TAKANORI MAEHARA

PERSONAL DETAIL

Name:	Takanori MAEHARA
Position:	Unit Leader, Discrete Optimization Unit,
	RIKEN Center for Advanced Intelligence Project
Address:	1-4-1, Nihonbashi, Chuo-ku, Tokyo, 103-0027, Japan
Phone/Mobile:	+81-3-6225-2482 (office) / +81-90-8433-0438 (personal)
EMail:	takanori.maehara@riken.jp / maehara@prefield.com
Web:	http://www.prefield.com
Google Scholar:	https://scholar.google.co.jp/citations?user=3ei4ZqoAAAAJ
Orcid-id	https://orcid.org/0000-0002-2101-1484

EDUCATION

Doctor of Information Science and Technology *March 2009 – September 2012*
The University of Tokyo, Japan
Graduate School of Information Science and Technology
Supervisor: Professor Kazuo MUROTA

Master of Information Science and Technology *March 2007 – March 2009*
Graduate School of Information Science and Technology
The University of Tokyo, Japan
Supervisor: Professor Kazuo MUROTA

Bachelor of Engineering *April 2004 – March 2007*
Faculty of Engineering
The University of Tokyo, Japan
Supervisor: Professor Masato TAKEICHI

Associate Degree of Engineering *April 1999 – March 2004*
Department of Electronic Control System Engineering
Numazu College of Technology, Japan
Supervisor: Professor Toshio FUNADA

WORK EXPERIENCE

Unit Leader *December 2016 – Present*
Discrete Optimization Unit
RIKEN Center for Advanced Intelligence Project, Japan

A leader of a research team (Discrete Optimization Unit) at a scientific research institute (RIKEN). The purpose of my team is to establish machine-learning algorithms using discrete optimization theory. The research topic includes combinatorial optimization, approximation algorithms, game theory, fairness and explainability, and graph neural networks.

- Leading a research team that has 6 full-time researchers and 5 part-time students in total. Accepted 9 internship students in total.
- Published more than 45 peer-reviewed papers in journals and conferences, including SODA, NeurIPS, ICML, AAAI, and IJCAI. See http://www.prefield.com/publications-discopt.html for the publication list of my team.
- Organized 3 international workshops about discrete optimization and machine learning.

- Collaborating with several industries as a technical advisor.

Researcher *April 2017 – Present*
CyberAgent, inc., Japan

A part-time member (12 hour per week) of an engineering team for computational advertising.

- Developing machine-learning algorithms for location-based advertisements.
- Developed bid-price optimization algorithms for real-time bidding.
- Published a paper at IJCAI.

Visiting Associate Professor *April 2018 – Present*
Department of Electrical and Electronic Engineering
Tokyo University of Agriculture and Technology, Japan

- Supervised 1 Ph.D. student.
- Taught discrete optimization for 1st and 2nd-year graduate students. (3 courses)

Visiting Associate Professor *April 2018 – Present*
University of Electro-Communications, Japan

- Taught combinatorial optimization and game theory for 3rd-year undergraduate students. (15 courses)

Visiting Researcher *May 2015 – March 2019*
KIBAN(S): Large Graph Project: Theory and Algorithms
National Institute of Informatics, Japan

A visiting researcher for JSPS Grants-in-Aid for Scientific Research, KIBAN (S) Large Graphs: Theory and Algorithms lead by Ken-ichi Kawarabayashi.

Assistant Professor *February 2015 – March 2017*
Department of Mathematical and Systems Engineering
Shizuoka University, Japan

A faculty member (assistant professor) at a department of mathematical engineering in a local university.

- Supervised 2 undergraduate students as a laboratory head.
- Published 9 peer-reviewed papers in journals and conferences, including Mathematical Programming, ICML, AAAI, IJCAI, KDD, and ACL.
- Taught programming (C language) for first and second-year undergraduates and graph theory for third-year undergraduates.
- Organized 1 domestic workshop on operations research.

Project Researcher *October 2012 – January 2015*
JST ERATO Kawarabayashi Large Graph Project
National Institute of Informatics, Japan

A post-doc at a research institute. The project aims at establishing graph-theoretic algorithms for machine learning, data mining, and database.

- Published 10 peer-reviewed papers in journals and conferences, including AAAI, ICDE, VLDB, and SIGMOD.

TEACHING EXPERIENCE

Operations Research 2 *October 2019 – March 2020*
Department of Informatics *October 2018 – March 2019*
University of Electro-Communications, Japan

Introduction to Interdisciplinary Sciences *December 17 2019 (3 Classes)*
Department of Interdisciplinary Sciences *October 23 2018 (3 Classes)*
University of Tokyo, Japan

Electronic and Information Engineering: Advanced Lecture II *August 27 2019 (3 Classes)*
Department of Electrical and Electronic Engineering *February 20 2019 (3 Classes)*
Tokyo University of Agriculture and Technology, Japan

Graph Theory *October 2016 – March 2017*
Graduate School of Engineering *October 2015 – March 2016*
Shizuoka University, Japan

Program Contest *April 2016 – September 2016*
Graduate School of Engineering *April 2015 – September 2015*
Shizuoka University, Japan

Basics of Programming *October 2015 – March 2016*
Graduate School of Engineering
Shizuoka University, Japan

HONORS AND AWARDS

Best Paper Award *April 2018*
21th International Conference on Artificial Intelligence and Statistics

Best Young Presentation Award *June 2016*
Japan Society for Industrial and Applied Mathematics

Best Presentation Award *March 2010*
The Operations Research Society of Japan

Student Paper Award *September 2009*
The Operations Research Society of Japan

Dean's Award *March 2009*
Graduate School of Information Science and Technology
University of Tokyo, Japan

Tsukuba OR Student Presentation Award *March 2009*
The Operations Research Society of Japan

S@CO Best Presentation Award *June 2008*
The Operations Research Society of Japan

Dean's Award *March 2006*
Faculty of Engineering
University of Tokyo

SOCIAL ACTIVITY

Workshop Organizing Committee: Conference on Optimization *November 25–27 2019*
Fields Institute, Toronto, Canada
(co-organized with Antoine Deza, Jelena Diakonikolas, Paul Grigas, Swati Gupta, Sebastian Pokutta, Yuriy Zinchenko)

Organizer: Second Workshop on Discrete Optimization and Machine Learning *July 28–31 2019*
RIKEN AIP, Tokyo, Japan
(co-organized with Antoine Deza and Sebastian Pokutta)

Workshop Organizer: Workshop on Discrete Optimization and Machine Learning *July 23–25 2018*
RIKEN AIP, Tokyo, Japan
(co-organized with Antoine Deza and Sebastian Pokutta)

Judge, ACM-ICPC Japan Regional *April 2014 – Present*

Activity Group Member: Research Association of Mathematical Programming (RAMP), The Operations Research Society of Japan *April 2015 – Present*

Workshop Organizer: The 27th RAMP Symposium *October 15–16 2015*
Shizuoka University, Shizuoka, Japan

RESEARCH GRANTS

Theory of Optimization with Queries *April 1 2019 – March 31 2023*
KAKENHI 19K20219, PI, 4,290,000 JPY
Japan Society for the Promotion of Science

Developing a Quantitative Evaluation Framework of Game Theoretic Resource Allocation Mechanisms *April 1 2017 – March 31 2020*
KAKENHI 17H01787, Co-PI (PI: Atsushi IWASAKI), 17,290,000 JPY
Japan Society for the Promotion of Science

Tree-Metric Approximation and Approximate Computation of the Shapley Value of Minimum Cost Spanning Tree Games *April 1 2015 – March 31 2019*
KAKENHI 15K00033, Co-PI (PI: Kazutoshi ANDO), 2,990,000 JPY
Japan Society for the Promotion of Science

Discrete Convex Analysis-Based Discrete Optimization Method for Machine Learning Applications *April 1 2016 – March 31 2019*
KAKENHI 16K16011, PI, 2,470,000 JPY
Japan Society for the Promotion of Science

The Telecommunications Advancement Foundation Grant for Oversea Travel *December 2015*
Travel Grant for International Conference (December 2015), 220,000 JPY
The Telecommunications Advancement Foundation

Analysis and Development of Random Field in Deep Learning *February 13 2017 – February 17 2017*
Short-Term Joint Research Project, 500,000 JPY
Institute of Mathematics for Industry, Kyushu University

SOCIETY MEMBERSHIP

Association for Computing Machinery (ACM)	8106208
The Institute of Electrical and Electronics Engineers (IEEE)	92860511
Mathematical Optimization Society	20097846
The Japan Society for Industrial and Applied Mathematics	64-696-4672
The Operations Research Society of Japan	02602930
Information Processing Society of Japan	201703365
e-Rad Researcher ID	20751407

PUBLICATIONS (ALL PEER-REVIEWED)

[1] Yoichi Sasaki, Takanori Maehara, Takumi Akazaki, Kazeto Yamamoto, and Kunihiko Sadamasa. Solving weighted abduction via max-sat solvers. In *Proceedings of the 33rd International FLAIRS Conference (FLAIRS'20)*, page to appear, 2020.

[2] Soh Kumabe and Takanori Maehara. Convexity of hypergraph matching game. In *Proceedings of the 19th International Conference on Autonomous Agents and Multi-Agent Systems (AAMAS'20), Auckland, New Zealand, May 9 - 13, 2020*, page to appear, 2020.

[3] Kazuto Fukuchi, Satoshi Hara, and Takanori Maehara. Faking fairness via stealthily biased sampling. In *Proceedings of the 34th AAAI Conference on Artificial Intelligence (AAAI'20), Special Track on AI for Social Impact, New York, New York, USA, February 7 - 12, 2020*, page to appear, 2020.

[4] Satoshi Hara, Atsushi Nitanda, and Takanori Maehara. Data cleansing for models trained with sgd. In *Proceedings of the 33rd Annual Conference on Neural Information Processing Systems (NeurIPS'19), Vancouver, Canada, December 8 - 14, 2019*, pages 4215–4224, 2019.

[5] Satoshi Hara and Takanori Maehara. Convex hull approximation of nearly optimal lasso solutions. In *Proceedings of the 16th Pacific Rim International Conference on Artificial Intelligence (PRICAI'19), anuca Island, Cuvu, Fiji, August 26-30, 2019*, pages 350–363, 2019.

[6] Junjie Chen and Takanori Maehara. Chance-constrained submodular knapsack problem. In *Proceedings of the 25th International Computing and Combinatorics Conference (COCOON'19), Xian, China, July 29 - 31, 2019*, pages 103–114, 2019.

[7] Masakazu Ishihata and Takanori Maehara. Exact bernoulli scan statistics using binary decision diagrams. In *Proceedings of the 28th International Joint Conference on Artificial Intelligence (IJCAI'19), Macau, China, August 10-16, 2019*, pages 5737–5743, 2019.

[8] Takuro Fukunaga and Takanori Maehara. Computing a tree having a small vertex cover. *Theoretical Computer Science*, pages 48–61, October 29 2019.

[9] Takanori Maehara and Yutaro Yamaguchi. Stochastic packing integer programs with few queries. *Mathematical Programming, Series A*, pages 1–34, March 15 2019.

[10] Mohammed Alsuhaibani, Takanori Maehara, and Danushka Bollegala. Joint learning of hierarchical word embeddings from a corpus and a taxonomy. In *Proceedings of the 1st Conference on Automated Knowledge Base Construction (AKBC'19), University of Massachusetts Amherst, United States, May 20 - 22, 2019*, 2019.

[11] Ben Chugg and Takanori Maehara. Submodular stochastic probing with prices. In *Proceedings of the 6th International Conference on Control, Decision and Information Technologies (CoDIT'19), Paris, France, April 23-25, 2019*, pages 60–66, 2019.

[12] Soh Kumabe, Takanori Maehara, and Ryoma Sin'ya. Linear pseudo-polynomial factor algorithm for automaton constrained tree knapsack problem. In *Proceedings of the 13th International Conference and Workshops on Algorithms and Computation (WALCOM'19), Guwahati, India, February 27 - March 2, 2019*, pages 248–260, 2019.

[13] So Nakashima and Takanori Maehara. Subspace selection via dr-submodular maximization on lattices. In *Proceedings of the 33rd AAAI Conference on Artificial Intelligence (AAAI'19), Honolulu, Hawaii, January 27 - February 1, 2019*, pages 4618–4625, 2019.

[14] Takanori Maehara and Yuma Inoue. Group decision diagram (GDD): A compact representation for permutations. In *Proceedings of the 33rd AAAI Conference on Artificial Intelligence (AAAI'19), Honolulu, Hawaii, United States, January 27–February 1, 2019*, pages 2986–2994, 2019.

[15] Taro Takaguchi, Takanori Maehara, Ken-ichi Kawarabayashi, and Masashi Toyoda. Existence of outsiders as a characteristic of online communication networks. *Network Science*, 6(4):431–447, December 2018.

[16] Mario Coutino, Elvin Isufi, Takanori Maehara, and Geert Leus. On the limits of finite-time distributed consensus through successive local linear operations. In *Proceedings of the 52nd Asilomar Conference on Signals, Systems, and Computers (ACSSC'18), Pacific Grove, CA, USA, October 28-31, 2018*, pages 993–997, 2018.

[17] Danushka Bollegala, Vincent Atanasov, Takanori Maehara, and Ken-ichi Kawarabayashi. Classinet - predicting missing features for short-text classification. *ACM Transactions on Knowledge Discovery from Data*, 12(5):55:1–55:29, July 2018.

[18] Tatsunori Taniai and Takanori Maehara. Neural inverse rendering for general reflectance photometric stereo. In *Proceedings of the 35th International Conference on Machine Learning (ICML'18), Stockholm, Sweden, July 10-15, 2018*, pages 4864–4873, 2018.

[19] Takanori Maehara, Atsuhiro Narita, Jun Baba, and Takayuki Kawabata. Optimal bidding strategy for brand advertising. In *Proceedings of the 27th International Joint Conference on Artificial Intelligence (IJCAI'18), Stockholm, Sweden, July 13-19, 2018*, pages 424–432, 2018.

[20] Takanori Maehara, Naoki Marumo, and Kazuo Murota. Continuous relaxation for discrete DC programming. *Mathematical Programming Series B*, 169(1):199–219, April 15 2018.

[21] Masaaki Imaizumi, Takanori Maehara, and Yuichi Yoshida. Statistically efficient estimation for non-smooth probability densities. In *International Conference on Artificial Intelligence and Statistics (AISTATS'18), Playa Blanca, Lanzarote, Canary Islands, Spain, April 9 - 11, 2018*, pages 978–987, 2018.

[22] Mohammed Alsuhaibani, Danushka Bollegala, Takanori Maehara, and Ken-ichi Kawarabayashi. Jointly learning word embeddings using a corpus and a knowledge base. *PloS ONE*, 13(3):e0193094, 2018.

[23] Satoshi Takabe, Takanori Maehara, and Koji Hukushima. Typical approximation performance for maximum coverage problem. *Physical Review E*, 97(2):022138, February 23 2018.

[24] Takayuki Osogami, Rudy Raymond, Akshay Goel, Tomoyuki Shirai, and Takanori Maehara. Dynamic determinantal point processes. In *Proceedings of the 32nd AAAI Conference on Artificial Intelligence (AAAI'18), New Orleans, Louisiana, USA., February 2-7, 2018*, pages 3868–3875, 2018.

[25] Takanori Maehara and Yutaro Yamaguchi. Stochastic packing integer programs with few queries. In *Proceedings of the 29th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA'18), New Orleans, LA, USA, January 7-10, 2018*, pages 293–310, 2018.

[26] Takanori Maehara, Yasushi Kawase, Hanna Sumita, Katsuya Tono, and Ken-ichi Kawarabayashi. Optimal pricing for submodular valuations with bounded curvature. In *Proceedings of the 31st AAAI Conference on Artificial Intelligence (AAAI'17), February 4-9, 2017, San Francisco, California, USA.*, pages 622–628, 2017.

[27] Satoshi Hara and Takanori Maehara. Enumerate lasso solutions for feature selection. In *Proceedings of the 31st AAAI Conference on Artificial Intelligence (AAAI'17), February 4-9, 2017, San Francisco, California, USA.*, pages 1985–1991, 2017.

[28] Daisuke Hatano, Takuro Fukunaga, Takanori Maehara, and Ken-ichi Kawarabayashi. Scalable algorithm for higher-order co-clustering via random sampling. In *Proceedings of the 31st AAAI Conference on Artificial Intelligence (AAAI'17), February 4-9, 2017, San Francisco, California, USA.*, pages 1992–1999, 2017.

[29] Masaaki Imaizumi, Takanori Maehara, and Kohei Hayashi. On tensor train rank minimization : Statistical efficiency and scalable algorithm. In *Proceedings of the 31st Annual Conference on Neural Information Processing Systems (NIPS'17), December 4-9 2017, Long Beach, CA, USA*, pages 3933–3942, 2017.

[30] Takanori Maehara, Hirofumi Suzuki, and Masakazu Ishihata. Exact computation of influence spread by binary decision diagrams. In *Proceedings of the 26th International Conference on World Wide Web (WWW'17), Perth, Australia, April 3-7, 2017*, pages 947–956, 2017.

[31] Ryosuke Nishi, Taro Takaguchi, Keigo Oka, Takanori Maehara, Masashi Toyoda, Ken-ichi Kawarabayashi, and Naoki Masuda. Reply trees in twitter: data analysis and branching process models. *Social Network Analysis and Mining*, 6(1):26:1–26:13, December 2016.

[32] Takuro Fukunaga and Takanori Maehara. Computing a tree having a small vertex cover. In *Proceedings of the 10th International Conference on Combinatorial Optimization and Applications (COCOA'16), Hong Kong, China, December 16-18, 2016, Proceedings*, pages 77–91, 2016.

[33] Takanori Maehara, Kohei Hayashi, and Ken-ichi Kawarabayashi. Expected tensor decomposition with stochastic gradient descent. In *Proceedings of the 30th AAAI Conference on Artificial Intelligence (AAAI'16), February 12-17, 2016, Phoenix, Arizona, USA.*, pages 1919–1925, 2016.

[34] Danushka Bollegala, Mohammed Alsuhaibani, Takanori Maehara, and Ken-ichi Kawarabayashi. Joint word representation learning using a corpus and a semantic lexicon. In *Proceedings of the 30th AAAI Conference on Artificial Intelligence (AAAI'16), February 12-17, 2016, Phoenix, Arizona, USA.*, pages 2690–2696, 2016.

[35] Kohei Hayashi, Takanori Maehara, Masashi Toyoda, and Ken-ichi Kawarabayashi. Real-time top-r topic detection on twitter with topic hijack filtering. In *Proceedings of the 21th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD'15), Sydney, NSW, Australia, August 10-13, 2015*, pages 417–426, 2015.

[36] Naoto Ohsaka, Takanori Maehara, and Ken-ichi Kawarabayashi. Efficient pagerank tracking in evolving networks. In *Proceedings of the 21th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD'15), Sydney, NSW, Australia, August 10-13, 2015*, pages 875–884, 2015.

[37] Danushka Bollegala, Takanori Maehara, and Ken-ichi Kawarabayashi. Unsupervised cross-domain word representation learning. In *Proceedings of the 53rd Annual Meeting of the Association for Computational Linguistics (ACL'15), July 26-31, 2015, Beijing, China*, pages 730–740, 2015.

[38] Takanori Maehara, Akihiro Yabe, and Ken-ichi Kawarabayashi. Budget allocation problem with multiple advertisers: A game theoretic view. In *Proceedings of the 32nd International Conference on Machine Learning (ICML'15), Lille, France, 6-11 July 2015*, pages 428–437, 2015.

[39] Danushka Bollegala, Takanori Maehara, and Ken-ichi Kawarabayashi. Embedding semantic relations into word representations. In *Proceedings of the 24th International Joint Conference on Artificial Intelligence (IJCAI'15), Buenos Aires, Argentina, July 25-31, 2015*, pages 1222–1228, 2015.

[40] Takanori Maehara and Kazuo Murota. Valuated matroid-based algorithm for submodular welfare problem. *Annals of Operations Research*, 229(1):565–590, June 2015.

[41] Takanori Maehara and Kazuo Murota. A framework of discrete DC programming by discrete convex analysis. *Mathematical Programming, Series A*, 152(1-2):435–466, June 2015.

[42] Takanori Maehara. Risk averse submodular utility maximization. *Operations Research Letters*, 43(5):526–529, May 2015.

[43] Takanori Maehara, Naoki Marumo, and Kazuo Murota. Continuous relaxation for discrete DC programming. In *Proceedings of the 3rd International Conference on Modelling, Computation and Optimization in Information Systems and Management Sciences (MCO'15), Metz, France, May 11-13, 2015*, pages 181–190, 2015.

[44] Yasushi Kawase, Takanori Maehara, and Ken-ichi Kawarabayashi. Scalable sensor localization via ball-decomposition algorithm. In *Proceedings of the 14th IFIP Networking Conference (Networking'15), Toulouse, France, 20-22 May, 2015*, pages 1–9, 2015.

[45] Takanori Maehara, Mitsuru Kusumoto, and Ken-ichi Kawarabayashi. Scalable simrank join algorithm. In *Proceedings of the 31st IEEE International Conference on Data Engineering (ICDE'15), Seoul, South Korea, April 13-17, 2015*, pages 603–614, 2015.

[46] Daisuke Hatano, Takuro Fukunaga, Takanori Maehara, and Ken-ichi Kawarabayashi. Lagrangian decomposition algorithm for allocating marketing channels. In *Proceedings of the 29th AAAI Conference on Artificial Intelligence (AAAI'15), January 25-30, 2015, Austin, Texas, USA.*, pages 1144–1150, 2015.

[47] Danushka Bollegala, Takanori Maehara, Yuichi Yoshida, and Ken-ichi Kawarabayashi. Learning word representations from relational graphs. In *Proceedings of the Twenty-Ninth AAAI Conference on Artificial Intelligence (AAAI'15), January 25-30, 2015, Austin, Texas, USA.*, pages 2146–2152, 2015.

[48] Takanori Maehara, Takuya Akiba, Yoichi Iwata, and Ken-ichi Kawarabayashi. Computing personalized pagerank quickly by exploiting graph structures. *Proceedings of the VLDB Endowment (The 40th International Conference on Very Large Data Bases (VLDB'14), Hangzhou, China, 1-5, September, 2014)*, 7(12):1023–1034, August 2014.

[49] Mitsuru Kusumoto, Takanori Maehara, and Ken-ichi Kawarabayashi. Scalable similarity search for simrank. In *Proceedings of the 2014 ACM SIGMOD International Conference on Management of Data (SIGMOD'14), Snowbird, UT, USA, June 22-27, 2014*, pages 325–336, 2014.

[50] Takanori Maehara and Kazuo Murota. Algorithm for error-controlled simultaneous block-diagonalization of matrices. *SIAM Journal on Matrix Analysis Applications*, 32(2):605–620, June 2011.

[51] Harold W. Gutch, Takanori Maehara, and Fabian J. Theis. Second order subspace analysis and simple decompositions. In *Proceedings of the 9th International Conference on Latent Variable Analysis and Signal Separation (LVA/ICA'10), St. Malo, France, September 27-30, 2010.*, pages 370–377, 2010.

[52] T Funada, DD Joseph, T Maehara, and S Yamashita. Ellipsoidal model of the rise of a taylor bubble in a round tube. *International journal of multiphase flow*, 31(4):473–491, April 2005.