Machine Learning and Statistical Data Analysis

Sugiyama-Yokoya-Ishida Lab

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http://www.ms.k.u-tokyo.ac.jp

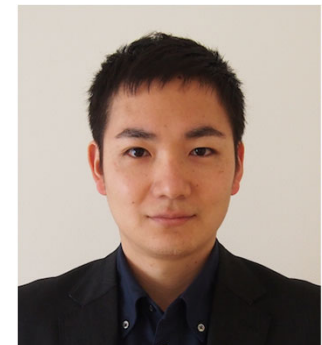東京大学
THE UNIVERSITY OF TOKYO

Faculty Members

■ **Masashi Sugiyama (Professor)**

- Machine learning algorithms
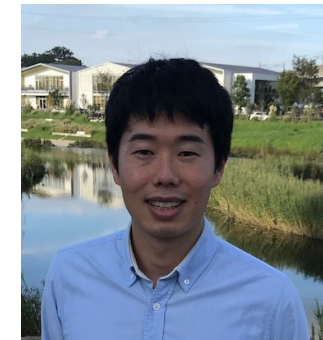- Industrial applications

■ **Naoto Yokoya (Associate Professor)**

- Image processing
- Remote sensing

■ **Takashi Ishida (Lecturer)**

- Weakly supervised learning
- Regularization

Staffs' Affiliations

- Graduate School of Frontier Sciences (K)
- Graduate School of Information Science and Technology (H)
- Faculty of Science (H)
- The Institute for AI and Beyond (H)
- RIKEN Center for Advanced Intelligence Project (N)

Current members in our lab:
Research & support staffs: 6
Doctoral students: 23
Master students: 24
Research students: 3

(including former Prof. Sato's students)

Kashiwa

Hongo

Nihonbashi

How Intelligent Can Computers Be?

■ We are interested in machine learning:

- Construction of fundamental theories.
- Development of practical algorithms.
- Application in real-world problems.

Sugiyama-Yokoya-Ishida Lab at the University of Tokyo

We are working on theory, algorithm, and application of machine learning and statistical data analysis.

[English | Japanese]

| Sugiyama Lab | Yokoya Lab | Ishida Lab |

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Members

Publications

How to Join Us

Access

How Intelligent Can Computers Be?
Theory, Algorithm, and Application of Machine Learning

With the dramatic performance improvement of information and communication technology, intelligent information processing that can be done only by humans is becoming possible also by computers. Under the theme of "how intelligent can computers be?", Sugiyama Laboratory is working on various research topics related to intelligent data analysis, called machine learning, in the field of artificial intelligence.
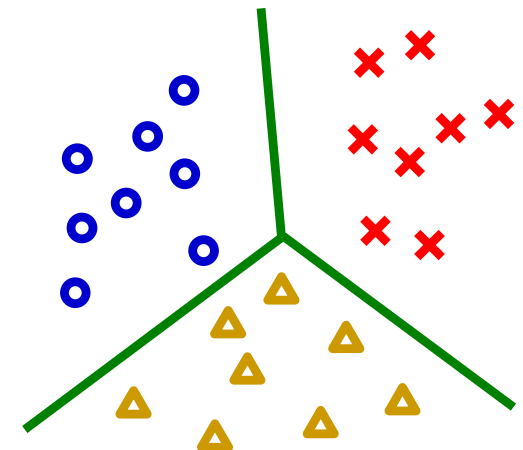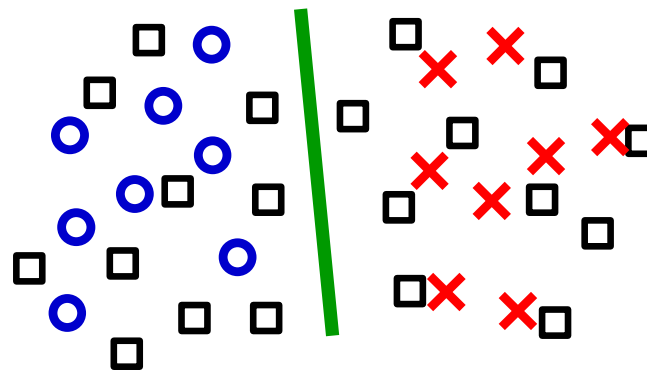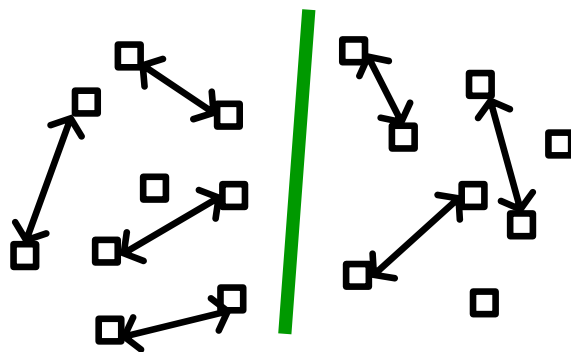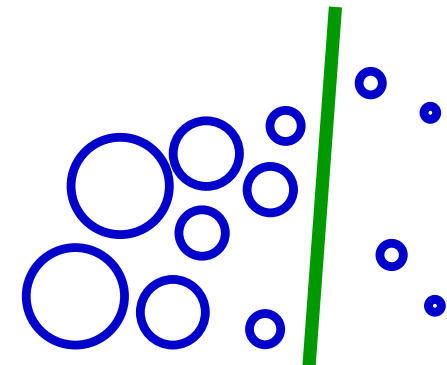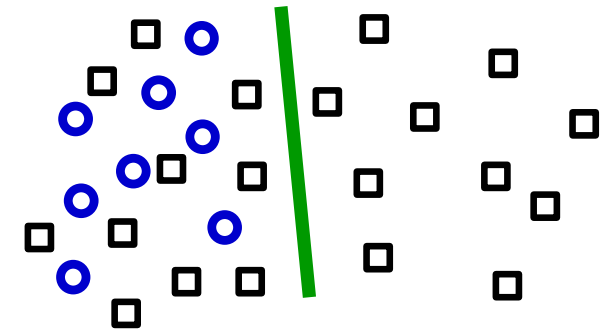
Recent Research Topics

■ **Weakly supervised learning:**

- Labeling data is costly.

- But learning from small data is generally difficult.

- Let's utilize "weak" data that can be collected easily!

- Examples: PU, PNU, Pconf, UU, SDU, Comp. learning, etc.

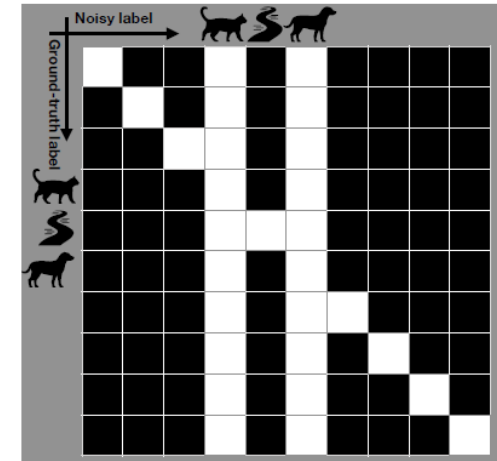# Recent Research Topics

■ Robust and reliable learning:

- Data is often contaminated by noise, outlier, non-stationarity, etc.

- Standard machine learning methods do not work well with such data.

- We are developing new technologies that can overcome these difficulties.

- Examples: Co-teaching, label-noise learning, classification with rejection, transfer learning, etc.
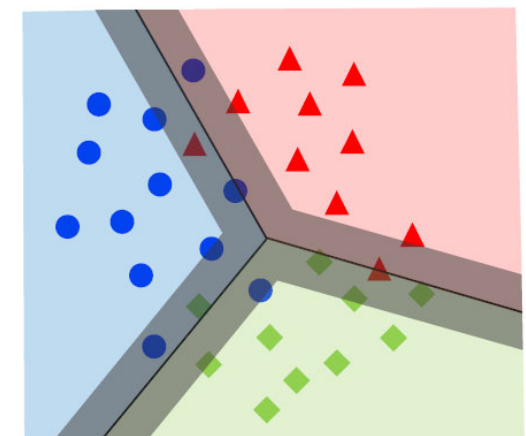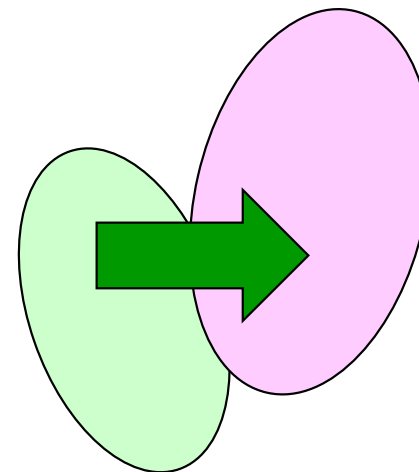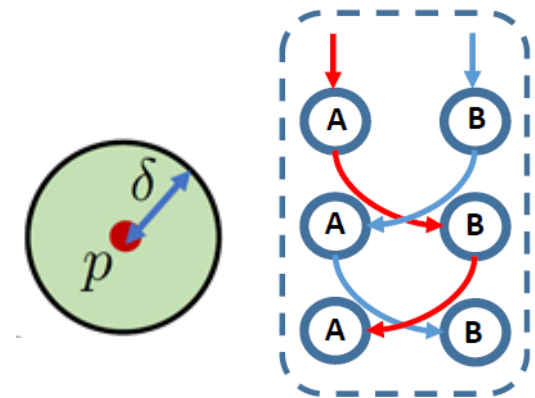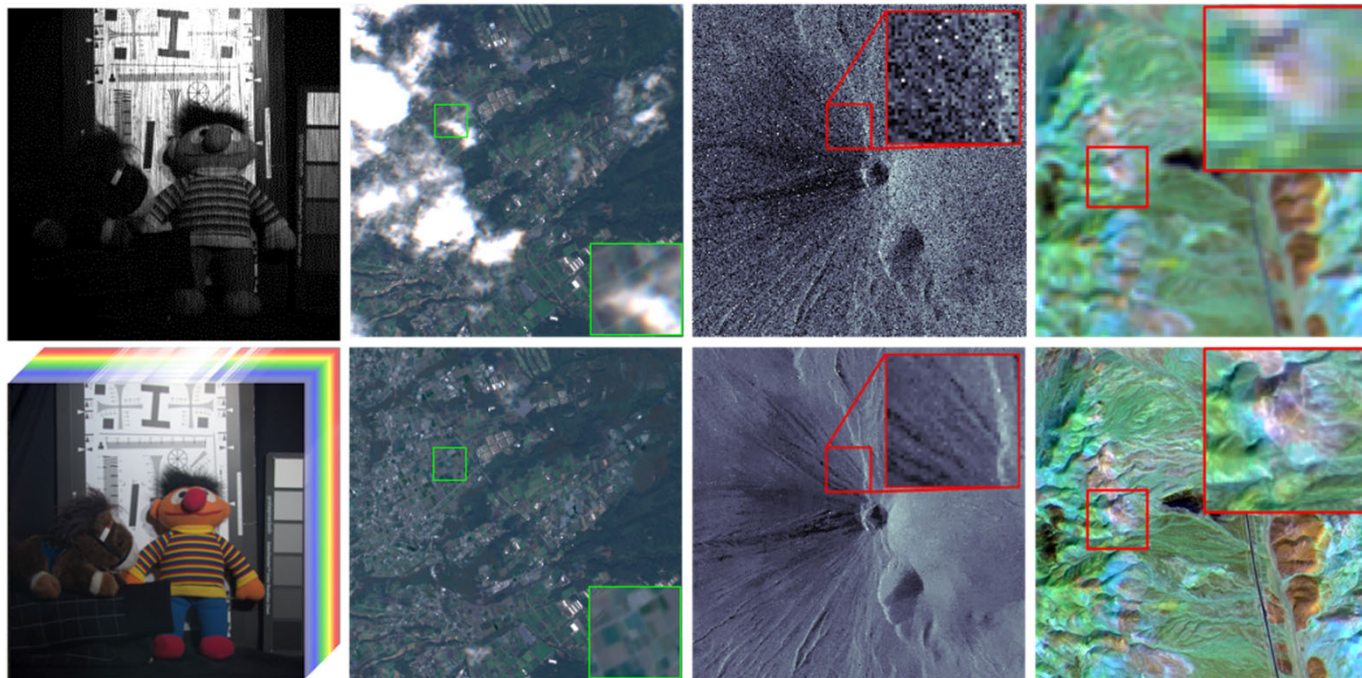
Recent Research Topics

■ Computational imaging

- Recover images from incomplete measurements
- Compressive spectral imaging, super-resolution, inpainting, image fusion, etc.
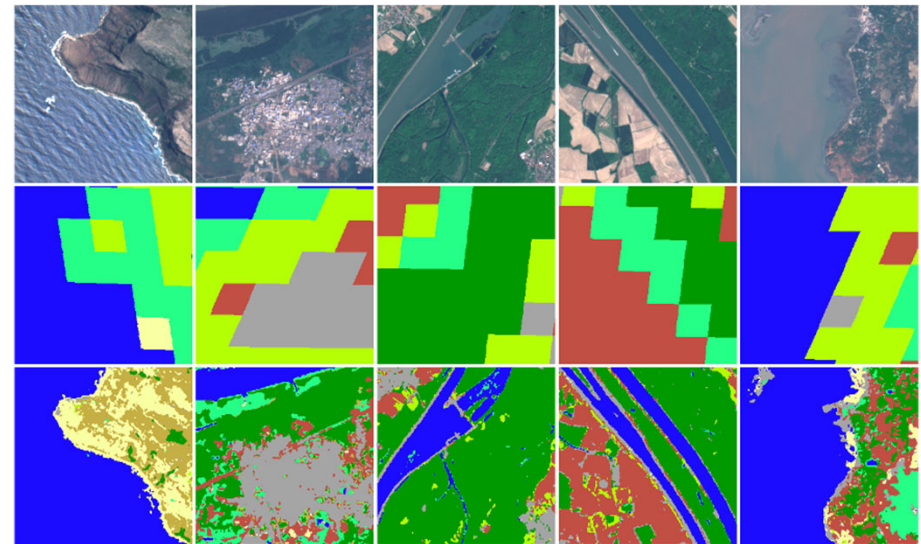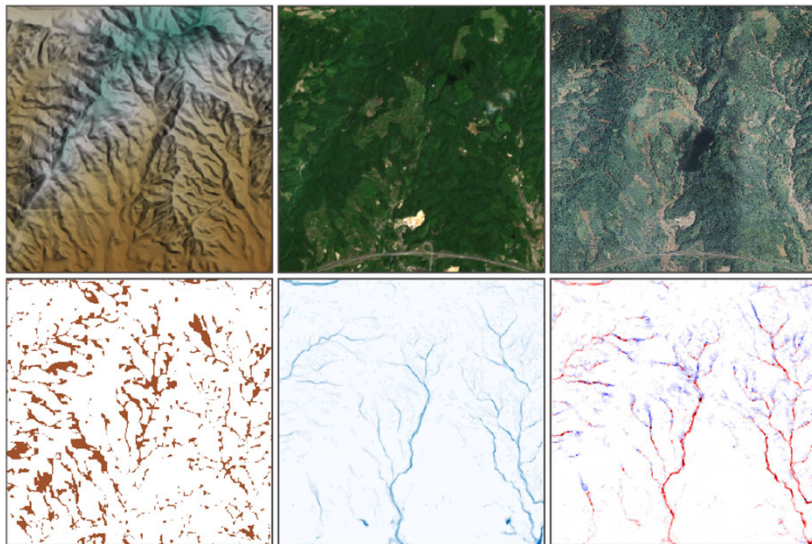- Deep image prior, low-rank tensor analysis, etc.

Recent Research Topics

■ Remote sensing image analysis

- Human annotation is expensive in remote sensing

- Mapping, 3D reconstruction, and change detection with low-cost supervision

- Label super-resolution, learning from synthetic data, cross-modal learning etc.

Sugiyama-Yokoya-Ishida Lab:
Machine Learning and Statistical Data Analysis

■ **Goal**: Develop computers that learn like us.

- **Supervised learning:** We directly help computers.
- **Unsupervised learning:** We do not help computers.
- **Reinforcement learning:** We indirectly help computers.

■ **Research aspects:**

- **Theory:** Probability, statistics, optimization, information theory, etc.
- **Algorithm:** Effectiveness, efficiency, practicality, etc.
- **Application:** signal, image, sensor, web, language, robot, biology, brain, medicine, etc.