for our activities.

Tomoyuki Higuchi
Director-General

October 2015

Organization Diagram (As of April 1, 2015)



1 Organization

Since its foundation as the one and only national institute for statistical science in Japan, the Institute of Statistical Mathematics has continued to exert a prominent influence on the study and research of statistical science. The ever-increasing needs for statistical methods and ideas in various fields of science and technology led the Institute to reorganize itself in 1985 as an inter-university research institute, which puts a major emphasis on research collaboration with all disciplines of science.

In April 2004, the Institute begun a new chapter as a member of the Research Organization of Information and Systems, Inter-University Research Institute Corporation, together with three other institutes, National Institute of Informatics, National Institute of Genetics and National Institute of Polar Research. The new Institute building, which is shared with National Institute of Polar Research and National Institute of Japanese Literature, was built in Tachikawa in March 2009. The institute moved to Tachikawa and started its activities in October 2009.

At present, the Institute consists of three departments, five research centers, a school, a support center, an administration office, a council, and a committee. All Institute activity is guided by the leadership of the Director-General and three Vice Director-Generals. The Council of the Institute of Statistical Mathematics implements any necessary recommendations. The Cooperative Research Committee organizes and facilitates collaborative research projects developed between scholars at the Institute and scientists in other academic agencies.

Three research departments, the Department of Statistical Modeling, the Department of Data Science, and the Department of Mathematical Analysis and Statistical Inference, form the active core of the Institute with its 45 academic staff, carrying out research on either statistical theory or its application to other fields of science and industry. The Department of Statistical Modeling and its three groups study statistical modeling aspects on various fields. In the three groups of the Department of Data Science, efforts are concentrated on data collection and handling. The three groups of the Department of Mathematical

Analysis and Statistical Inference are specifically concerned with fundamental aspects of statistics.

The five strategic research centers, Risk Analysis Research Center, Research and Development Center for Data Assimilation, Survey Science Center, Research Center for Statistical Machine Learning, and Service Science Research Center were established in 2005, 2011, 2011, 2012 and 2012 respectively, as main bodies for establishing Network of Excellence (NOE) and performing project research on specific topics. Risk Analysis Research Center studies many topics related to risk, such as food, drug, clinical trials, suicide, environment, resource management, finance, insurance, earthquake and genome information. Research and Development Center for Data Assimilation conducts research and development of data assimilation techniques such as the ensemble Kalman filter and the particle filter and applies them to a variety of research fields. Survey Science Center carries out survey research of Japanese national character and cross-national comparative studies, and studies techniques of survey research. Research Center for Statistical Machine Learning aims at supporting the research community of the field as an activity of the NOE projects, and producing influential research works by carrying out various research projects with domestic and international collaborations. Service Science Research Center brings the data-centric methodologies into the service fields, for example, marketing and supply chain management. More detailed descriptions of the objectives of each department and center are presented in the next chapter. The information covers research subjects and the interests of staff, which range from the physical sciences and life sciences to the social and cultural sciences.

The School of Statistical Thinking was established in 2012 to perform the project for fostering and promoting statistical thinking. As data produced in various fields of the real world become very large and complex, people who can discover important information buried in such data are strongly required. The Institute has provided several educational courses and supports to disseminate statistical thinking for a long time. The School integrates and expands such activities and is a place to study statistical thinking.

The Center for Engineering and Technical Support was established in 2006 to help the activities of the Japanese statistical science commu-

nity by providing adequate computational and informational resources. This center has 11 technical staff that work on special jobs including maintenance of computer systems, editing journals and bibliographical services. The Institute has three supercomputer systems and a library of books and journals, not only in pure statistics, but also in fields of specific interest to researchers (e.g., physics, genetics and social sciences). Lastly, there is also a division of 13 officials who manage general affairs.

The Institute devotes itself to educating young statisticians as well. As a constituent of the Graduate University for Advanced Studies (Department of Statistical Science, School of Multidisciplinary Sciences), the Institute offers graduate programs leading to a Ph.D. degree. (See Supplement on page 96.) (The number of staff mentioned above refer to the full strength on April 1, 2015.)

2

Departments, Centers and Research Staff

Department of Statistical Modeling

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

■ Spatial and Time Series Modeling Group

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

— *Staff* —

Nobuhisa KASHIWAGI, Prof.
Tomoyuki HIGUCHI, Director-General, Prof.
Jiancang ZHUANG, Assoc. Prof.
Genta UENO, Assoc. Prof.
Shin'ya NAKANO, Assist. Prof.

— *Subjects* —

- Methods for prediction and knowledge discovery based on Bayesian model
- Modeling and application of point location and/or spatial structure
- Bayesian multi-dimensional data analysis
- Point process modeling of market data and its application
- Statistical seismology
- Model integration by particle filter
- Statistical analysis and modeling of stochastic point process

- Point process model and its applications to biosciences
- Development of data assimilation system in Earth science
- Environmental data analysis

■ Complex System Modeling Group

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

— *Staff* —

Yoshiyasu TAMURA, Vice Director-General, Prof.
Junji NAKANO, Prof.
Yukito IBA, Assoc. Prof. (-2013.8.31), Prof. (2013.9.1-)
Takehiro FUKUI, Visiting Prof.
Hiroko NAKANISHI, Visiting Prof.
Yumi TAKIZAWA, Assoc. Prof.
Fumikazu MIWAKEICHI, Assoc. Prof.
Shinsuke KOYAMA, Assist. Prof. (-2014.8.31), Assoc. Prof. (2014.9.1-)
Kazuhiro AOYAMA, Visiting Assoc. Prof.

— *Subjects* —

- Non-linear stochastic differential equations and non-linear time series analysis
- Markov chain Monte Carlo/sequential Monte Carlo methods and their applications
- Physical random number generation and evaluation
- Rare event sampling
- Individual and social behavior analysis
- Data and model visualization
- Time series/spatial-temporal analysis for neural data
- Spatial-temporal random event estimation by neural network
- Modeling for intensive data

■ Latent Structure Modeling Group

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

— *Staff* —

Hiroshi MARUYAMA, Vice Director-General, Prof.
Tomoko MATSUI, Director, Prof.
Yoshinori KAWASAKI, Assoc. Prof.
Ryo YOSHIDA, Assoc. Prof.
Kazuhiro MINAMI, Assoc. Prof. (2014.9.1-)
Sayaka SHIOTA, Project Assist. Prof. (2013.4.1-2014.3.31)

— *Subjects* —

- Hidden variable modeling with smoothing prior
- Estimation and application of regularized non-linear models
- Data structure learning using kernel methods
- Modeling and simulation for biological control system
- Multi-dimensional modeling for social behavior
- Inverse problem solution using hierarchical Bayesian inference
- Requirement definition in modeling for life cycle
- Model evaluation by information criteria
- Estimation of latent structure for speech, musical and image data based on machine learning

Department of Data Science

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

■ Data Design Group

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

— *Staff* —

Takashi NAKAMURA, Director, Prof.
Ryozo YOSHINO, Prof.
Kazufumi MANABE, Visiting Prof. (2013.4.1-2014.3.31)

Naomasa MARUYAMA, Assoc. Prof.
Tadahiko MAEDA, Assoc. Prof.
Takahiro TSUCHIYA, Assoc. Prof.
Toshihiko KAWAMURA, Assist. Prof. (-2014.11.30)

— *Subjects* —

- Social research methods and data analysis
- Cohort analysis of repeated social research data
- Data science for Behaviormetric study of civilizations
- Theory and applications of latent variable models
- Research on nonsampling errors in surveys
- Analysis of longitudinal and repeated cross-sectional surveys
- Statistical research on the Japanese national character
- Sampling theory and its applications
- Methodology of cross-national comparative survey
- Development of indirect questioning techniques
- Statistical quality control
- Decoding of algebraic geometric codes
- Methodology for collecting and publishing information relating to statistical science

■ Metric Science Group

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

— *Staff* —

Satoshi YAMASHITA, Prof.
Kenichiro SHIMATANI, Assoc. Prof.
Masayuki HENMI, Assoc. Prof.
Ikuko FUNATOGAWA, Assoc. Prof. (2014.4.1-)
Nobuo SHIMIZU, Assist. Prof.
Hisashi NOMA, Assist. Prof.

— *Subjects* —

- Evaluation methodology for financial statistic models
- Valuation of market risk and credit risk
- Statistical analysis in clinical trials of pharmaceutical drugs

- Design and analysis of clinical studies for personalized medicine
- Methodology of clinical researches for developing predictive medicine
- Methodology of study designs and statistical methods for epidemiologic researches
- Theory of semiparametric inference and its application
- Foundation of meta-analysis and its application
- Design for long-term ecological study
- Missing data analysis
- Symbolic data analysis
- Functional data analysis

■ Structure Exploration Group

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

— *Staff* —

Hiroe TSUBAKI, Vice Director-General, Prof.
Koji KANEFUJI, Prof.
Jun ADACHI, Assoc. Prof.
Manabu KUROKI, Assoc. Prof.
Yoo Sung PARK, Assist. Prof.

— *Subjects* —

- Statistical methods to establish environment standards
- Reliability theory based on life-span models
- Environmental statistics
- Causal data analysis for advanced business modeling
- Statistical causal inference
- Graphical modeling
- Modeling of molecular evolution
- Maximum likelihood inference of molecular phylogeny
- Comparative analysis of genome structure
- Theoretical biology and bioinformatics
- Analysis of educational and psychological assessment data
- Latent variable models for social sciences
- Theory and applications of multilevel modeling

・ Longitudinal data analysis
・ Organizational behavior based on multilevel analysis

Department of Mathematical Analysis and Statistical Inference

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

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

— *Staff* —
Satoshi KURIKI, Director, Prof.
Yoichi NISHIYAMA, Assoc. Prof.
Shuhei MANO, Assoc. Prof.
Shogo KATO, Assist. Prof. (-2014.8.31), Assoc. Prof. (2014.9.1-)
Takaaki SHIMURA, Assist. Prof.
Kei KOBAYASHI, Assist. Prof.
Teppei OGIHARA, Assist. Prof. (2014.7.1-)

— *Subjects* —
・ Statistical inference and statistical decisions
・ Analysis of multivariate data and contingency tables
・ Integral-geometric approach to random field theory
・ Multiple comparisons
・ Statistical inference based on graphical models
・ Additive processes
・ Heavy-tailed distributions
・ Algebraic statistics
・ Directional statistics
・ Stochastic modeling of data with combinatorial structures

■ Learning and Inference Group

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

— *Staff* —

Shinto EGUCHI, Prof.
Kenji FUKUMIZU, Prof.
Ryuei NISHII, Visiting Prof.
Hironori FUJISAWA, Assoc. Prof. (-2013.8.31), Prof. (2013.9.1-)
Shiro IKEDA, Assoc. Prof.
Daichi MOCHIHASHI, Assoc. Prof.
Yoshiyuki NINOMIYA, Visiting Assoc. Prof.
Osamu KOMORI, Project Assist. Prof. (2013.6.1-)

— *Subjects* —

- Statistical learning theory
- Information geometry
- Robust statistics
- Statistical inference for observational studies
- Theory of multivariate distributions and its application
- Bioinformatics
- Stochastic inference
- Genome statistics
- Statistical inference based on positive semidefinite kernel
- Approximation theory on graph
- Statistical singular model
- Statistical natural language processing

■ Computational Inference Group

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

— *Staff* —

Yoshihiko MIYASATO, Prof.
Atsushi YOSHIMOTO, Prof.

Satoshi ITO, Prof.
Tadayoshi FUSHIKI, Assist. Prof. (-2013.7.14), Project Assist. Prof. (2013.7.15-2014.3.31)

— *Subjects* —

- Algorithms for computational inference
- Optimization modeling in computational inference
- Systems design under uncertainty
- Nonlinear H∞ control based on inverse optimality
- Adaptive gain-scheduled control
- Mathematics and computational complexity analysis of convex programming
- Theory and computational methods of optimization
- Iterative learning control
- Computational algorithms for state-space modeling
- Analysis of social system
- Optimization in natural resource controling problem
- Control of multi-agent system

Risk Analysis Research Center

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

■ Data Infrastructure for Risk Analysis
To generate data-centric risk sciences this group will construct data bases for risk analysis by collecting relevant data and their linkage. The project will further investigate quality management of risk data and supply secured and efficient data editing environment to researchers where they can analyze well anonymized individual information safely.

— *Staff* —

Hiroe TSUBAKI, Vice Director-General, Prof.
Satoshi YAMASHITA, Director, Prof.
Sadaaki MIYAMOTO, Visiting Prof.

Kouji OKUHARA, Visiting Assoc. Prof.
Hideki KATAGIRI, Visiting Assoc. Prof.

■ Mathematical Analysis of Risk

To quantify the risk factors such as natural disasters, severe diseases and accidents, we need to formalize their stochastic behaviors, and make statistical inferences based on their tail distributions. As such, we study the extreme value theory, copula model and multiple comparisons from the mathematical and computational viewpoints. To promote the activity of this research community, we organize the annual cooperative research symposiums "Extreme value theory and applications" (since 1994) and "Infinitely divisible processes and related topics" (since 1992), and other occasional international symposiums.

— *Staff* —

Satoshi KURIKI, Prof.
Rinya TAKAHASHI, Visiting Prof.
Nakahiro YOSHIDA, Visiting Prof.
Shogo KATO, Assoc. Prof.(2014.4-)
Toshikazu KITANO, Visiting Assoc. Prof.
Hisayuki HARA, Visiting Assoc. Prof.
Takaaki SHIMURA, Assist. Prof.

■ Medical Care and Health Science Project

This project consists of the following three subprojects. In the first one, we aim to develop the statistical framework and methodology of quantitative risk evaluation for substances ingested by the human body. In the second one, we construct theoretical schemes for clinical trial designs toward predictive medicine and develop effective statistical methods for developing and validating predictive biomarkers for treatment efficacy and adverse reactions and for evaluating risk and benefit of treatment based on predictive biomarkers in premarketing and postmarketing clinical trials. In the third one, we clarify effective suicide prevention and mental health care through discussion with experts of mental health and application of spatio-temporal data analysis and causal modeling of various data which may affect mental health.

— *Staff* —

Masayuki HENMI, Vice Director, Assoc. Prof.

Hiroe TSUBAKI, Vice Director-General, Prof.
Shinto EGUCHI, Prof.
Manabu IWASAKI, Visiting Prof.
Yoichi KATO, Visiting Prof.
Tosiya SATO, Visiting Prof.
Masaaki MATSUURA, Visiting Prof.
Shigeyuki MATSUI, Visiting Prof.
Satoshi TERAMUKAI, Visiting Prof.
Tatsuhiko TSUNODA, Visiting Prof.
Manabu KUROKI, Assoc. Prof.
Fumikazu MIWAKEICHI, Assoc. Prof.
Ikuko FUNATOGAWA, Assoc. Prof. (2014.4.1-)
Toshio OHNISHI, Visiting Assoc. Prof.
Hisateru TACHIMORI, Visiting Assoc. Prof.
Makoto TOMITA, Visiting Assoc. Prof.
Takafumi KUBOTA, Project Assoc. Prof. (-2014.3.31), Visiting Assoc. Prof. (2014.4.1-)
Hisashi NOMA, Assist. Prof.
Yoshitake TAKEBAYASHI, Project Assist. Prof. (2014.9.1-)

■ Environmental Statistics Project

This group intends to develop statistical methods in the environmental problems we face.

— *Staff* —

Koji KANEFUJI, Prof.
Nobuhisa KASHIWAGI, Prof.
Kunio SHIMIZU, Prof.
Mihoko MINAMI, Visiting Prof.
Megu OHTAKI, Visiting Prof.
Satoshi TAKIZAWA, Visiting Prof.
Osamu NAGAFUCHI, Vsiting Prof.
Toshihiro HORIGUCHI, Visiting Prof.
Naoki SAKAI, Visiting Prof.
Kenichiro SHIMATANI, Assoc. Prof.
Takashi KAMEYA, Visiting Assoc. Prof.
Tomoaki IMOTO, Project Assist. Prof.

■ Risk analysis for resource management Project

Our research focuses on mathematical modeling for prediction and control of natural and socio-economic resource change within deterministic and stochastic frameworks. Through field survey, we conduct research on sustainable renewable resource management as a socio-economic system. One of our current projects concerns risk evaluation and economic analysis of sustainable forest and ecosystem management.

— *Staff* —

Atsushi YOSHIMOTO, Prof.
Katsuhiko TAKATA, Visiting Prof.
Peter SUROVY, Project Assoc. Prof. (2013.11.1-2014.3.31)
Takafumi KUBOTA, Project Assoc. Prof. (-2014.3.31), Visiting Assoc. Prof. (2014.4.1-)
Kenichi KAMO, Visiting Assoc. Prof.
Masashi KONOSHIMA, Visiting Assoc. Prof.
Katsuya TANAKA, Visiting Assoc. Prof.
Bam Haja Nirina RAZAFINDRABE, Visiting Assoc. Prof.
Chiho KAMIYAMA, Project Assist. Prof. (2013.4.1-2013.6.30)
Diana SUROVA, Project Assist. Prof. (2013.12.1-2014.3.31)
Buntaro KUSUMOTO, Project Assist. Prof. (2014.9.1-2015.3.10)

■ The risk evaluation, control and management of finance and insurance

The aims of this project are to develop the methodology of risk evaluation, risk control and risk management, focusing to financial market, credit risk and macro-economic data.

— *Staff* —

Satoshi YAMASHITA, Director, Prof.
Naoto KUNITOMO, Visiting Prof.
Hiroshi TSUDA, Visiting Prof.
Toshio HONDA, Visiting Prof.
Michiko MIYAMOTO, Visiting Prof.
Toshinao YOSHIBA, Visiting Prof.
Tadashi ONO, Visiting Prof.
Masayuki HENMI, Vice Director, Assoc. Prof.
Yoshinori KAWASAKI, Assoc. Prof.
Yoichi NISHIYAMA, Assoc. Prof.

Masakazu ANDO, Visiting Assoc. Prof.
Yasutaka SHIMIZU, Visiting Assoc. Prof.
Masaaki FUKASAWA, Visiting Assoc. Prof.
Seisho SATO, Visiting Assoc. Prof.
Teppei OGIHARA, Assist. Prof. (2014.11.1-)

■ Statistical Seismological Research Project

The statistical seismological research group develops statistical models for quantitative analysis of earthquake occurrence and the relation between seismicity and other phenomena from geophysical or geochemical observations, techniques of probabilistic earthquake forecasting, and methods for evaluating forecasting performance. More general types of random events in time and/or space, such as fires, crimes, etc., are also studied, especially, the construction of forecasting models based on our understanding of the mechanisms of these phenomena, as well as their statistical inferences.

—Staff—

Shiyong ZHOU, Visiting Prof.
Warner MARZOCCHI, Visiting Prof.
Jiancang ZHUANG, Assoc. Prof.
Bogdan Dumitru ENESCU, Visiting Assoc. Prof.
Takaki IWATA, Visiting Assoc. Prof.
Shi CHEN, Visiting Assoc. Prof.
Shun'ichi NOMURA, Visiting Assist. Prof.
Ting WANG, Visiting Assist. Prof.

Research and Development Center for Data Assimilation

Data assimilation is a fundamental technique that constructs precise and predictable models by combining numerical simulations and observational/experimental data. Research and Development Center for Data Assimilation studies foundations of the data assimilation based on Bayesian statistics, implements numerical algorithms on high-performance computer systems in order to deal with large-scale problems, and promotes the data assimilation to various fields of sciences.

— *Staff* —

Tomoyuki HIGUCHI, Director-General, Director, Prof.
Yoshiyasu TAMURA, Vice Director-General, Vice Director, Prof.
Junji NAKANO, Prof.
Yukito IBA, Assoc. Prof. (-2013.8.31), Prof. (2013.9.1-)
Takashi WASHIO, Visiting Prof.
Genta UENO, Assoc. Prof.
Ryo YOSHIDA, Assoc. Prof.
Hiromichi NAGAO, Project Assoc. Prof. (-2013.8.31), Visiting Assoc. Prof. (2014.11.1-)
Kazuyuki NAKAMURA, Visiting Assoc. Prof.
Hiroshi KATO, Visiting Assoc. Prof.
Osamu HIROSE, Visiting Assoc. Prof.
Shin'ya NAKANO, Assist. Prof.
Christopher Andrew ZAPART, Project Assist. Prof. (-2014.3.31)
Masaya SAITO, Project Assist. Prof.
Terumasa TOKUNAGA, Project Assist. Prof. (2013.5.1-)

— *Subjects* —

- Research of sequential Monte Carlo methods, nonlinear filtering and visualization of ultrahigh dimensional data
- Development of new algorithms that generates random numbers with ultrahigh speed and quality by combining pseudo and hardware random numbers
- Application of data assimilation to practical probrems in various fields of sciences such as space, earth and life sciences
- Development of next-generation industrial science geared towards highly-accurate simulations and highly-sensitive sensors
- Development of advanced Monte Carlo algorithm and its applications
- Implementation of statistical analysis systems in high performance computing and cloud computing environments
- Establishment of a cooperative network that consists of institutes and universities associated with numerical simulations

Survey Science Center

Founded on the accomplishments in social research by the Institute of Statistical Mathematics spanning over half a century including the Study of

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

— *Staff* —

Ryozo YOSHINO, Director, Prof.
Takashi NAKAMURA, Prof.
Yoshimichi SATO, Visiting Prof.
Fumi HAYASHI, Visiting Prof.
Masato YONEDA, Visiting Prof.
Shintaro SONO, Visiting Prof.
Hidekazu CHAYAMA, Visiting Prof.
Kazufumi MANABE, Visiting Prof.
Takatoshi IMADA, Visiting Prof.
Toru KIKKAWA, Visiting Assoc. Prof. (-2014.5.31), Visiting Prof. (2014.6.1-)
Tadahiko MAEDA, Assoc. Prof.
Takahiro TSUCHIYA, Assoc. Prof.
Takahito ABE, Visiting Assoc. Prof.
Wataru MATSUMOTO, Visiting Assoc. Prof.
Koken OZAKI, Visiting Assoc. Prof.
Hiroko TSUNODA, Visiting Assoc. Prof.
Tadayoshi FUSHIKI, Visiting Assoc. Prof.
Yoo Sung PARK, Assist. Prof.

■ The Study of the Japanese National Character (JNC)

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

■ The Cross-National Studies of the National Character

The JNC survey has been developed into the cross-national comparative surveys which include the people with Japanese ancestry overseas since 1971.

This study attempts to understand the Japanese people and their culture in the comparative context as well as the global configuration of psychological distances of many countries (a sort of cultural manifold).

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

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

■ The Project on Utilizing Information on Social Research
Under our paradigm "Science of Data", we study practical and scientific ways to utilize survey data and develop new statistical methods and techniques to collect and analyze survey data.

Research Center for Statistical Machine Learning

The Research Center for Statistical Machine Learning started in January 2012, aiming at taking charge of advancing the "Statistical Machine Learning NOE", one of the Network Of Excellence Establishing Projects, and at being a central research organization in the field of statistical machine learning. The center is carrying out various research projects in the machine learning, as well as contributing the research community through organizing and supporting workshops and seminars for the developing this research field.

— *Staff* —

Kenji FUKUMIZU, Director, Prof.
Tomoko MATSUI, Vice Director, Prof.
Shinto EGUCHI, Prof.
Yoshihiko MIYASATO, Prof.
Satoshi ITO, Prof.
Atsuko IKEGAMI, Visiting Prof.

Takashi TSUCHIYA, Visiting Prof.
Tadashi WADAYAMA, Visiting Prof.
Masataka GOTO, Visiting Prof.
Koji TSUDA, Visiting Prof.
Shiro IKEDA, Assoc. Prof.
Daichi MOCHIHASHI, Assoc. Prof.
Shinsuke KOYAMA, Assist. Prof. (-2014.8.31), Assoc. Prof. (2014.9.1-)
Yuji SHINANO, Visiting Assoc. Prof.
Shaogao LU, Visiting Assoc. Prof.
Arthur GRETTON, Visiting Assoc. Prof.
Ido NEVAT, Visiting Assoc. Prof.
Tadayoshi Fushiki, Assist. Prof. (-2013.7.16)
Kei KOBAYASHI, Assist. Prof.
Yu NISHIYAMA, Project Assist. Prof. (-2014.9.30)

Service Science Research Center

Very few scientific methodologies have been developed for and applied to service activities, whereas businesses of the service sector produce more than three quarters of the developed world's economy today. Our Service Science Research Center brings the data-centric methodologies into the service fields — from marketing, supply chain management, management engineering, to modeling of social systems. In order to integrate diverse disciplines, we connect researchers in various fields through collaborations with hundreds of universities nationwide, under our project of the Network-Of-Excellence (NOE) for service science.

— *Staff* —

Hiroshi MARUYAMA, Vice Director-General, Director, Prof.
Tomoyuki HIGUCHI, Director-General, Prof.
Hiroe TSUBAKI, Vice Director-General, Prof.
Tomoko MATSUI, Prof.
Junji NAKANO, Prof.
Yoichi MOTOMURA, Visiting Prof.
Shusaku TSUMOTO, Visiting Prof.
Nobuhiko TERUI, Visiting Prof.
Yoshiki YAMAGATA, Visiting Prof.

Tadahiko SATO, Visiting Assoc. Prof. (-2014.9.30), Visiting Prof. (2014.10.1-)
Manabu KUROKI, Assoc. Prof.
Kazuhiro MINAMI, Assoc. Prof. (2014.9.1-)
Toshihiko KAWAMURA, Assist. Prof. (-2014.11.30), Visiting Assoc. Prof. (2014.12.15-)
Tsukasa ISHIGAKI, Visiting Assoc. Prof.
Yukihiko OKADA, Visiting Assoc. Prof.
Haruhisa FUKUDA, Visiting Assoc. Prof.
Eiji MOTOHASHI, Visiting Assoc. Prof.
Nobuo SHIMIZU, Assist. Prof.

■ Project on Quality Assurance and Reliability of Products and Services
We study the statistical methods that have been developed for quality management of products and apply them to services to realize reliability and safety of services.

■ Project on Bayesian Analysis of Marketing Data
We apply the statistical methods such as Bayesian network to large-scale marketing data so that enterprises and the society at large have more detailed and personalized marketing data and predicts their clients' demands.

■ Project on Resilient Society
We investigate general strategies for making complex systems (such as societies) resilient and prove their effectiveness through building multi-domain agent simulator for a city.

■ Project on Building Social Behavior Model
We build an integrated model of collective human behavior by integrating existing models in various domains such as economics, disaster management, transportation, finance and marketing. This model will enable us to do more reliable predictions of collective human behaviors and could be used for planning in various purposes.

■ Project on Analyzing Structure of Services Industry
We develop a suite of methods to analyze the large-scale and diverse source of data and visualize them. This will enable obtaining insights on the overall structure of the services industry and will lead to efficiency improvement and higher rate of innovation.

■ Project on Data Curation
Data need to be prepared, such as removing outliers, supplying missing values, adjusting units, merging, splitting, coding, etc. for useful analytics. This project aims at developing an organized body of knowledge for this important process for data analysis.

■ Project on Data Scientist Traning
We investigate the current status and best practicies of training data scientists, who can analyze data and translate its results into business values.

■ Project on Privacy-Preserving Data Publishing
How to share data while preserving privacy is a big issue. We apply innovative approach in publishing location data without violating certain privacy criteria.

URA (University Research Administrator)

ISM assigned URA in the Administration Planning and Coordination Section for promoting and strengthening joint research in mathematical statistics.

— *Roles of URA* —

- Promotion for research collaborations and interchanges with universities and research institutions
- Support for design and planning of ISM research strategy
- Promotion for utilizations of ISM supercomputer systems
- Pre-awards and post-awards
- Public-relations and outreach

School of Statistical Thinking

The School of Statistical Thinking was established as a center for the planning and implementation of various programs for professional development and education and training in statistical thinking. In the setting of a joint research facility, the school is working to develop professionals (specialists with broad knowledge and skills, modelers, research coordinators, etc.) equipped with the statistical thinking ability to meet the demands of the “big

data era", in which large-scale data sets are utilized for modeling, research coordination, and other applications.

— *Staff* —

Junji NAKANO, Director
Yoshinori KAWASAKI, Vice Director
Hiroshi MARUYAMA, Vice Director-General, Prof.
Satoshi ITO, Prof.
Yukito IBA, Assoc. Prof. (2013.5.1-2013.8.31), Prof. (2013.9.1-)
Yasumasa BABA, Adjunct Prof.
Makio ISHIGURO, Adjunct Prof.
Masami HASEGAWA, Adjunct Prof. (-2014.3.31)
Kunio SHIMIZU, Adjunct Prof. (2014.4.1-)
Naomasa MARUYAMA, Assoc. Prof.
Teppei OGIHARA, Assist. Prof. (2014.7.1-)
Osamu KOMORI, Project Assist. Prof. (-2013.5.31)
Kei TAKAHASHI, Project Assist. Prof. (2013.4.1-)
Keiichi FUKAYA, Project Assist. Prof. (2013.4.1-)
Kaname MATSUE, Project Assist. Prof. (2013.9.1-)
Toshiya KAZAMA, Project Assist. Prof. (2014.1.1-)

— *Activities* —

- Open lecture for public: Free and introductory lecture concerning statistical science, once a year in November
- Tutorial courses: Pay courses for various topics in statistical science, about 13 times a year
- Graduate school linkage program: Courses and/or guidances at collaborative graduate schools
- Special collaboration with research students: Guidance given in ISM to graduate students belonging to other universities
- Summer graduate Seminar: Free open lecture for graduate students, once a year in summer
- Open-type professional development program: Support for research meetings and workshops for promoting statistical thinking
- Statistical mathematics seminar: Seminars on new research results by researchers in ISM, once a week on Wednesday afternoon
- Research collaboration start-up: Advises and supports given by researchers in ISM for problems of various fields concerning statistical

mathematics
- Researcher exchange promotion program: Support to university researchers who use sabbatical system and study at ISM
- Statistical training for school teachers: Training for school teachers to increase their leadership of statistical thinking

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.

— *Staff* —

Junji NAKANO, Director, Prof.
Yoshinori KAWASAKI, Vice Director, Assoc. Prof.

■ Computing Facility Unit

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

■ Information Resources Unit

The Information Resources Unit is in charge of the management of the system for disseminating research results and an extensive library and is responsible for planning statistical education courses.

■ Media Development Unit

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

Project Researchers

Project researchers is the all-inclusive term for post-doctoral researchers participating in specific projects. To name a few, ISM NOE (Network Of Excellence) projects, ROIS TRIC (Transdisciplinary Research Integration

Center) projects, government-commissioned projects, and the projects funded by independent agencies like JST.

Akaishi, Ryo	Komori, Osamu	Saito, Masaya
Ariyoshi, Yuya	Kubota, Takafumi	Shibai, Kiyohisa
Arizumi, Nana	Kumazawa, Takao	Shibuya, Kazuhiko
Chan, Hei	Kusumoto, Buntaro	Shiota, Sayaka
Dou, Xiaoling	Matsue, Kaname	Surova, Diana
Fujita, Shigeru	Matsumae, Hiromi	Surovy, Peter
Fukaya, Keiichi	Matsuoka, Ryoji	Suzuki, Kazue
Fushiki, Tadayoshi	Minami, Kazuhiro	Takahashi, Hisanao
Hattori, Hiromasa	Nagao, Hiromichi	Takahashi, Kei
Imoto, Tomoaki	Nikaido, Kosuke	Takebayashi, Yoshitake
Inagaki, Yusuke	Nishino, Jo	Tamamori, Akira
Iwata, Takaki	Nishiyama, Yu	Tanjo, Tomoya
Kamiya, Naoki	Nomura, Ryosuke	Tokunaga, Terumasa
Kamiyama, Chiho	Okamoto, Motoi	Uetsuhara, Masahiko
Katayama, Shota	Osada, Yutaka	Wang, Min-zhen
Kazama, Toshiya	Roberto, Sebastian Legaspi	Zapart, Christopher Andrew
Koike, Yuta	Saita, Satoko	

Visiting Professors

To push forward the frontiers of interaction between statistics and other fields of science, the Institute provides positions for visiting professors.

Each of the Institute's three departments and five centers have invited foreign and Japanese professors from universities and institutes as shown in the list below.

— *Foreign Visiting Professors* —

Wynn, Henry Philip	(U.K.)	2013. 4.15 – 2013. 5. 2
Richards, Donald ST. P.	(U.S.A.)	2013. 6.11 – 2013. 6.28
Marzocchi, Warner	(Italy)	2013. 6.17 – 2013. 7.12
Synodinos, Nicolaos Emmanuel	(U.S.A.)	2013. 6.20 – 2013. 8.19
Ibid.	(U.S.A.)	2014. 6. 1 – 2014. 7.31
Peters, Gareth William	(Australia)	2013. 6.21 – 2013. 8.22
Ibid.	(Australia)	2014. 7. 2 – 2014. 9.29

Doucet, Arnaud	(France)	2013. 7. 8 – 2013. 8.30
Ibid.	(France)	2014. 7. 7 – 2014. 8.12
Myrvoll, Tor Andre	(Norway)	2013. 7.22 – 2013. 8.16
Ibid.	(Norway)	2014. 7.14 – 2014. 8. 8
Negri, Ilia	(Italy)	2013. 9. 9 – 2013.10. 4
Ibid.	(Italy)	2014.11.10 – 2014.12. 5
Jimenez-Sobrino, Juan Carlos	(Cuba)	2013. 9.30 – 2013.12.27
Griffiths, Robert Charles	(U.K.)	2014. 1. 8 – 2014. 3.28
Liu, Shuangzhe	(Australia)	2014. 1.10 – 2014. 2. 5
Zhou, Shiyong	(China)	2014. 7.10 – 2014. 8. 8
Hwang, Hsien-kuei	(Taiwan)	2014. 7.11 – 2014. 8. 7
Septier, Francois Jean Michel	(France)	2014. 7.22 – 2014. 8. 8

— *Japanese Visiting Professors* —

Abe, Takahito	2013. 4. 1 - 2014. 3.31	Kitamura, Tadashi	2013. 4. 1 - 2014. 3.31
Ando, Masakazu	2013. 4. 1 - 2015. 3.31	Kitano, Toshikazu	2013. 4. 1 - 2015. 3.31
Aoyama, Kazuhiro	2013. 4. 1 - 2015. 3.31	Konoshima, Masashi	2013. 4. 1 - 2015. 3.31
Chayama, Hidekazu	2013. 4. 1 - 2014. 3.31	Kunitomo, Naoto	2013. 4. 1 - 2015. 3.31
Enescu, Bogdan Dumitru	2013. 4. 1 - 2015. 3.31	Manabe, Kazufumi	2013. 4. 1 - 2014. 3.31
Endo, Satoru	2013. 4. 1 - 2014. 3.31	Ibid.	2014. 8. 1 - 2015. 3.31
Fukasawa, Masaaki	2013. 4. 1 - 2015. 3.31	Matsumoto, Wataru	2013. 4. 1 - 2014. 3.31
Fukuda, Haruhisa	2013. 4. 1 - 2015. 3.31	Matsuura, Masaaki	2013. 4. 1 - 2015. 3.31
Fukui, Takehiro	2013. 4. 1 - 2015. 3.31	Minami, Mihoko	2013. 4. 1 - 2015. 3.31
Goto, Masataka	2013. 4. 1 - 2015. 3.31	Miyamoto, Michiko	2013. 4. 1 - 2015. 3.31
Hara, Hisayuki	2013. 4. 1 - 2015. 3.31	Miyamoto, Sadaaki	2013. 4. 1 - 2015. 3.31
Honda, Toshio	2013. 4. 1 - 2015. 3.31	Motomura, Yoichi	2013. 4. 1 - 2015. 3.31
Horiguchi, Toshihiro	2013. 4. 1 - 2015. 3.31	Nakamura, Kazuyuki	2013. 4. 1 - 2015. 3.31
Ikegami, Atsuko	2013. 4. 1 - 2014. 3.31	Nakanishi, Hiroko	2013. 4. 1 - 2015. 3.31
Imanaka, Tetsuji	2013. 4. 1 - 2014. 3.31	Nameshida, Takashi	2013. 4. 1 - 2014. 3.31
Ishigaki, Tsukasa	2013. 4. 1 - 2015. 3.31	Ninomiya, Yoshiyuki	2013. 4. 1 - 2015. 3.31
Iwasaki, Manabu	2013. 4. 1 - 2014. 3.31	Ohashi, Jun	2013. 4. 1 - 2014. 3.31
Kameya, Takashi	2013. 4. 1 - 2015. 3.31	Ohnishi, Toshio	2013. 4. 1 - 2015. 3.31
Kamo, Kenichi	2013. 4. 1 - 2015. 3.31	Ohtaki, Megu	2013. 4. 1 - 2015. 3.31
Katagiri, Hideki	2013. 4. 1 - 2015. 3.31	Okada, Yukihiko	2013. 4. 1 - 2015. 3.31
Kato, Yoichi	2013. 4. 1 - 2015. 3.31	Okuhara, Kouji	2013. 4. 1 - 2015. 3.31
Kikkawa, Toru	2013. 4. 1 - 2014. 3.31	Sato, Tadahiko	2013. 4. 1 - 2014. 9.30
Ibid.	2014. 6. 1 - 2015. 3.31	Sato, Tosiya	2013. 4. 1 - 2015. 3.31
Kishino, Hirohisa	2013. 4. 1 - 2014. 3.31	Sato, Yoshimichi	2013. 4. 1 - 2015. 3.31

Shimizu, Kunio	2013. 4. 1 - 2014. 3.31	Hayashi, Fumi	2013. 6. 1 - 2015. 3.31
Shimizu, Yasutaka	2013. 4. 1 - 2015. 3.31	Sato, Seisho	2013. 6. 1 - 2015. 3.31
Shimodaira, Hidetoshi	2013. 4. 1 - 2014. 3.31	Yoneda, Masato	2013. 6. 1 - 2015. 3.31
Shinano, Yuji	2013. 4. 1 - 2015. 3.31	Ozaki, Koken	2013. 6. 1 - 2014. 3.31
Tachimori, Hisateru	2013. 4. 1 - 2015. 3.31	Hwang, Hsien-kuei	2013. 7. 1 - 2014. 3.31
Takahashi, Rinya	2013. 4. 1 - 2015. 3.31	Gretton, Arthur	2013. 8. 1 - 2014. 3.31
Takata, Katsuhiko	2013. 4. 1 - 2015. 3.31	Ibid.	2015. 3. 1 - 2015. 3.31
Takizawa, Satoshi	2013. 4. 1 - 2015. 3.31	Nevat, Ido	2013. 8. 1 - 2014. 3.31
Tanaka, Katsuya	2013. 4. 1 - 2015. 3.31	Nagao, Hiromichi	2013.11. 1 - 2015. 3.31
Terui, Nobuhiko	2013. 4. 1 - 2015. 3.31	Hirose, Osamu	2014. 4. 1 - 2015. 3.31
Tomita, Makoto	2013. 4. 1 - 2015. 3.31	Kato, Hiroshi	2014. 4. 1 - 2015. 3.31
Tsuchiya, Takashi	2013. 4. 1 - 2014. 3.31	Kubota, Takafumi	2014. 4. 1 - 2015. 3.31
Tsuda, Hiroshi	2013. 4. 1 - 2015. 3.31	Nagafuchi, Osamu	2014. 4. 1 - 2015. 3.31
Tsuda, Koji	2013. 4. 1 - 2015. 3.31	Nishii, Ryuei	2014. 4. 1 - 2015. 3.31
Tsumoto, Shusaku	2013. 4. 1 - 2015. 3.31	Ono, Tadashi	2014. 4. 1 - 2015. 3.31
Tsunoda, Tatsuhiko	2013. 4. 1 - 2015. 3.31	Sono, Shintaro	2014. 4. 1 - 2015. 3.31
Wadayama, Tadashi	2013. 4. 1 - 2015. 3.31	Iwata, Takaki	2014. 6. 1 - 2015. 3.31
Washio, Takashi	2013. 4. 1 - 2015. 3.31	Motohashi, Eiji	2014. 6. 1 - 2015. 3.31
Yamagata, Yoshiki	2013. 4. 1 - 2015. 3.31	Lu, Shaogao	2014. 9. 1 - 2015. 3.31
Yonezawa, Takahiro	2013. 4. 1 - 2014. 3.31	Furukawa, Masakazu	2014.10. 1 - 2015. 3.31
Yoshiba, Toshinao	2013. 4. 1 - 2015. 3.31	Nakamura, Ryota	2014.10. 1 - 2015. 3.31
Yoshida, Nakahiro	2013. 4. 1 - 2015. 3.31	Sato, Tadahiko	2014.10. 1 - 2015. 3.31
Yoshida, Nobuo	2013. 4. 1 - 2014. 3.31	Razafindrabe, Bam Haja Nirina	2014.12. 1 - 2015. 3.31
Matsui, Shigeyuki	2013. 5. 1 - 2015. 3.31	Kawamura, Toshihiko	2014.12.15 - 2015. 3.31
Teramukai, Satoshi	2013. 5. 1 - 2015. 3.31		

Visiting Research Fellows

In addition to visiting professors, the Institute provides research fellowships to researchers in Japan and abroad, from companies as well as from universities. The Institute also provides support for those who are appointed as staff of programs by the Japan Society for the Promotion of Science (JSPS). A list follows showing research fellows received during the period April 2013 to March 2015.

(The list does not show all of the visiting fellows from abroad. Foreign visiting research fellows are listed under “Foreign Visitors” on page 33.)

— *Research fellows upon JSPS program* —

Katayama, Shota
Nakagome, Shigeki
Tominaga, Kyoko
Uematsu, Yoshimasa
Uetsuhara, Masahiko

— *Japanese visiting research fellows* —

Adachi, Yusuke
Baba, Yasumasa
Dou, Xiaoling
Fujita, Marina
Fujiwara, Kaisei
Funatogawa, Takashi
Han, Peng
Hasegawa, Masami
Hirose, Kei
Hirotsu, Chihiro
Ichinokawa, Momoko
Ikoma, Norikazu
Imamura, Osamu
Imazeki, Mikiko
Ishiguro, Makio
Isomura, Tetsu
Itagaki, Masao
Iwasaki, Manabu
Iwata, Takaki
Kawaguchi, Tomoko
Kawai, Shigeharu
Kawakita, Masanori
Komatsu, Tatsuya
Markov, Konstantin
Matsu'ura, Mitsuhiro
Matsumoto, Yukio
Miura, Ryozo
Mori, Keita
Motohashi, Eiji
Motoyama, Hitoshi
Mukuta, Yusuke
Naito, Kanta
Nakamura, Tamiko
Nakazato, Yasushi
Nishihara, Hidenori
Nomura, Shunichi
Notsu, Akifumi
Oka, Mayumi
Okamura, Hiroshi
Okamura, Tsuyoshi
Omi, Takahiro
Owada, Takashi
Pritchard, Mari
Sakota, Takahiro
Sano, Natsuki
Sasaki, Takeshi
Seki, Mami
Shikano, Kiyohiro
Shimizu, Kunio
Shiota, Sayaka
Suoh, Setsuo
Suzuki, Shigenori
Takahashi, Hayato
Takai, Tsutomu
Takanami, Tetsuo
Takenouchi, Takashi
Tamamori, Akira
Tanabe, Kunio
Tanaka, Yutaka
Tanaka, Ushio
Toukaku, Hiroshi
Tsubone, Seiya
Tsujikawa, Misaki
Uemura, Yoshiki
Yamauchi, Takashi
Yanagimoto, Takemi

— *Students from graduate school* —

Igawa, Kousaku
Imaizumi, Masaaki
Ishiguro, Junko
Kawada, Akihiro
Kurisu, Daisuke
Hayakawa, Takashi
Hashimoto, Takashi

3 Research Collaboration

The Institute runs a unique system to promote collaborative research activities between statisticians and scientists in related fields, such as the social sciences, the humanities, life sciences, earth and space sciences and engineering. The system was initiated in 1985 with a special intention, which has much to do with the past experience of the Institute. Since the very beginning of the history of the Institute, one of the basic principles has been to attach great importance to applications. The principle came from appreciating that innovative methodologies and theories of statistics are frequently developed in an effort to solve real problems.

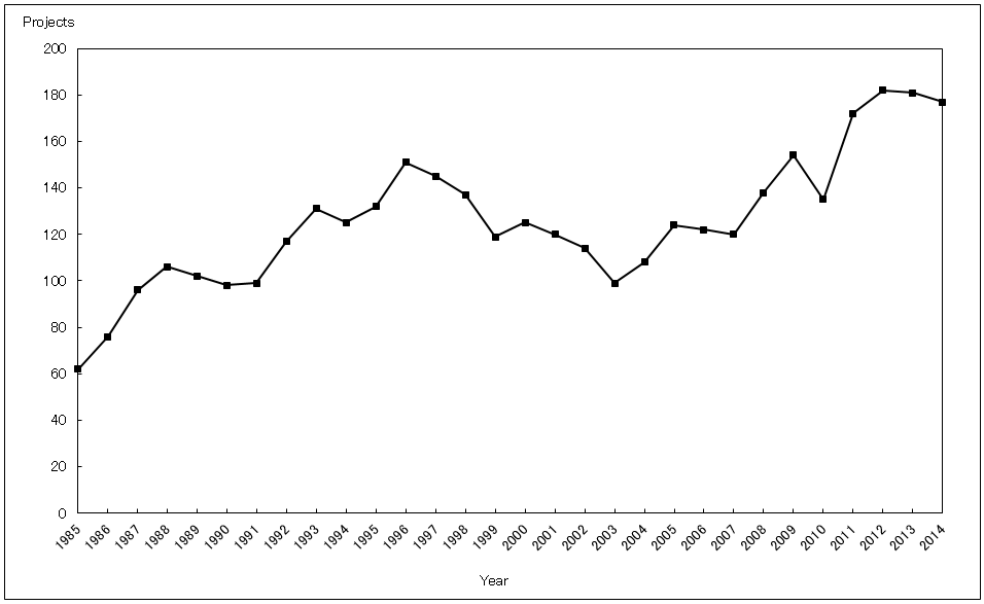
In past decades the Institute has maintained research collaborations between universities, government offices, private companies and various organizations. During this time, much useful work, both in theory and application, has been produced. This tradition of open collaboration with scientists outside the Institute has created a progressive and liberal academic atmosphere which, we believe, has contributed to developing new interdisciplinary research fields in related sciences.

The cooperative research activity was maintained through various research fields at different levels with various types of collaboration, long before the Institute was reorganized into an inter-university research institute. Many remarkable results have been produced through collaborative research in the last decades. To our regret, however, when joint work is organized by researchers at the individual level, the fruit of the collaborative research tends to be received by the general public as a successful contribution to the science where the solved problems arose, even when our statisticians played the most essential role. Obviously this tendency comes from the inherently abstract nature of statistics. The statistician's contribution, although essential, is not as easy to explain to the general public as explaining the problem itself in applied science. Accordingly, it seemed that the value and the raison d'être of the statisticians and the Institute was not appreciated as much as other scientists and research institutes in the applied sciences.

Our cooperative research system was initiated on the basis of two understandings. Firstly, this kind of collaborative research activity is beneficial to both statistics and other related sciences. Secondly, statisticians working in such circumstances need recognition, support and encouragement. We hope that the present system will play a role similar to the one that hospitals play in the medical sciences. Without constant stimuli from patients in the hospital, little development in medical sciences would be expected.

Since 1985 the system has been run by the Cooperative Research Committee, half of whose members are scientists from outside the Institute. Cooperative research projects between statisticians and scientists in related scientific fields are called for each year. More than a hundred projects in applied sciences and statistics are supported each year (see the figure below). In 1998, in hopes of enlarging the area of collaboration, the Institute relaxed a condition of application for projects which had stipulated that at least one member of the research project should belong to the Institute. The system of cooperation is open to projects that are to be planned and accomplished through international cooperation.

Our cooperative research projects are classified into several categories: cooperative use registration, general cooperative research 1, general cooperative research 2, specially promoted research and cooperative research symposium.



Number of collaborative research projects

4 International Research Exchange

Historically, statistical science has developed in response to the need for statistical ideas and methods to be exploited in other fields of science and industry. Therefore the Institute has established a systematic way to promote cross-disciplinary research projects either at a domestic or an international scale (see the previous chapter).

The Institute has also pushed forward research collaboration with a wide variety of foreign institutions including universities and governmental agencies.

Since 1988, the Institute has entered into special relationship with the following institutes to conduct programs on academic exchange and facilitate joint research projects;

- The Statistical Research Division of the U.S. Bureau of the Census, U.S.A., 1988-
- Stichting Mathematisch Centrum, Netherlands, 1989-
- Institute for Statistics and Econometrics, Humboldt University of Berlin, Germany, 2004-
- Institute of Statistical Science, Academia Sinica, Taiwan, 2005-
- The Steklov Mathematical Institute, Russia, 2005-
- Central South University, China, 2005-
- Soongsil University, Korea, 2006-
- Department of Statistics, University of Warwick, U.K., 2007-
- The Indian Statistical Institute, India, 2007-
- Department of Empirical Inference, Max Planck Institute for Biological Cybernetics, Germany, 2010-
- Faculudade de Medicina da Universidade de São Paulo, Brazil, 2011-
- Department of Communication Systems, SINTEF Information and Communication Technology, Norway, 2012-
- Human Language Technology Department, Institute for Infocomm Research, Singapore, 2012-

- Centre for Computational Statistics and Machine Learning, University College London, U.K., 2012-
- Department of Electronics and Telecommunications, Norwegian University of Science and Technology, Norway, 2012-
- Department of Probability and Mathematical Statistics, Charles University in Prague, Czech Republic, 2012-
- The Department of Ecoinformatics, Biometrics and Forest Growth of the Georg-August University of Goettingen, Germany, 2012-
- The Korean Statistical Society, Korea, 2013-
- Toyota Technological Institute at Chicago, U.S.A., 2014-
- Mathematical Sciences Institute Australian National University, Australia, 2014-
- RiskLab ETH Zurich, Switzerland, 2015-
- Institut de Recherche en Composants logiciel et materiel pour l' Information et la Communication Avancee (IRCICA), France, 2015-
- Le laboratoire de mathematiques de l' Universite Blaise Pascal, France, 2015-
- Centre de Rechereche en Informatique, Signal et Automatique de Lille (CRIStAL), France, 2015-
- University College London (UCL) Big Data Institute, U.K., 2015-
- The Institute of Forestry, Pokhara of Tribhuvan University, Nepal, 2015-
- The Institute of Forest and Wildlife Research and Development of the Forestry Administration of Cambodia, Cambodia, 2015-
- The Chancellor masters and Scholars of the University of Oxford, U.K., 2015-

The Institute has also been active in organizing international conferences and workshops. In April 2013-March 2015, 22 international symposia were held under the auspices of the Institute;

- Training Seminar on Applied Statistical Analysis with R for Forestry Studies, July 24-26, 2013
- International Workshop on Spatial and Temporal Modeling from Statistical, Machine Learning and Engineering perspectives (STM2013), August 1-3, 2013
- The 9th TRIZ Symposium 2013, September 5-6, 2013
- Joint International Symposium By Korea, Taiwan and Japan - Sustainable Forest Ecosystem Management in Rapidly Changing World -,

September 5-7, 2013

- Training on Introduction to Statistical Analysis in "R" for Forest Resource Management, September 25-27, 2013
- Joint International Symposium By Japan and Czech Republic Data Acquisition, Statistical Modeling and Decision-Making Toward Better Forestry, October 8-9, 2013
- 5th International Workshop on Analysis of Micro Data of Official Statistics, December 12-17, 2013
- Okazaki International Workshop on Advanced Time Series Analysis Applied to the Neurosciences, December 13, 2013
- Advances and Applications in Distribution Theory, January 14, 2014
- ISM Symposium on Environmental Statistics 2014, February 5, 2014
- Tutorial pbdR: Programming with Big Data in R, February 17-18, 2014
- Rare Event Sampling and Related Topics I, March 4-5, 2014
- Forest Resource Management and Mathematical Modeling International Symposium - FORMATH AKITA 2014 -, March 8-9, 2014
- Workshop on Mathematical Approaches to Large-Dimensional Data Analysis, March 13-15, 2014
- The 10th Japan Conference on Teaching Statistics (JCOTS14), March 14-15, 2014
- Workshop on 3D model reconstruction and biometry using digital photography, March 24, 2014
- International Symposium on Sustainable Forest Ecosystem Management in Rapidly Changing World, May 28-30, 2014
- International Workshop on Spatial and Temporal Modeling from Statistical, Machine Learning and Engineering perspectives (STM2013), July 28-29, 2014
- Workshop on complex systems modeling and estimation challenges in big data (CSM2014), July 30-31, 2014
- ISM Symposium on Environmental Statistics 2015, February 24, 2015
- FORMATH ROPPONGI 2015, March 7-8, 2015
- Rare Event Sampling and Related Topics II, March 17-18, 2015

The Institute actively encourages researchers to come to talk or give lectures and also to stay for collaboration with the staff. As shown in the list below, the Institute has received 103 visitors from 34 different countries. Of these researchers, 80 entered into a visiting research fellowship including a visiting professorship. Another list follows showing all the colloquia that were given by foreign visitors.

Foreign Visitors (April 2013-March 2015)

- The asterisk * before a visitor's name indicates that he/she is a visiting professor or a visiting research fellow.
- Date in the list refers to the period of visiting professorship/research-fellowship or the date of colloquium.

From Australia

*Peters, Gareth William 13.6.21-13.8.22
*Ibid. 14.7.2-14.9.29
*Liu, Shuangzhe 14.1.10-14.2.5
*Acuna, Mauricio 15.3.4-15.3.13

From Bangladesh

*Alam, Ashad Md. 14.9.30-14.10.10

From Bulgaria

*Markov, Konstantin.....13.4.1-13.4.6
*Ibid. 13.7.29-13.8.4
*Ibid. 14.1.20-14.3.31

From Cambodia

*Chheng, Kimsun.....15.3.4-15.3.9
*Heng, Sokh 15.3.4-15.3.9

From Canada

*Asante, Patrick 14.3.6-14.3.13
Small, Christopher G. 14.3.10
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*Cao, Ying 13.4.1-14.3.31
*Ibid. 14.4.1-15.3.31
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*Ibid. 14.11.1-14.12.29
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*Marzocchi, Warner.....13.6.17-13.7.12
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*Ibid. 13.12.23-13.12.27
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*Siew, Hai-Yen 13.4.1-14.3.31
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*Fam, Pei Shan.....14.8.18-14.8.30

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*Ibid. 14.6.22-14.7.11
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*Myrvoll, Tor Andre 13.7.22-13.8.16
*Ibid. 14.7.14-14.8.8

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*Radovanović, Miloš 14.3.10-14.3.15

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*Surovy, Peter.....13.4.1-13.11.12
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*Wuethrich, Mario Valentin ... 14.7.22-14.7.31
*Palomer, Daniel Pérez..... 14.7.25-14.8.3

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*Ibid. 14.9.3-14.9.6
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*Huang, Su-Yun.....14.5.8-14.5.17
*Hwang, Hsien-kuei..... 14.7.11-14.8.7
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*Lin, Gwo-dong..... 15.3.29-15.3.31

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*Muandet, Krikamol.....13.4.1-13.5.4

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*Ibid. 14.9.20-14.10.19
*Richards, Donald ST. P. 13.6.11-13.6.28
*Ibid. 13.9.4-13.9.8
*Ibid. 14.1.27-14.2.1
*Root, Jonathan 13.6.18-13.8.22
*Synodinos, Nicolaos Emmanuel....13.6.20-13.8.19
*Ibid. 13.8.20-13.9.6
*Ibid. 13.10.1-13.12.9
*Ibid. 14.6.1-14.7.31
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*Richards, Mercedes T..... 14.1.27-14.2.1
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*Ibid. 14.11.17-14.11.21
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*McCullagh, Peter..... 15.3.11-15.3.25
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*Hung, Nguyen Dinh.....15.3.1-15.3.9

Colloquia by Foreign Visitors

(2013.4-2015.3)

Speaker (Country)	Title	Date
Chen, Xiaowei (U.S.A.)	Aspects of earthquake triggering and seismicity clustering	2013. 4.16
SenGupta, Ashis (India)	Negative dependency: constructions of probability distributions and applications	2013. 6.21
Vu, Vincent Q. (U.S.A.)	Sparse principal components and subspaces: Concepts, theory, and algorithms	2013. 7.11
Alvarez, Mauricio (Colombia)	Multi-output Gaussian processes	2013. 7.11
Herrmann, Marcus (Switzerland)	Forecasting losses caused by a M6.6 scenario earthquake sequence in Basel, Switzerland	2013. 8.27
Huskova, Marie (Czech Republic)	Change point analysis: Robust and rank based procedures and applications	2013. 9. 6
Shen, Yuan (U.K.)	Spatial-temporal modelling of fMRI data through spatially regularized mixture of Hidden Process Models	2013. 9.27
Cheng, Ming-Yen (Taiwan)	Local linear regression on manifolds and its geometric interpretation	2013.10.10
Prakasa Rao, B. L. S. (India)	Statistical inference for fractional diffusion processes	2013.10.22
Huang, Qinghua (China)	Seismicity changes revealed by the Region-Time-Length (RTL) algorithm	2013.11.12
Borndörfer, Ralf (Germany)	Railway optimization and integer programming	2013.11.21
Zhou, Shiyong (China)	Detecting the regional tectonic stress variations in background seismicity data through statistical earthquake modeling	2014. 1.14
Ting, Wang (New Zealand)	Estimating the likelihood of volcanic eruptions with incomplete eruption record	2014. 1.14

Speaker (Country)	Title	Date
Hyvarinen, Aapo (Finland)	Testing independent components, with applications to brain imaging	2014. 1.23
Lee, Jaeyong (Korea)	Dependent species sampling models for spatial density estimation	2014. 2. 4
Kim, Hyunjoong (Korea)	An ensemble pruning method using performance measure based on degrees of difficulty	2014. 2. 4
Elisa, Varini (U.S.A.)	Bayesian estimation of doubly stochastic Poisson processes: A particle filtering approach	2014. 2.18
Harte, David (New Zealand)	Stochastic earthquake models: Ways to improve and insights into the physical process	2014. 2.18
Llenos, Andrea L. (U.S.A.)	Statistical modeling and identification of potentially induced seismicity rate changes	2014. 3. 4
Brito, Paula (Portugal)	Conceptual clustering of symbolic data using a quantile representation	2014. 3. 4
Small, Christopher G. (Canada)	Spanifold A new nonlinear dimension reduction algorithm	2014. 3.10
Mandal, Abhijit (India)	Dimension reduction using divergence measure	2014. 4.10
Fasy, Brittany Terese (U.S.A.)	Stochastic convergence of persistence landscapes and silhouettes	2014. 6. 5
Burguet, Jasime (France)	Integrating, analyzing and modeling biological spatial organizations from image data	2014. 7. 1
Kpotufe, Samory (U.S.A.)	Self-tuning in nonparametric regression	2014. 7. 7
Aiken, Chastity (U.S.A.)	Triggered seismic activity in geothermal regions and on strike-slip faults	2014. 7. 8
van de Velden, Michel (Netherlands)	Cluster correspondence analysis	2014. 7.15

Speaker (Country)	Title	Date
Zhou, Shiyong (China)	Seismicity simulation in Western Sichuan of China based on the fault interactions and its implication on the estimation of the regional earthquake risk	2014. 8. 5
Le Bihan, Nicolas (Australia)	von Mises-Fisher and Compound Cox processes on hyperspheres	2014. 9.11
Bhatia, Rajendra (India)	Riemannian geometry and matrix geometric means	2014.10. 3
Schehr, Grégory (France)	Exact statistics of the gap and time interval between the first two Maxima of random walks and Lévy flights	2014.10.14
Gamrath, Gerald (Germany)	The SCIP Optimization Suite - concepts, developments, and applications	2014.10.22
Gamrath, Inken (Germany)	Optimizing battery load schedules	2014.10.22
Bradley, Jones (U.S.A.)	21st Century screening experiments: Motivation, implementation and analysis	2014.11. 6
Ramdas, Aaditya (U.S.A.)	On the power of a nonparametric two dample test in high dimensions	2014.11.27
Wang, Ting (New Zealand)	Marked point process modeling with missing data in volcanic eruption records	2015. 1.27
Ma, Yanyuan (Colombia)	A semiparametric approach to dimension reduction and its inference	2015. 2. 5
Segou, Margaret (France)	The future of earthquake predictability	2015. 2.10
Müller, Günter (Germany)	Organization of resilient systems	2015. 2.27
McCullagh, Peter (U.S.A.)	Survival models and health sequences	2015. 3.16
Leitao, Jorge Cardoso (Germany)	Monte Carlo sampling in chaotic systems	2015. 3.27
Zuckerman, Daniel M (U.S.A.)	Basic theory and weighted ensemble simulation	2015. 3.28

Speaker (Country)	Title	Date
Zuckerman, Daniel M (U.S.A.)	Advanced theory and future challenges	2015. 3.28
Lai, Chin-Diew (New Zealand)	Hazard rates that level off to a constant	2015. 3.30
Gretton, Arthur (U.K.)	A wild bootstrap for degenerate kernel tests	2015. 3.31

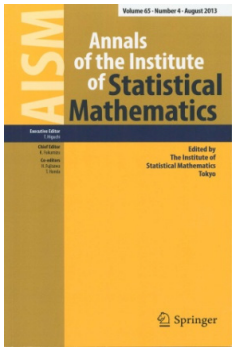
5 Publications

Periodicals

One of the driving forces behind the rapid progress of modern science has undoubtedly stemmed from the broad communication of research findings through international journals and reports. For the sake of publicizing its activities throughout academic and industrial circles, the Institute launched ***Annals of the Institute of Statistical Mathematics*** (AISM) in 1949 shortly after its foundation. Today AISM, distributed by Springer, has a worldwide reputation and is listed in citation review journals.

In the past two years, Volumes 66 and 67 (ten issues) were published. For paper titles, abstracts, and full texts, visit our website at http://www.ism.ac.jp/editsec/aism/, or at http://springerlink.com/. The aims of AISM are shown in the excerpt below:

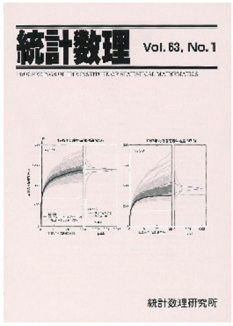
The journal aims to provide an international forum for open communication among statisticians and research workers who have the common purpose of advancing human knowledge through the development of the science and technology of statistics.



AISM will publish the broadest possible coverage of statistical papers of the highest quality. Emphasis will be placed on the publication of papers relating to (a) establishment of new areas of application, (b) development of new procedures and algorithms, (c) development of unifying theories, (d) analysis and improvement of existing procedures and theories, and (e) communication of empirical findings supported by real data.

The objective of AISM is to contribute to the advancement of statistics as a science for human handling of information to cope with uncertainties. Special emphasis will thus be placed on the publication of papers that will eventually lead to significant improvements in the practice of

statistics. In addition to papers by professional statisticians, contributions from authors in various fields of application will be welcomed.



The Institute publishes another periodical, ***Proceedings of the Institute of Statistical Mathematics***. This biannual journal made its first appearance in 1953 and now carries scientific papers and articles on topics of research (in Japanese with abstracts in English). Volumes 62 and 63 (four issues) were published in the past two years. Refer to http://www.ism.ac.jp/editsec/toukei/ for paper titles, abstracts and full texts.

Technical Reports

In addition to the two journals mentioned above, the Institute issues seven technical reports:

- *Cooperative Research Report*
- *ISM Survey Research Report*
- *Computer Science Monographs*
- *Research Memorandum*
- *ISM Report on Research and Education*
- *ISM Reports on Statistical Computing*
- *School of Statistical Thinking Research Report*

A list of the seven reports released from April 2013 to March 2015 follows.

Cooperative Research Report

(Reports, in Japanese and English, on the achievements emerging from collaborative research projects in the Institute.)

No.307: Kinoshita, K., Research meeting report about using microdata of official statistics. *(March 2014)*

No.308: Ishikawa, S., Statistical Approach to Language Variation. *(March 2014)*

No.309: Ikoma, N., Multimedia Computational Intelligence based on Particle Filters. *(March 2014)*

No.310: Iwaki, S., Analysis and modeling of signals from non-invasive biological measurements. *(March 2014)*

No.311: Tanaka, M., Econophysics and its Applications (10). *(March 2014)*

No.312: Konno, H., New Development of Dynamical Bioinformatics (2). *(March 2014)*

No.313: Fujii, Y., Research on best practice in teaching statistics Vol. 6. *(March 2014)*

No.314: Takeuchi, A., Research on Sports Data Analysis: Theory, Methodology, and Applications Vol.1. *(March 2014)*

No.315: Cho, K., Analyses of Event Schemas Using Corpora. *(March 2014)*

No.316: Kon, Y., The Effects of Regional Banks' Lending on Local Industries (Progressive Report). *(March 2014)*

No.317: Yoshida, N., Statistics for stochastic processes and data analysis. *(March 2014)*

No.318: Fujioka, K., Improvement algorithms for sensing accuracy and odor description in fragrance analyses with sensors. *(March 2014)*

No.319: Kanefuji, K., Information and Database on Environmental Risk. *(March 2014)*

No.320: Shimizu, K., Environmental and Ecological Data Analysis. *(March 2014)*

No.321: Koyama, Y., Domain-Specific Expressions from Science & Technology Corpora. *(March 2014)*

No.322: Tabata, T., Data-mining in Digital Humanities. *(March 2014)*

No.323: Tsuchiya, T., Optimization: Modeling and Algorithms 26. *(March 2014)*

No.324: Ishikawa, Y., Statistical Approaches to Textual Data. *(March 2014)*

No.325: Matsuda, Y., How to create a database of companies using anonymity medthod; hot to encode the activities of companies in an industrial classification scheme to show changes of industrial structure.

(March 2014)

No.326: Maruyama, N., Utilizing GeoGebra to mathematics, mathematics education and statistics education. *(March 2014)*

No.327: Kitano, T., Extreme value theory and applications (11). *(March 2014)*

No.328: Shimura, T., Infinitely divisible processes and related topics (18). *(February 2014)*

No.329: Tsubaki, H., Genesis and circulation mechanism of symbolic signals, and its application to social sciences. *(February 2014)*

No.330: Ikoma, N., Multimedia Computational Intelligence based on Particle Filters (2). *(March 2015)*

No.331: Horihata, S., Analysis and modeling of signals from non-invasive biological measurements (2). *(March 2015)*

No.332: Tanaka, M., Econophysics and its Applications (11). (March 2015)

No.333: Konno, H., New Development of Dynamical Bioinformatics (3). *(March 2015)*

No.334: Takeuchi, A., Research on Sports Data Analysis: Theory, Methodology, and Applications Vol.2. *(March 2015)*

No.335: Fujii, Y., Research on best practice in teaching statistics Vol. 7. *(March 2015)*

No.336: Kinoshita, K., Abstract Report of "New developments in studies using micro data of official statistics". *(March 2015)*

No.337: Furuzumi, H., Change of Industrial Structure and Using of Official Statistics (Progressive Report). *(March 2015)*

No.338: Koyama, Y., Corpus analysis and pedagogical application of ESP vocabulary and phrases. *(March 2015)*

No.339: Cho, K., Event Schemas and Foreign Language Learning. *(March 2015)*

No.340: Ishikawa, S., Statistical Approach to Frequency Data Obtained from Corpora. *(March 2015)*

No.341: Hasuike, T., Constructive methods of appropriate membership function based on statistical theory and decision making. *(March 2015)*

No.342: Ishikawa, Y., Statistical Analysis of Writing Style. *(March 2015)*

No.343: Shimizu, K., Environmental and Ecological Data Analysis. *(March 2015)*

No.344: Carreira, J.M., Needs Analysis of English Learning among University Students. *(March 2015)*

No.345: Tabata, T., Data-mining in Digital Humanities II. *(March 2015)*

No.346: Teramura, E., Estimation of Labor Supply of Elderly Women in Ja-

pan. *(March 2015)*

No.347: Tsuchiya, T., Optimization: Modeling and Algorithm 27. *(March 2015)*

No.348: Tsunoda, H., Data Science on Deep Structure of Health & Mind --Cultural Manifold Analysis--. *(March 2015)*

No.349: Kitano, T., Extreme Value Theory and Applications (12). *(February 2015)*

No.350: Shimura, T., Infinitely divisible processes and related topics (19). *(February 2015)*

ISM Survey Research Report

(Technical reports, mostly in Japanese, on the methodology of survey and analysis of measured data. Formerly published as Research Report (No.1-101). Full text can be downloaded from http://www.ism.ac.jp/.)

No.109: Yoshino, R. and Shibai, K. (eds.), The Asia-Pacific Values Survey — Cultural Manifold Analysis (CULMAN) on People's Sense of Trust — Australia 2012 Survey. *(June 2013)*

No.110: Yoshino, R. and Park, Y. (eds.), The Asia-Pacific Values Survey — Cultural Manifold Analysis (CULMAN) on People's Sense of Trust — South Korea 2012 Survey. *(June 2013)*

No.111: Yoshino, R., Fujita, T. and Shibai, K. (eds.), The Asia-Pacific Values Survey — Cultural Manifold Analysis (CULMAN) on People's Sense of Trust — Singapore 2012 Survey. *(July 2013)*

No.112: Park, Y. and Tsuchiya, T., TAMA-Area Residents Survey — Mail Survey in Akishima and Koganei (2013) —. *(September 2013)*

No.113: Yoshino, R., Nikaido, K. and Shibai, K. (eds.), The Asia-Pacific Values Survey — Cultural Manifold Analysis (CULMAN) on People's Sense of Trust — India 2013 Survey. *(July 2014)*

No.114: Yoshino, R., Hattori, H., Shibai, K. and Park, Y. (eds.), The Asia-Pacific Values Survey — Cultural Manifold Analysis (CULMAN) on People's Sense of Trust — Vietnam 2013 Survey. *(July 2014)*

No.115: Park, Y. and Tsuchiya, T., TAMA–Area Residents Survey — Mail Survey in Hachioji (2014) —. *(September 2014)*

No.116: Nakamura, T., Tsuchiya, T. and Maeda, T., A Study of the Japanese National Character — The Thirteenth Nationwide Survey —. *(February 2015)*

No.117: Yoshino, R., Shibai, K. and Nikaido, K. (eds.), The Asia-Pacific Values Survey — Cultural Manifold Analysis (CULMAN) on People's

Sense of Trust — Summary Report. *(March 2015)*

Computer Science Monographs

(Technical reports in English on Computer programs and software for statistical science. Full text and supplementary materials of No.31 onwards can be downloaded from http://www.ism.ac.jp/. Not issued during the period April 2013 to March 2015.)

Research Memorandum

(Technical Reports, mostly in English, that give immediate publicity to research findings. The full content of some of them can be downloaded from http://www.ism.ac.jp/.)

No.1172: Tanoue, Y. and Satoshi, Y., A Positive Analysis of the Probability of Recovery to Performing loan from Default loan. *(May 7, 2013)*

No.1173: Iwata, T., Decomposition of seasonality and long-term trend in earthquake detection capability through a B-spline approach in a Bayesian framework. *(May 14, 2013)*

No.1174: Fushiki, T. and Maeda, T., Regression analysis in sample surveys with nonresponse. *(May 28, 2013)*

No.1175: Ogata, Y. and Tanaka, U., Searching for locations of parents from superposed clusters. *(June 3, 2013)*

No.1176: Nishiyama, Y., A stochastic maximal inequality and related topics. *(June 5, 2013)*

No.1177: Mano, S., Asymptotics of the Pitman random partition via combinatrics. *(June 12, 2013)*

No.1178: Fujisawa, H. and Abe, T., A family of multivariate skew distributions with monotonicity of skewness. *(July 19, 2013)*

No.1179: Yanagimoto, T. and Ohnishi, T., Partial Order of Concentration about a Position for Comparing Bayesian Prior Densities. *(October 8, 2013)*

No.1180: Iwata, T., Temporal change in the b-values in the aftershock sequence of the 2007 Noto earthquake, Japan. *(November 8, 2013)*

No.1181: Ishiwata, G., High luminance synchrotron radiation refraction contrast photograph technology that uses multi wave diffraction. *(November 26, 2013)*

No.1182: Komori, O., Eguchi, S. and Copas, J. B., Generalized t-statistic for two-group classification. *(January 15, 2014)*

No.1183: Yoshiba, T., Maximum likelihood estimation of skew t-copula. *(February 6, 2014)*

No.1184: Ono, Y., The significance of cluster analysis after Hayashi's Quanti-

fication Method Ⅲ in cultural sciences. *(February 24, 2014)*

No.1185: Yoshimoto, A. and Jimenez, J., Time Variant Distribution of Sugi Log Prices based on Reverting Mean Model for Risk Valuation. *(February 28, 2014)*

No.1186: Iwata, T. and Kanao, M., The quantitative evaluation of the annual variation in the teleseismic detection capability at Syowa Station, Antarctica. *(March 4, 2014)*

No.1187: Ninomiya, Y. and Kawano, S., AIC for the LASSO in generalized linear models. *(May 9, 2014)*

No.1188: Morishige, Y. and Kanefuji, K., Research Strategies and Research Evaluation Using the Web of Science Database: Creating Institutional Metrics for Evaluating Research Diversity. *(September 9, 2014)*

No.1189: Ikeda, S., A min-max problem for prediction. *(December 12, 2014)*

No.1190: Takahashi, J. and Yamashita, S., Imputing missing values using the k-NN method for extremely large-scale financial statement data. *(January 13, 2015)*

No.1191: Yoshida, H. and Ninomiya, Y., Two-class discriminant analysis via varying penalized likelihood. *(February 17, 2015)*

ISM Report on Research and Education

(Reports and documents concerned with education and research.)

No.35: The Institute of Statistical Mathematics, and Department of Statistical Science, The Graduate University for Advanced Studies (ed.), 2013 ISM Openhouse Posters and Annual Symposium of the Graduate Students of the Department of Statistical Science. *(June 2013)*

No.36: Eguchi, S. (ed.), Annual Symposium of the Graduate Students of the Department of Statistical Science, 2013. *(February 2014)*

No.37: The Institute of Statistical Mathematics, and Department of Statistical Science, The Graduate University for Advanced Studies (ed.), 2014 ISM Openhouse Posters and Annual Symposium of the Graduate Students of the Department of Statistical Science. *(June 2014)*

No.38: Miyasato, Y. (ed.), Annual Symposium of the Graduate Students of the Department of Statistical Science, 2014. *(February 2015)*

ISM Reports on Statistical Computing

(Technical reports in Japanese and English that describe management and manipulation of computer systems. Not issued during the period April 2013 to March 2015.)

School of Statistical Thinking Research Report

(Reports on the achievements emerging from project for fostering and promoting statistical thinking. All the articles published so far are in Japanese, and English titles are appended just as bibliographic information.)

No.1: Shimatani, K., Matrix model and population dynamics in ecology. *(March 2014)*

No.2: Teshima, K., Statistical analysis of genome diversity data. *(March 2015)*

6 Published Papers and Books

Many of the achievements made by the staff of the Institute consist of scientific papers and monographs. Each of the staff has selected works worthy of note out of his/her papers and books published in the period from April 2013 to March 2015, to complete the following list. Also included are works by visiting professors and students.

Abe, T., Pewsey, A. and Shimizu, K. : Extending circular distributions through transformation of argument, *Annals of the Institute of Statistical Mathematics*, 65(5), 833-858, 2013.

Aida, J., Yokoyama, A., Shimomura, N., Nakamura, K., Ishikawa, N., Terai, M., Poon, S., Matsuura, M., Fujiwara, M., Sawabe, M., Arai, T. and Takubo, K. : Telomere shortening in the esophagus of Japanese alcoholics: Relationships with chromoendoscopic findings, ALDH2 and ADH1B genotypes and smoking history, *PLOS ONE*, 8(5):e63860, 1-7, doi:10.1371/journal.pone.0063860, 2013.

Akashi, K. and Kunitomo, N. : The limited information maximum likelihood approach to dynamic panel structural equations models, *Annals of the Institute of Statistical Mathematics*, 67, 39-73, doi:10.1007/s 10463-013-0438-5, 2015.

Alam, M. A. and Fukumizu, K. : Hyperparameter selection in kernel principal component analysis, *Journal of Computer Science*, 10(7), 1139-1150, doi:10.3844/jcssp.2014.1139.1150, 2014.

Alam, M. A. and Fukumizu, K. : Higher-order regularized kernel canonical correlation analysis, *International Journal of Pattern Recognition and Artificial Intelligence*, doi:10.1142/S0218001415510052, 2015.

Alam, A. K. M. R., Hagino, T., Fukaya, K., Okuda, T., Nakaoka, M. and Noda, T. : Early phase of the invasion of *Balanus glandula* along the coast of eastern Hokkaido: Changes in abundance, distribution and recruitment, *Biological Invasions*, 16, 1699-1708, doi:10.1007/s10530-

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7 Tutorial and Consultation Programs

Tutorial courses on statistical science are held around 13 times a year for the benefit of researchers, students, and the general public. The levels of courses vary from beginner's level to advanced level.

Year	Category	Title	Month	Number of participants
2013	Standard course	Data Assimilation with the Ensemble Kalman Filter	April	47
	Standard course	A Prospect of Earthquake Prediction Research	April	38
	Basic course	Introduction to Sampling Methods and Sample Surveys	May	67
	Standard course	Electro-Physical Modeling of Neural Systems and Its Mathematics of Dynamics	June	35
	Basic course	Basic Course of Statistics	June	86
	Basic course	Introduction to Dynamic Geometry Software "GeoGebra" and Its Application to Mathematic Education	July	31
	Basic course	Introduction to Multivariate Analysis	August	94
	Standard course	Statistical Mathematics of Quality Control	September	35
	Standard course	Special Lecture on Micro Marketing and Bayesian Modeling	October	60
	Standard course	Discrete Optimization	November	68
	Standard - Advanced course	Introduction to Statistical Topic Models	December	96

Year	Category	Title	Month	Number of participants
2014	Standard course	New Developments on Omics Data Science	January	49
	Standard course	Special Lecture on Micro Marketing and Bayesian Modeling	February	69
	Standard course	Robust Statistics	March	99
	Standard - Advanced course	Statistical Analysis of Random Partitions	March	33
	Basic course	Basic Course of Statistics	May	87
	Standard course	Non-Stationary Time Series Analysis	June	69
	Standard course	Robust Parameter Design	June	54
	Standard course	Analysis of Complex Sample Surveys	July	27
	Basic course	Introduction to Dynamic Geometry Software "GeoGebra" and Its Application to Mathematic Education	August	9
	Basic course	Introduction to Multivariate Analysis	September	86
	Standard course	Non-Stationary Time Series Analysis	September	69
	Standard course	Statistical Analysis with Missing Data: Theory and Applications	November	70
	Standard course	Statistical Analysis for Bioimage Data	December	38
	Standard course	Theory and Applications of Copulas	December	49
2015	Advanced course	Advances of Kernel Methods – as Methods of Nonparametric Inference	January	55
	Advanced course	An Introduction to Survival Analysis	February	64
	Standard course	Gaussian Process: Fundamental Theory and Its Application	March	99

The Institute launched the School of Statistical Thinking in January 2012. Since then, the School has centralized control over the educational programs for the general public. Tutorial courses are the most popular among the programs operated by the School. There is consistent demand for non-degree pursuing continuous education from the private sector. Actually around 70% of the total attendants are from private companies. A yearly open lecture is a more accessible half-day program where a timely topic relating to statistical science is explained in plain language.

Former services for consultancy have been renovated as the "Research Collaboration Start-Up" program. A team of experienced emeritus professors and young research fellows give advice and handle nearly 40 cases a year. Some of them have led to the registration for our Cooperative Research Program or funded joint project between the Institute and the client company.

The ISM Summer School program is also integrated as an activity of the School. It was started in 2006 as a free crash course open to graduate students from all over Japan. The topic of 2013 was "Information Geometry" which gathered 120 registrations. In 2014 we held a program for "Mathematical Modeling for Pandemic Disease", which was held for 10 consecutive days, which was also well attended.

In 1989 the Institute took part in the Graduate University for Advanced Studies and became a degree-granting institution. Since then, the Institute has accepted master's degree holders in the three-year doctoral program. In 2006, the GUAS, and accordingly the Institute, started a five-year program to accept graduates. These programs and courses are managed by the Department of Statistical Sciences, not by the School of Statistical Thinking. See also Supplement.

8 Software Products

The creation of new theories and new methods of analysis generally accompany testing procedures, which are often fulfilled through complicated calculations run by elaborate computer programs. The Institute believes that programs and software completed in the course of research should be delivered as quickly as possible to the relevant fields of science and business. Therefore the Center for Engineering and Technical Support is engaged in cataloguing and storing in a library the software products developed at the Institute. Detailed information on the library, named ISMLIB, is available through: kks@ism.ac.jp (e-mail), http://www.ism.ac.jp/ (URL). Some programs in the library can be downloaded from the Internet site. The following is a partial list of programs developed in the Institute. Most of the programs are coded in Fortran, C, C++, Java, S and R.

Programs developed in ISM

Program	Explanation etc.	Access
■ TIMSAC (*TIMe Series Analysis and Control*)	— *Main features* — Package of programs for analysis, prediction and control of time series. — *Typical examples of application* — ・ Analysis of channel records of brain wave ・ Analysis of economic data ・ Optimal control of plants ・ Implementation of ship's autopilot ・ Analysis of seismological data	Mail to kks@ism.ac.jp

Program	Explanation etc.	Access
■ TIMSAC for Windows	— *Main features* — TIMSAC program implemented on Windows. — *Typical examples of application* — ・ Analysis of brain wave ・ Prediction of sales ・ Prediction of stock price ・ Analysis of seismological data	Mail to kks@ism.ac.jp
■ TIMSAC for R package	TIMSAC program implemented as an R package.	http://jasp.ism.ac.jp/ism/timsac/
■ Web Decomp	A system for time series analysis, mainly for seasonal adjustment or decomposition, used through our Web page.	http://ssnt.ism.ac.jp/inets/inets.html
■ Ardock (dock for AR models)	— *Main features* — A dialogue system for system analysis. — *Typical examples of application* — ・ Analysis of industrial plants ・ System analysis ・ Analysis of chemical processes in human bodies	http://www.ism.ac.jp/ismlib/jpn/ismlib/
■ TIMSAC84: Statistical Analysis of Series of Events (TIMSAC84-SASE) Version 2	Progrms for point process analysis.	http://www.ism.ac.jp/~ogata/Ssg/ssg_softwaresE.html
■ BAYSEA (BAYesian SEasonal Adjustment)	— *Main features* — Computer program for realizing a decomposition of a time series into trend, seasonal and irregular components. — *Typical examples of application* — ・ Seasonal adjustment of economic time series	Mail to kks@ism.ac.jp

Program	Explanation etc.	Access
■ CATDAP (CATegorical Data Analysis)	— *Main features* — A program for the selection of variables that explain well the structure of categorical data. — *Typical examples of application* — ・ Analysis of multi-dimensional contingency tables	Mail to kks@ism.ac.jp
■ CATDAP for Windows	CATDAP program implemented on Windows.	Mail to kks@ism.ac.jp
■ CATDAP for R package	CATDAP program implemented as an R package.	http://jasp.ism.ac.jp/ism/catdap/
■ QUANT (QUANTification theory)	— *Main features* — Programs for the quantification theories of type I, II, III. — *Typical examples of application* — ・ Survey of behavior of the younger generation ・ Analysis of clinical data ・ Prediction of elections ・ Effect of advertisement ・ Data analysis in educational psychology	Mail to kks@ism.ac.jp
■ DALL	— *Main features* — Davidon's variance algorithm subroutine customized for maximum likelihood. — *Typical examples of application* — ・ Analysis of medical data ・ Analysis of multi-dimensional non-stationary data	http://www.ism.ac.jp/ismlib/jpn/ismlib/
■ Jasp (Java based Statistical Processor)	— *Main features* — An experimental statistical analysis system written in Java language. — *Typical examples of application* — ・ Explanatory data analysis ・ Developing new computational statistical methodology	http://jasp.ism.ac.jp/

Program	Explanation etc.	Access
■ Jasplot (Java statistical plot)	— *Main features* — Statistical graphics library in Java language. — *Typical examples of application* — ・Data visualization	http://jasp.ism.ac.jp/jasplot/
■ Statistical Analysis of Seismicity - updated version (SASeis2006)	Programs for seismicity analysis.	http://www.ism.ac.jp/~ogata/Ssg/ssg_softwaresE.html
■ SAPP	An R package for seismicity analysis based on TIMSAC84-SASE Version 2 and SASeis2006.	http://jasp.ism.ac.jp/ism/sapp/
■ NScluster	An R package for simulation and estimation of the Neyman-Scott type spatial cluster models.	http://jasp.ism.ac.jp/ism/NScluster/
■ CloCK-TiME	Web service to analyze multivariate time series by the particle filter.	http://sheep.ism.ac.jp/CloCK-TiME/
■ TSSS	An R package for time series analysis with state space model	http://jasp.ism.ac.jp/ism/TSSS

(Supercomputer system A (right), I (left), C (center))

Supplement

Introduction to the Department of Statistical Science, School of Multidisciplinary Sciences, SOKENDAI (The Graduate University for Advanced Studies)

"In Japan, inter-university research institutes have been established in various research fields as centers of advanced studies and large-scale joint researches since 1971 when National Laboratory for High Energy Physics was built as the first one. A novel idea of applying the excellent academic staff and facilities of inter-university research institutes to postgraduate education had been extensively discussed since 1982. Consequently it was decided to establish the Graduate University for Advanced Studies as a new postgraduate education system operated under close contact and tight cooperation with inter-university research institutes ("parent institutes"). The main purposes of the University are to cultivate young scientists of rich originality backed with wider vision and an international sense and also to promote fundamental research in the direction of opening up new scientific disciplines."

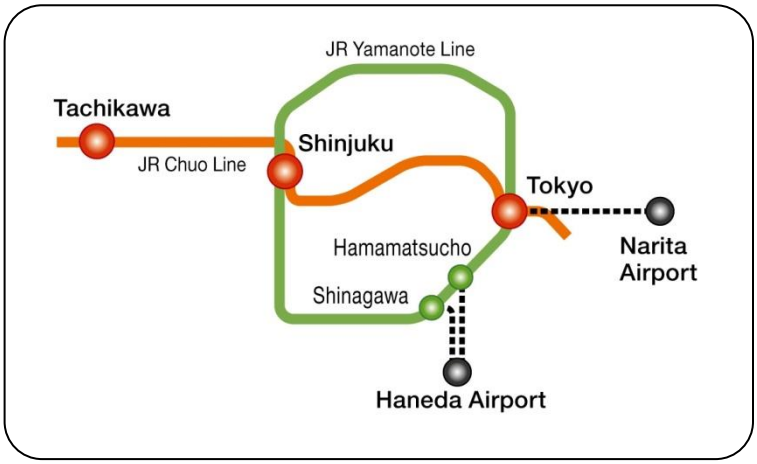
(from the *President's Statement*)

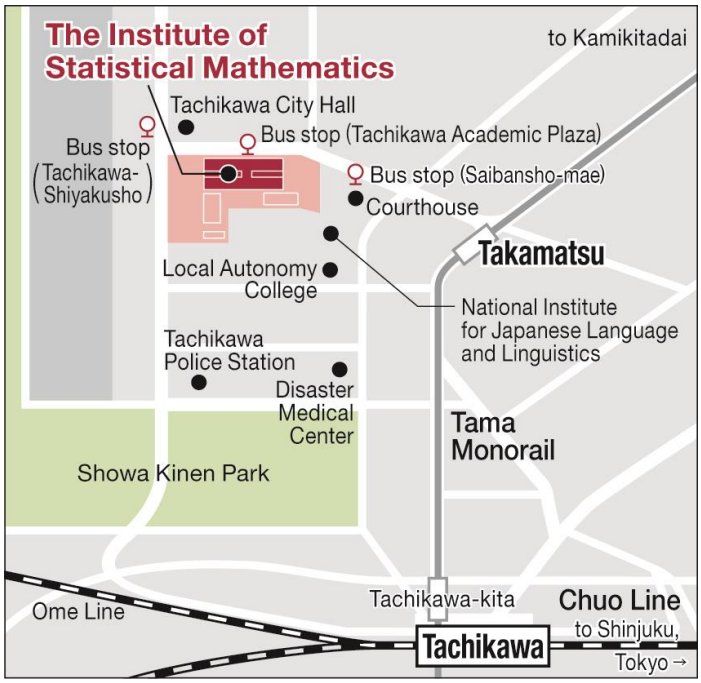
SOKENDAI (The Graduate University for Advanced Studies) was thus established in October 1988 with seven institutes as parents. As of April 2015, the University has grown to have 18 parent institutes and 1777 Ph.D. students. The organization is composed of 6 schools that comprise 21 departments and a center.

In the Department of Statistical Science, research and educational activities focus on the effective use of data for the realization of rational inferences or predictions, in the same way as in the construction and confirmation of scientific hypotheses. The subject area covers the theory and application of statistical science, such as fundamental statistical theory, statistical methodologies, and the theory of prediction and control.

Since its establishment, 114 Doctors of Philosophy have been conferred by the Department. As of April 2015, the Department has 28 students.

Location of the Institute





Access to the ISM

- Tama Monorail
  - -10 min walk from Takamatsu Sta.
- Tachikawa Bus
  - -Tachikawa Academic Plaza bus stop
  - -5 min walk from Saibansho-mae or Tachikawa-Shiyakusho bus stop

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

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