

This document is an unofficial translation from the official Japanese version.

**2018 Admission Guide**  
**Department of Mathematical Informatics**  
**Graduate School of Information Science and Technology**  
**The University of Tokyo**

Master's Programs

Doctoral Programs

Contact

Office of Department of Mathematical Informatics,  
Graduate School of Information Science and Technology,  
The University of Tokyo,  
7-3-1 Hongo, Bunkyo-ku, Tokyo 113-8656, JAPAN.  
TEL: 03-5841-6888 E-mail: [office@office.keisu.t.u-tokyo.ac.jp](mailto:office@office.keisu.t.u-tokyo.ac.jp)

Visit

[http://www.i.u-tokyo.ac.jp/index\\_e.shtml](http://www.i.u-tokyo.ac.jp/index_e.shtml)

In addition to this brochure, be sure to refer to the Admission Guides of Graduate School of Information Science and Technology, The University of Tokyo.

## **(I) Master's Program**

### **1. Outline**

The selection will be conducted based on the “2018 Admission Guide: Master's Program, Graduate School of Information Science and Technology, The University of Tokyo” (also posted on <http://www.i.u-tokyo.ac.jp/>), and on this Admission Guide of the Department of Mathematical Informatics. All important items common to the graduate school, including requirements for eligibility and application procedures, are listed in the above common Guide, so please be sure to refer to the document. This admission guide supplements the above common Guide with explanations regarding examination procedures that are specific to the Department of Mathematical Informatics.

Based on the interdisciplinary nature of the Department of Mathematical Informatics, this department invites applicants from a wide range of fields, both inside and outside The University of Tokyo, with a fundamental understanding and knowledge of mathematics, informatics, and physics. Examination subjects have been selected to ensure that applicants with diverse backgrounds can take examinations under fair conditions.

### **2. Preference Card**

On the “Preference card (for the Master's Program)” included with this Guide, fill in your preferences with regard to faculty advisors, fields, etc., and submit the card along with the application documents.

Note: Regarding preferred faculty advisors

Please select your preferred advisors from amongst those in the Department of Mathematical Informatics (listed on pages 11-13).

### **3. Examination Schedule**

#### **3.1. Regular education subjects**

Examination date	Location	Examination time	Examination subjects
August 21, 2017 (Monday)	School of Engineering; Bldg. No. 6	10:00 – 12:30	Mathematics

- Details on the Examination location will be posted on the bulletin board at the main entrance to Bldg. No.6 of the School of Engineering at 9:00 a.m. on the day of the Examination.
- After the Examination is completed, applicants will be provided with information regarding the subsequent Oral Examinations.

#### **3.2. Foreign languages (English)**

TOEFL scores will be used to evaluate the applicants' English skills. No written English Examination will be administered. For details, refer to “2018 Guidelines for Submission of TOEFL Test Scores; Graduate School of Information Science and Technology, The University of Tokyo,” which is enclosed in the common Admission Guide.

#### **3.3. Specialized subjects**

##### **1) Written Examination**

For Examinations on Specialized Subjects, applicants shall choose one subject from among the following: “Mathematical Informatics,” “Information Physics and Computing,” “Computer Science,” and “Information and Communication Engineering.” Please note that dates, times, and locations differ depending on the subjects.

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Specialized subjects	Examination Dates, Times, and Locations	Scope of questions
Mathematical Informatics	August 22, 2017 (Tuesday) 10:00 – 13:00 School of Engineering; Bldg. No. 6	Applicants will be required to solve three out of five problems related to mathematical problem-solving methods, including: algebraic methods, analytic methods, geometric methods, discrete methods, stochastic methods, statistical methods, and algorithms, etc.
Information Physics and Computing	Please refer to the “Admission Guide” of the Department of Information Physics and Computing.	
Computer Science	Please refer to the “Admission Guide” of the Department of Computer Science.	
Information and Communication Engineering	Please refer to the “Admission Guide” of the Department of Information and Communication Engineering.	

Details on the Examination location for “Mathematical Informatics” will be posted on the bulletin board at the main entrance to Bldg. No. 6 of the School of Engineering at 9:00 a.m. one day before the Examination.

For information on the Examination locations for “Information Physics and Computing,” “Computer Science,” and “Information and Communication Engineering,” please refer to the “Admission Guide” of the department in question.

## 2) Oral Examination

Oral Examinations are scheduled to be held between 9:00 a.m. and 6:00 p.m. on August 24, 2017 (Thursday). Detailed schedules will be posted and distributed during the Examination period.

## 4. Important Notes

4.1. During the written Examinations, applicants are allowed to use only writing instruments (pencils or mechanical pencils; all must be black), pencil sharpeners, erasers, and a clock or watch (that only shows the time; devices with other functions not allowed). No other instruments can be used.

4.2. Persons wishing to enter the school in September are required to confirm their eligibility with the Department Team (the Department of Mathematical Informatics), Academic Affairs Group, Graduate School of Engineering / Information Science, The University of Tokyo.

4.3. For other notes, please be sure to carefully read the “Useful information for persons taking Entrance Examinations (Master’s and Doctoral Programs),” which is included on page 7 of this Guide.

## 5. Contacts

If you have any questions regarding this Application Guide, please contact the Department Administration Office as indicated on the cover.

## **(II) Doctoral Program [Summer and Winter Entrance Examinations]**

### **1. Outline**

The selection will be conducted based on the “2018 Admission Guide: Doctoral Program, Graduate School of Information Science and Technology, The University of Tokyo” (also posted on <http://www.i.u-tokyo.ac.jp/>), and on this Admission Guide of the Department of Mathematical Informatics. All important items common to the graduate school, including requirements for eligibility and application procedures, are listed in the above common Guide, so please be sure to refer to the document. This admission guide supplements the above common Guide with explanations regarding examination procedures that are specific to the Department of Mathematical Informatics.

### **2. Contact before Submission of Applications**

Applicants are required to contact the following office prior to submission of applications and arrange a meeting with their preferred faculty advisor.

#### **Contact:**

Department Team (the Department of Mathematical Informatics)  
Academic Affairs Group  
University of Tokyo Graduate School of Engineering / Information Science  
7-3-1 Hongo, Bunkyo-ku, Tokyo 113-8656  
(TEL: 03-5841-6888, E-mail: [office@office.keisu.t.u-tokyo.ac.jp](mailto:office@office.keisu.t.u-tokyo.ac.jp))

### **3. Preference Card**

On the “Preference card (for Doctoral Program)” included with this Guide, fill in your preferences with regard to faculty advisors, fields, etc., and submit the card along with the application documents.

### **4. Documents for Submission**

Applicants are requested to write a report on the following theme and submit it along with the application documents.

Theme:

- (1) Summarize your past research achievements and future research plans in a report comprising no more than ten A4 size pages, including formulas, diagrams, etc. Applicants may use any appropriate format for this report.
- (2) Provide an English summary of the above report on about one A4 size page.
- (3) Provide responses to the following questions regarding the content of the above report, comprising no more than two A4 size pages.
  - (a) What is the goal of your research?
  - (b) What is the specific content of this research and the methods used?
  - (c) What is the current status of this field of research, in Japan and overseas?
  - (d) What aspects of this research could be considered new in comparison to past research in this field?
  - (e) How will the results of this research contribute to the field in question?

### **5. Primary Examinations**

#### **5.1 Foreign languages (English)**

- TOEFL scores will be used to evaluate the applicants’ English skills. No written English

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Examination will be administered. For details, refer to “2018 Guidelines for Submission of TOEFL Test Scores; Graduate School of Information Science and Technology, The University of Tokyo,” which is enclosed in the common Admission Guide.

- Persons who have completed or are expected to complete a University of Tokyo Graduate School Master's Program will not be required to submit TOEFL scores.

## 5.2 Written Examination

- Applicants will take an Examination on the specialized subject “Mathematical Informatics.” Applicants will be required to write descriptive answers to questions that assess specialized academic skills and knowledge.

- In the Summer Entrance Examination, the Written Examination will be held in Bldg. No.6 of the School of Engineering between 10:00 a.m. and 12:00 p.m. on August 21, 2017 (Monday). Details on the Examination location will be posted on the bulletin board at the main entrance to Bldg. No.6 of the School of Engineering at 9:00 a.m. on the day of the Examination.

- In the Winter Entrance Examination, the Written Examination will be held between January 30 (Tuesday) and February 2 (Friday), 2018. Applicants will be notified directly regarding dates, times, and locations.

- Persons who have completed or are expected to complete a University of Tokyo Graduate School Master's Program may be exempted from the written Examinations on the specialized subject. Applicants wishing to be exempted must contact the Department via their preferred faculty advisor no later than June 14 (Wednesday) in the case of the Summer Entrance Examination, and no later than November 27 (Monday) in the case of the Winter Entrance Examination.

## 5.3 Oral Examination

- Applicants will be required to answer questions on the research plan and other materials submitted in advance.

- In the Summer Entrance Examination, the Oral Examination is held in Bldg. No. 6 of the School of Engineering between August 21 (Monday) and 23 (Wednesday), 2017. Applicants will be notified directly regarding dates, times, and locations.

- In the Winter Entrance Examination, the Oral Examination will be held between January 30 (Tuesday) and February 2 (Friday), 2018. Applicants will be notified directly regarding dates, times, and locations.

## 6. Secondary Examinations

In the case of the Summer Entrance Examinations, persons who have passed the Primary Examinations shall take the Secondary Examinations between late January and mid-February, 2018. Note, however, that persons who wish to enter the school in September and persons who have already completed a master's program by the time of application shall take Secondary Examinations on the same day as the Primary Examinations.

In the case of the Winter Entrance Examination, the Secondary Examinations will be conducted on the same day as the Primary Examinations.

Oral examination will be conducted in the secondary examination. Applicants should bring their Master's thesis (or some equivalent material) to the oral examination. Applicants will be notified later regarding dates, times, and locations.

## 7. Contacts

If you have any questions regarding this Application Guide, please contact the Department Administration Office as indicated on the cover.

## **(III) Doctoral Program - Special Selection of Working Students [Summer and Winter Entrance Examinations]**

### **1. Outline**

The selection will be conducted based on the “2018 Admission Guide: Doctoral Program, Graduate School of Information Science and Technology, The University of Tokyo” (also posted on <http://www.i.u-tokyo.ac.jp/>), “2018 Admission Guide: Doctoral Program, Graduate School of Information Science and Technology, The University of Tokyo [Special Selection of Working Students]” (official Japanese version) and on this Admission Guide of Department of Mathematical Informatics. All important items common to the graduate school, including requirements for eligibility and application procedures, are listed in the above common Guides, so please be sure to refer to the documents. This admission guide supplements the above common Guides with explanations regarding examination procedures that are specific to the Department of Mathematical Informatics.

### **2. Contact before Submission of Applications**

Applicants are required to contact the following office prior to submission of applications and arrange a meeting with their preferred faculty advisor.

#### **Contact:**

Department Team (Department of Mathematical Informatics)  
Academic Affairs Group  
University of Tokyo Graduate School of Engineering / Information Science  
7-3-1 Hongo, Bunkyo-ku, Tokyo 113-8656  
(TEL: 03-5841-6888, E-mail: [office@office.keisu.t.u-tokyo.ac.jp](mailto:office@office.keisu.t.u-tokyo.ac.jp))

### **3. Preference Card**

On the “Preference card (for Doctoral Program)” included with this Guide, fill in your preferences with regard to faculty advisors, fields, etc., and submit the card along with the application documents.

### **4. Documents for Submission**

In their application documents, applicants shall include the documents consisting of the following five items regarding the applicant's research and work achievements in a field related to Mathematical Informatics.

#### (1) List of achievements

Provide a list of academic papers, patents, products, and other examples of the applicant's achievements. In the case of collaborative achievements involving several persons, clearly indicate the part and the weight of the applicant's contributions.

#### (2) Outline of main achievements

Select three or less main achievements from the above list, and provide an outline of these achievements.

#### (3) Research plan

Provide a detailed description of the applicant's plan for research to be conducted in the Doctoral Program.

#### (4) Materials related to main achievements

These materials may include reprints (or copies) of academic papers, detailed descriptions of patents, or product pamphlets.

#### (5) Recommendation letters

Select two individuals with a clear understanding of the applicant's achievements, and have them

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provide separate evaluations of those achievements by filling in the specified form found at (<http://www.i.u-tokyo.ac.jp/edu/course/mi/pdf/gyouseki.doc>). Evaluations should be sealed before being submitted.

Note: Items (2) and (3) should be combined on about ten A4 size pages.

## 5. Selection Methods

A few students will be selected based on research achievements and work achievements in fields related to Mathematical Informatics, and also on the selection below.

### 5.1 Foreign languages (English)

- TOEFL scores will be used to evaluate the applicants' English skills. No written English Examination will be administered. For details, refer to "2018 Guidelines for Submission of TOEFL Test Scores; Graduate School of Information Science and Technology, The University of Tokyo," which is enclosed in the common Admission Guide.
- Persons who have completed or are expected to complete a University of Tokyo Graduate School Master's Program will not be required to submit TOEFL scores.

### 5.2 Written Examination

- Applicants will take an Examination on the specialized subject "Mathematical Informatics." Applicants will be required to write descriptive answers to questions that assess specialized academic skills and knowledge.
- In the Summer Entrance Examination, the Written Examination will be held in Bldg. No.6 of the School of Engineering between 10:00 a.m. and 12:00 p.m. on August 21, 2017 (Monday). Details on the Examination location will be posted on the bulletin board at the main entrance to Bldg. No.6 of the School of Engineering at 9:00 a.m. on the day of the Examination.
- In the Winter Entrance Examination, the Written Examination will be held between January 30 (Tuesday) and February 2 (Friday), 2018. Applicants will be notified directly regarding dates, times, and locations.
- Persons who have completed or are expected to complete a University of Tokyo Graduate School Master's Program may be exempted from the written Examinations on the specialized subject. Applicants wishing to be exempted must contact the Department via their preferred faculty advisor no later than June 14 (Wednesday) in the case of the Summer Entrance Examination, and no later than November 27 (Monday) in the case of the Winter Entrance Examination.

### 5.3 Oral Examination

- Applicants will be required to answer questions on the research plan and other materials submitted in advance.
- In the Summer Entrance Examination, the Oral Examination is held in Bldg. No. 6 of the School of Engineering between August 21 (Monday) and 23 (Wednesday), 2017. Applicants will be notified directly regarding dates, times, and locations.
- In the Winter Entrance Examination, the Oral Examination will be held between January 30 (Tuesday) and February 2 (Friday), 2018. Applicants will be notified directly regarding dates, times, and locations.
- Applicants should bring their Master's thesis (or some equivalent material) to the oral examination.

## 6. Contacts

If you have any questions regarding this Application Guide, please contact the Department Administration Office as indicated on the cover.

**Department of Mathematical Informatics**  
**Useful information for persons taking Entrance Examinations**  
**(Master's and Doctoral Programs)**

**1. Examination dates and times**

Please refer to the main body of this Guide.

**2. Examination locations**

University of Tokyo (7-3-1 Hongo, Bunkyo-ku, Tokyo)

Refer to the map on page 8.

By subway:

Marunouchi Line / Oedo Line: Get off at Hongo Sancho Station

Chiyoda Line: Get off at Nezu Station

Namboku Line: Get off at Todai Mae Station

Mita Line: Get off at Kasuga Station

By Bus:

Take Toei Bus No. 43 or 51 to “Todai Seimon Mae” (Main Gate of The University of Tokyo), or Toei School Bus No. 1 or 7 to “Todai Konai” (Campus of The University of Tokyo).

- (1) Please check the Department bulletin board for information on your own Examination rooms.
- (2) Examinees should be in the designated Examination room no later than 15 minutes before the start of Examination. If an examinee is late, the examinee should contact the Examination supervisor.

**3. What to bring**

- (1) Examination admission card
- (2) Be sure to bring black pencils (or mechanical pencil), erasers, pencil sharpeners (desktop types are not acceptable) or a knife if you are using black pencils, and a clock or watch (that only shows the time).

Caution: During the Examination period, all mobile phones must be turned off and put away.

**4. Items to keep in mind during Examinations**

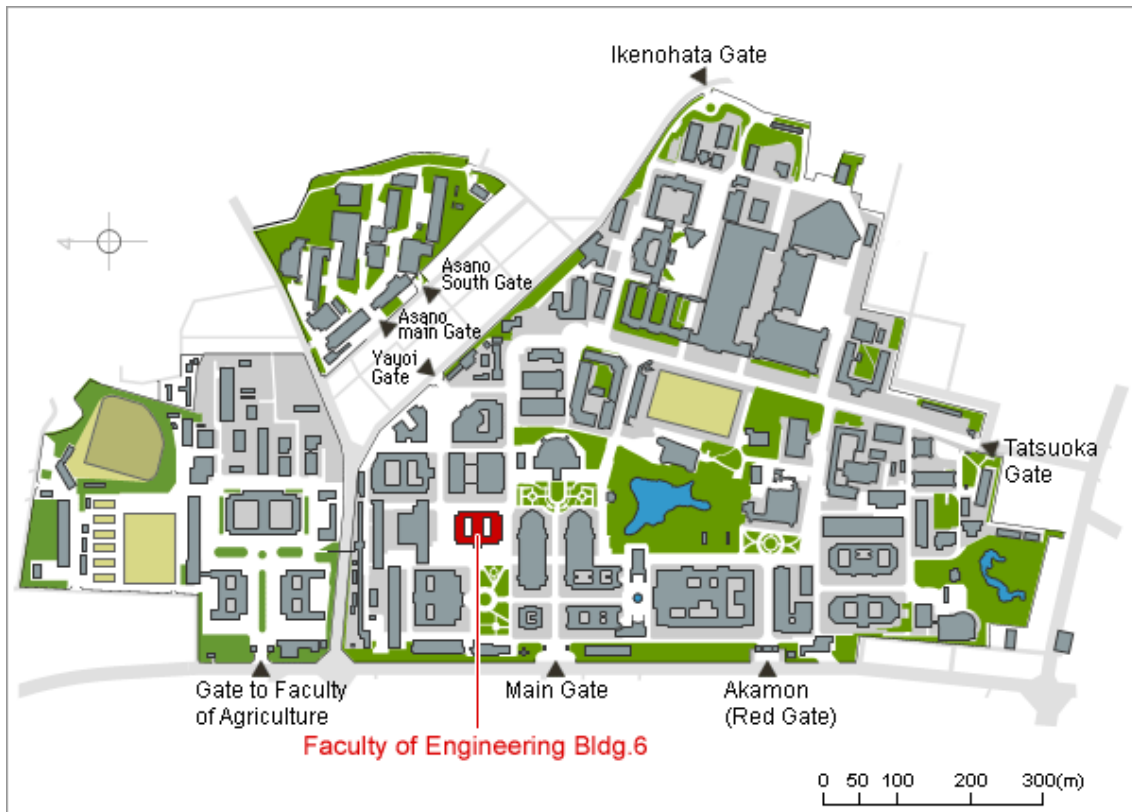
- (1) Examinees will not be allowed to leave the examination room after the start of the Examination.
- (2) Examinees will not be allowed, in principle, to leave their seats even temporarily. Call the proctor in case feeling sick or needing to use the bathroom facilities during the Examination period.
- (3) Examination admission cards must be placed on the desk throughout the examination period.
- (4) Enter your examinee's number on all answer sheets. Do not write your name. Enter your answers on the designated sheet. If there is not enough space, you may write on the back of the answer sheet.
- (5) Examinees are not allowed to take answer sheets and question booklets out of the examination room.



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## Department of Mathematical Informatics

### Map of Examination Location



By subway:

Marunouchi Line / Oedo Line: Get off at Hongo Sanjome Station

Chiyoda Line: Get off at Nezu Station

Namboku Line: Get off at Todai Mae Station

Mita Line: Get off at Kasuga Station

Bus:

Take Toei Bus No. 43 or 51 to “Todai Seimon Mae” (Main Gate of The University of Tokyo), or Toei School Bus No. 1 or 7 to “Todai Konai” (Campus of The University of Tokyo).

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**[Preference card (for Master's Program)]**

Department of Mathematical Informatics, Graduate School of Information Science and Technology, The University of Tokyo

Program	Master's Program			
Examinee's name			*Examinee's number	
Graduating university (Graduate school if applicable)	University: _____ School: _____ Department: _____ Graduation date(expected)                      year                      month Graduate School: _____ School: _____ Department: _____ Graduation date(expected)                      year                      month			
Contact address during the examination period	Address: TEL: E-mail:			
Names of preferred faculty advisors	Preference 1			
	Preference 2			
	Preference 3			
Specialized subjects to be tested on the Examination	Mathematical Informatics	Information Physics and Computing	Computer Science	Information and Communication Engineering
Do you wish to enter the school in September 2017?	Yes		No	
Preferred field (Please describe in detail)				
If you have any preferred faculty advisor or preferred fields other than those noted above, please indicate them here.				

- Submit this card along with your application.
- \*Leave this box blank.
- Please circle the relevant specialized subjects to be taken.
- Persons wishing to enter the school in September are required to confirm the eligibility with the Department Team (the Department of Mathematical Informatics), Graduate School of Engineering / Information Science and Technology, Academic Affairs Group, The University of Tokyo, and circle "Yes" in the appropriate column above.

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**[Preference card (for Doctoral Program)]**

Department of Mathematical Informatics, Graduate School of Information Science and Technology, The University of Tokyo

Program	Doctoral Program		
Examinee's name		*Examinee's number	
Graduating university and graduate school	University: _____ School: _____ Department: _____ Graduation date(expected)                      year                      month Graduate School: _____ School: _____ Department: _____ Graduation date(expected)                      year                      month		
Contact address during the examination period	Address: TEL: E-mail:		
Name of preferred faculty advisor			
	(Confirm the following statement and mark the check box.) <input type="checkbox"/> I have made contact and held a meeting with the preferred faculty advisor prior to submission of this application.		
Application Category (Please mark the appropriate item)	Summer Examinations	<input type="checkbox"/>	
	Winter Examinations	<input type="checkbox"/>	
	Special selection for working students	<input type="checkbox"/>	
Do you wish to enter the school in September 2017?	Yes	No	
Preferred field			

- Submit this card along with your application.
- \*Leave this box blank.
- Please note that the period for acceptance of applications differs for the Summer Examination and the Winter Examination. Application documents that arrive outside of the respective periods for acceptance of applications shall be deemed invalid.
- Persons wishing to enter the school in September are required to confirm the eligibility with the Department Team (the Department of Mathematical Informatics), Graduate School of Engineering / Information Science and Technology, Academic Affairs Group, The University of Tokyo, and circle "Yes" in the appropriate column above.

**Department of Mathematical Informatics**

**Graduate School of Information Science and Technology, The University of Tokyo**

[http://www.i.u-tokyo.ac.jp/edu/course/mi/members\\_e.shtml](http://www.i.u-tokyo.ac.jp/edu/course/mi/members_e.shtml)

Satoru Iwata (Professor)	(1) Discrete optimization: Design and analysis of algorithms for optimization problems related to matroids and submodular functions. (2) Discrete mathematical engineering: Discrete optimization techniques in numerical linear algebra and dynamical systems analysis. (3) Global optimization: Design of efficient algorithms for solving nonconvex optimization problems with geometric backgrounds. (4) Chemo-informatics: Information processing methods for assisting research in chemistry.
Fumiyasu Komaki (Professor)	(1) Theoretical statistics: inference theory, prediction theory, Bayesian theory, experimental design, model selection. (2) Statistical modeling: Bayesian networks, graphical models, point processes. (3) Information geometry: differential geometry of statistical inference.
Kunihiko Sadakane (Professor)	(1) Theory of data structures, algorithms, and data compression, and its application to big data processing. (2) Computational models for many-core environments and algorithm design on those models.
Tsuyoshi Takagi (Professor)	(1) Mathematical Cryptography: Theoretical analysis and efficient implementation of post-quantum cryptography in the era of quantum computers. (2) Applied Cryptography: Security evaluation of Bitcoin system or cryptographic protocols such as SSL/TLS.
Takayasu Matsuo (Professor)	(1) Numerical algorithm: differential equation, function approximation, numerical linear algebra, tensor. (2) Theoretical numerical analysis: geometric numerical integration, discrete functional analysis, asymptotic behaviors of algorithms. (3) Applications: physical simulation, data analysis.
Kenji Yamanishi (Professor)	(1) Theory of machine learning: an information-theoretic or statistical approach to machine learning. (2) Data mining and knowledge discovery: anomaly detection, change analysis, network mining, latent dynamics. (3) Big data analysis: security, marketing, education, traffic risk analysis, healthcare.
Taiji Suzuki (Associate Professor)	(1) Machine learning, statistical learning theory: theory of generalization error, kernel method, regularization, stochastic optimization. (2) Mathematical statistics, statistical modeling: high dimensional sparse estimation, Bayesian statistics, information geometry.
Tomonari Sei (Associate Professor)	(1) Theoretical statistics: inference theory, directional statistics, algebraic statistics, information geometry, Bayesian statistics. (2) Statistical modeling of rare events, time series data, etc. (3) Statistical modeling with optimal transport map.
Ken'ichiro Tanaka (Associate Professor)	(1) Theoretical Numerical Analysis: numerical integration, function approximation, mathematical analysis of approximation formulas, design of accurate approximation formulas by optimization. (2) Numerical algorithm: accurate computation by variable transformation, fast and accurate computation of integral transforms, fast and accurate methods for functional equations. (3) Numerical methods for finance: option

	pricing, risk evaluation.
Shin-ichi Tanigawa (Associate Professor)	(1) Discrete and computational geometry: distance geometry, rigidity theory, graph embeddings. (2) Discrete optimization: graph algorithms, approximation algorithms, matroids, submodular functions.
Hiroshi Hirai (Associate Professor)	(1) Discrete optimization: multicommodity flow, facility location, network design, etc. (2) Discrete mathematics: finite metric spaces, polyhedral combinatorics, graph theory, and their applications.
Kumiko Tanaka-Ishii (Professor) [RCAST]	(1) Mathematical modeling of natural language, computational linguistics. (2) Statistical natural language processing, language engineering using machine learning methods, unsupervised machine learning methods. (3) Dynamics of natural language and communication based on complex systems theory.
◇Kazuyuki Aihara (Professor) [IIS]	(1) Bioinformative systems theory: mathematics for AI, mathematical modelling and nonlinear dynamical analysis of neural networks and genetic networks, learning and self-organization theory, and neuroeconomics. (2) Complex systems theory: chaos engineering, chaotic artificial brain, quantum artificial brain, prediction and control of complex systems, combinatorial optimization by nonlinear dynamics, nonlinear analysis of complicated real-world data, mathematical modelling of social and economic phenomena, cancers, and immune systems, econophysics, and mathematical arts.
※Hiroshi Nakagawa (Professor) [ITC]	(1) Machine learning application: Online learning, Directed learning based on Bayesian optimization. (2) Privacy protection in data mining: Differential privacy, privacy protection in information retrieval, Analysis of side effect of privacy protection.
Kengo Nakajima (Professor) [ITC]	(1) Parallel Numerical Algorithms: Parallel Linear Solvers (Iterative Methods, Preconditioning), Multigrid Methods. (2) High-Performance Computing (HPC): Parallel Programming Models, Problem Solving Environment (PSE). (3) Scientific Computing: Computational Mechanics, Finite Element Methods (FEM). (4) Large-Scale Data Processing: Adaptive Mesh Refinement (AMR), Visualization.
Takaaki Ohnishi (Associate Professor) [SICT]	Big data analysis on socio-economic phenomena: Time series and spatio-temporal analysis (financial market, real estate market, bubble phenomena, accumulation of industry and population, human behavior), complex networks (inter-firm networks, correlation between economic markets, diffusion process), text analysis (broadcasts, newspapers, ancient documents, web pages), socio-econophysics, massively parallel computing.
Hiromichi Nagao (Associate Professor) [ERI]	(1) Information fusion for earthquake and tsunami disasters: algorithm for hypocenter determination, earthquake and tsunami early warning system, application of big data related to earthquakes. (2) Data assimilation: integration of large-scale numerical simulations and massive observation data, sequential Bayesian filters, four-dimensional variation method (fast automatic differentiation method), optimization of observational/experimental design, programming on parallel supercomputers.

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Yoshito Hirata (Project Associate Professor) [IIS]	(1) Theoretical developments of nonlinear time series analysis: time series prediction, high-dimensional time series, point processes, recurrence plots, and symbolic analysis. (2) Applications of nonlinear time series analysis: renewable energy, biological phenomena including cancer, brains and neurons, economies, and earthquakes. (3) Mathematical medicine: mathematical modelling of diseases, parameter estimation, and optimal treatment scheduling.
※Hirosuke Yamamoto (Professor) [Frontier Sciences]	(1) Information theory: Shannon theory, data compression algorithms, information-spectrum theory, network coding. (2) Cryptology: secret sharing schemes, visual cryptography, information theoretic cryptology, broadcast encryption. (3) Coding theory: convolutional codes, turbo codes, low density parity check codes, polar codes, and their decoding algorithms.
Noboru Kunihiro (Associate Professor) [Frontier Sciences]	(1) Cryptanalysis of public key cryptosystems: RSA and elliptic curve scheme etc. (2) Algorithmic number theory: factoring algorithm etc. (3) Construction of efficient and secure cryptosystems. (4) Cryptographic protocols: e-voting and e-cash etc.
Takashi Kohno (Associate Professor) [IIS]	(1) Neuromorphic system: designing and construction of artificial system that mimics information processing scheme in nerve system and brain. (2) Modeling nerve system and brain: nonlinear model and bifurcation of neuronal cell, learning rule.
Tetsuya Kobayashi (Associate Professor) [IIS]	(1) Theory for stochastic cellular information processing: stochastic process, stochastic dynamical systems, and information theory for cellular responses. (2) Systems biology: image analysis, data analysis, and modeling of biological phenomena. (3) Design of stochastic computation systems: application of (1) to designing new engineering systems.
Gouhei Tanaka (Project Associate Professor) [Engineering]	(1) Complex systems dynamics: mathematical modeling and qualitative analysis of dynamics, bifurcation phenomena, phase transitions, network robustness, epidemics, diseases, and social phenomena. (2) Energy-saving information processing: downsizing cognitive networks for low power consumption, nano and micro systems, and computational intelligence.
◇Yoko Yamaguchi (Professor) [RIKEN BSI]	(1) Computational neuroscience: computational theory of spatial memory formation in the hippocampus, nonlinear dynamics theory for working memory and central executive functions. (2) Human brain imaging study (EGG, fMRI) on perception, memory operation and creative thinking. (3) Design of brain-style intelligent systems and its application to robot control.

Faculty members marked with ◇ accept students only in the Master's program. Faculty members marked with ※ do not accept students for 2018. [RCAST] means members belonging to the Research Center for Advanced Science and Technology. [IIS] means members belonging to the Institute of Industrial Science. [ITC] means members belonging to the Information Technology Center. [SICT] means members belonging to the Social ICT Research Center. [ERI] means members belonging to the Earthquake Research Institute. [Frontier Science] means members belonging to the Graduate School of Frontier Sciences. [Engineering] means members belonging to the Graduate School of Engineering. [RIKEN BSI] means faculty members belonging to the Riken Brain Science Institute. For locations of offices of the faculty members, refer to their web pages.