TAKANORI MAEHARA

PERSONAL DETAIL

Name:	Takanori MAEHARA
Position:	Senior Software Engineer
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SUMMARY

A Machine-Learning Engineer specialised in Search Recommendation Systems and a Researcher in Theoretical Computer Science focusing on Discrete Mathematics and Theoretical Machine Learning.

EDUCATION

Doctor of Information Science and Technology   *March 2009 – September 2012*
The University of Tokyo, Japan
Graduate School of Information Science and Technology

Master of Information Science and Technology   *March 2007 – March 2009*
Graduate School of Information Science and Technology
The University of Tokyo, Japan

Bachelor of Engineering   *April 2004 – March 2007*
Faculty of Engineering
The University of Tokyo, Japan

WORK EXPERIENCE (ONLY FULL-TIME JOBS)

Senior Software Engineer   *August 2023 – Present*
Search and Recommendation Team,
Roku, Cambridge, UK

- Developing a search and recommendation system for hundreds of millions of users of the Roku video streaming service as a project owner. Deployed multiple state-of-the-arts models including sequential recommendation model for better recommendation, value-aware search/recommendation model to balance multiple objectives, and popularity-debiasing recommendation model.
- Researching and developing large language model (LLM)-based solutions for personalised message generation to make search/recommendation convincing to users.
- Published one research paper at NeurIPS'24, which clarified the relationship between the graph neural network architecture and its expressive power using advanced graph theory.

Machine-Learning Engineer   *November 2020 – Present*
Meta AI,
Meta, Inc., London

- Developed an internal graph neural network (GNN) framework as a project owner. The framework was used in all projects in our team as well as multiple projects in partner teams. The framework trained GNNs on whole Facebook graph consists of billions of nodes and hundreds of billions of edges in a few hours; it was the most scalable GNN framework in the company. The framework was built on Python, PyTorch, Dataswarm (similar to Airflow), and Presto.
- Developed a component for the Facebook Reels (short videos) recommendation system as a project owner. The component predicted future user-creator engagements and creator-creator co-engagement, and optimized matching to help less-popular but high-quality creators. This component improved creators' productivity by 0.49% compared to the existing system
- Improved a Facebook Reels recommendation system by adding a new embedding feature representing the users; it was computed by a graph neural network. The embeddings improved the group AUC by 0.6%.
- Improved a system of detecting malicious user behaviour. Added a new embedding feature representing the users to improve the detection performance. Also, implemented a component explaining the model decision to help understanding the nature of malicious behaviour.
- Published one research paper at NeurIPS'21, which showed the validity of our GNN framework.
- Co-mentored 2 research interns and 2 AI Residency (1-year research intern).
- Performed more than 20 coding interviews.

Unit Leader *December 2016 – November 2020*

Discrete Optimization Unit,
RIKEN Center for Advanced Intelligence Project (RIKEN AIP), Japan

- Led a research team for discrete optimization and machine learning. Managed 6 full-time researchers and 5 part-time students, and accepted 9 internship students in total.
- Conducted research in various topics including combinatorial optimization, approximation algorithms, game theory, fairness and explainability, and graph neural networks. Published more than 50 peer-reviewed publications in journals and conferences, including SODA, NeurIPS, ICML, AAAI, and IJCAI.
- Organized 3 International workshops about discrete optimization and machine learning.
- Collaborating with several industries as a technical advisor.

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. The topics of the papers are diverge, but the main piller is an application of discrete optimisation methods for machine learning.
- 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-doctoral researcher 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. These topics were discrete algorithms for large graphs.

RECENT PUBLICATIONS

[1] Takanori Maehara and Hoang NT. Deep homomorphism network. In *Proceedings of the 38th Annual Conference on Neural Information Processing Systems (NeurIPS'24), Vancouver, Canada, December 10–15, 2024*, December 2024.

[2] Takanori Maehara and So Nakashima. Rank axiom of modular supermatroids: A connection with directional dr submodular functions. *Advances in Applied Mathematics*, 134:102304, 2022.

[3] Takanori Maehara and Hoang NT. Learning on random balls is sufficient for estimating (some) graph parameters. In *Proceedings of the 35th Annual Conference on Neural Information Processing Systems (NeurIPS'21), Online, December 7–10, 2021*, December 2021.

[4] Takanori Maehara, So Nakashima, and Yutaro Yamaguchi. Multiple knapsack-constrained monotone dr-submodular maximization on distributive lattice. *Mathematical Programming*, February 2021.

[5] Yoshifumi Seki and Takanori Maehara. A method to anonymize business metrics to publishing implicit feedback datasets. In *Proceedings of the 14th ACM Conference on Recommender Systems (RecSys'20)*, pages 4–12, 2020.

SELECTED AWARDS

Best Paper Award   *April 2018*
21th International Conference on Artificial Intelligence and Statistics (AISTATS'18)

SELECTED 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   *July 28–31 2019*
Learning
RIKEN AIP, Tokyo, Japan
(co-organized with Antoine Deza and Sebastian Pokutta)

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: International Collegiate Programming Contest (ICPC)   *April 2014 – March 2021*
Japan Regional