Keisuke **Otaki**

Research Scientist, Toyota Central R&D Labs., Inc.

Koraku Mori Bldg 10F, Koraku 1-4-14, Bunkyo, Tokyo, 1120004, Japan.

keisuke.otaki.jp@gmail.com | https://researchmap.jp/cocomoff/?lang=english | cocomoff | cocomoff | @cocomoff

Summary

Keisuke Otaki received the B.E. degree in Engineering (Computer Science) in 2011 from Kyoto University, Japan. He also received his Ph.D. degree in Informatics from Kyoto University in 2016. He was a visiting doctor course student at the University of Bonn and Fraunhofer IAIS from 2013 to 2014 during his Ph.D. course. He was also an research fellow of JSPS from 2014 to 2016. He then joined the current position.

Statements on Recent Work: I'm working at Toyota Central R&D Labs., Inc. in Japan (whose headquater is located in Aichi, and its branch office is in Tokyo). Recent targeting international conferences of our team: AAAI, IJCAI, ITSC, AAMAS, ICAPS, etc. My recent research topics are

- combinatorial optimization (both problem modeling and solving with various solvers like LP/MIP/CSP/Annealing) for applications such as path-planning, vehicle operations, ride-sharing, multi-agent path-findings, etc.,
- interactive combinatorial optimization for various transportation/MaaS applications on the viewpoint of Human-AI cooperation and/or human-computer interaction, and
- learning-based optimization framework (e.g., decision-focused learning, learning models, etc.)

Note: TCRDL is a research institute in the Toyota group, whose mission statement is doing advanced researches and development for the modern and sustainable transportation system. We often do collaborative research with other companies in the Toyota group (e.g., Toyota Motor Corp., Denso, etc.) and also with other universities or institutes.

Education

Graduate School of Informatics, Kyoto University

Kyoto, Japan

Ph.D in Informatics, and M.S. in Informatics — *Apr. 2011 - Mar. 2016*

- Ph.D Thesis: Algorithmic Approaches to Pattern Mining from Structured Data
- Supervisor: Akihiro Yamamoto, Committee: Akutsu Tatsuya, Kashima Hisashi

Faculty of Engineering, Kyoto University

Kyoto, Japan

B.S. in Computer Science and Engineering — *Mar. 2011 - Apr. 2009*

National Institute of Technology, Fukui College

Fukui, Japan

Quasi-undergraduate course of Engineering — *Mar. 2009 - Apr. 2004*

Research Experiences

Toyota Central R&D Labs., Inc.

Aichi and Tokyo, Japan

Researcher — *April 2016 - present*

- Working as a researcher since January 2017 to present in several departments/groups.

Japan Society for the Promotion of Science

Kyoto, Japan

Research Fellow (DC2) — *Apr. 2014 - Mar. 2016*

- Project: Studies on mining from structured data and their visualization
- Supervisor: Dr. Akihiro Yamamoto
- Research topics: Pattern mining, Visualization, Graph-structured data

Fraunhofer IAIS and University of Bonn

Sankt Augstin, Germany

Visitor (Visiting student) — *Mar. 2013 - Feb. 2014*

- Project: Studies on mining algorithms from structured data and methods for preserving privacy, particularly for graph-structured data
- Supervisor: Dr. Tamás Horváth
- Research topics: Mining algorithms, Graph pattern mining, Probabilistic algorithms

Projects at TCRDL

Optimization System and Decision-Focused Learning
Bunkyo, Tokyo

Applied Mathematics Research Domain — *Jan. 2022 - present*

- Worked as AI/ML/DS researchers, see our AAAI2022 papers.

On-demand Transportation Systems
Bunkyo, Tokyo

Multi-Agent System Program, Social-Science Research Domain — *Oct. 2020 - Dec. 2021*

- Details are hidden due to confidentiality reasons.
- **Keywords:** Combinatorial optimization, routing problems, on-demand transportation systems

Optimization for Social Transportation System
Bunkyo, Tokyo

Multi-Agent System Program, Social-Science Research Domain — *Jan. 2020 - Sept. 2020*

- Worked on cooperative transportation systems and did research on ride-sharing and optimization problems, see our SoCS2020, PRIMA2020, and ITSC2021 papers.

Combinatorial Optimization for Intelligent Transportation Systems
Bunkyo, Tokyo

Multi-Agent System Program, Data-Analytics Research Domain — *Apr. 2019 - Dec. 2019*

- Worked on cooperative transportation systems and did research on multi-agent systems (MAS), see our ITSC2019 and ICTAI2019 papers.
- Did large-scale numerical experiments of combinatorial optimizations for multiple vehicles.
- Developed optimization methods using data structures for MAS.

Learning and Optimization for Intelligent Transportation Systems
Nagakute, Aichi

Multi-Agent System Program, Data-Analytics Research Domain — *Feb. 2018 - Mar. 2019*

- Learned foundations on mathematical programmings and implementations by Gurobi, see our AAMAS2019 paper.
- Modeled and did experiments on recent transportation systems such as ride-sharing, transfer, vehicle routing, etc.
- Proposed a new mathematical model for heterogeneous vehicles.

Reinforcement Learning for Transportation System and Maintenance Systems
Nagakute, Aichi

Intelligent System Control Program, Data-Analytics Research Domain — *Oct. 2017 - Jan. 2018*

- Surveyed and tested the maintenance domain for RL.
- Worked on the warm-up problem of RL, particularly on the routing domain.

Reinforcement Learning for Transportation System
Nagakute, Aichi

Data Science Program, Data-Analytics Research Domain — *Apr. 2017 - Sep. 2017*

- Learned fundamental concepts on Reinforcement Learning (RL) and Deep RL (DRL) via OpenAI gym.
- Worked on proposed RL applications for transportation systems, including routing and traffic signal control.

Learning and Inference System
Nagakute, Aichi

Learning and Inference Program, Data-Analytics Research Domain — *Feb. 2017 - Mar. 2017*

- Surveyed Topological Data Analysis (TDA) and program developments for computing persistent diagrams for 3D protein structures.

Selected Publications

These are selected papers. See my researchmap page for details.

High Density Automated Valet Parking Via Multi-Agent Path Finding — *IEEE ITSC2022*
A. Okoso, K. Otaki, S. Koide, T. Nishi — *Oct. 2022*

Planning with Explanations for Finding Desired Meeting Points on Graphs — *AAAI2022*
K. Otaki — *Feb. 2022*

Partial Wasserstein Covering — *AAAI2022*
K. Kawano, S. Koide, K. Otaki — *Feb. 2022*

Network-Flow-Problem-Based Approach to Multi-Agent Path Finding for Connected Autonomous Vehicles — *IEEE ITSC2021*
A. Okoso, B. Okumura, K. Otaki, T. Nishi — *Nov. 2021*

Multi-Agent Path Finding with Destination Choice — *PRIMA2020*
A. Okoso, K. Otaki, T. Nishi — *Oct. 2020*

Distance-based Heuristic Solvers for Cooperative Path Planning with Heterogeneous Agents — *PRIMA2020*
K. Otaki, S. Koide, A. Okoso, T. Nishi — *Oct. 2020*

Cooperative Path Planning for Heterogeneous Agents (Extended Abstract) — *SoCS2020*
K. Otaki, S. Koide, A. Okoso, T. Nishi — *May 2020*

Multi-agent Path Planning with Heterogeneous Cooperation — *IEEE ICTAI2019*
K. Otaki, S. Koide, K. Hayakawa, A. Okoso, T. Nishi — *Nov. 2019*

Multi-Agent Path Finding with Priority for Cooperative Automated Valet Parking — *IEEE ITSC2019*
A. Okoso, K. Otaki, T. Nishi — *Oct. 2019*

NERO: Hierarchical-approximated Rebalancing Optimization for Mobility on Demand — *arXiv*
T. Nishi, S. Koide, K. Otaki, A. Okoso — *2019*
arXiv:1906.10835, 2019

Cooperative Routing with Heterogeneous Vehicles — *AAMAS2019*
K. Otaki, S. Koide, A. Okoso, T. Nishi — *May. 2019*

Traffic Signal Control Based on Reinforcement Learning with Graph Convolutional Neural Nets — *IEEE ITSC2018*
T. Nishi, K. Otaki, K. Hayakawa, T. Yoshimura — *Nov. 2018*

Learning Concepts and Their Unions from Positive Data with Refinement Operators — *Annals of Mathematics and Artificial Intelligence*
S. Ouchi, T. Okayama, K. Otaki, R. Yoshinaka, A. Yamamoto — *2017*
DOI:10.1007/s10472-015-9458-6.

Periodic Pattern Mining with Periodical Co-occurrences of Symbols — *IPSJ TOM*
K. Otaki, A. Yamamoto — *2016*
vol.9(1), pp.33-42, 2016.

Periodical Skeletonization for Partially Periodic Pattern Mining — *DS2015*
K. Otaki, A. Yamamoto — *Oct. 2015*

Awards

2020	**IPSJ Transaction Award**, IPSJ, Japan	
2020	**Best Paper Nominate**, PRIMA2020	
2019	**Poster Award**, JAWS2019	*Hiroshima, Japan*
2016	**IPSJ Yamashita SIG Research Award**, IPSJ	*Japan*
2015	**Best Presentation Award**, IPSJ SIG-MPS #105	*Kitami, Japan*

Extracurricular Activity

Machine Learning Summer School 2015

Kyoto, Japan

The web master, a localizer, and a local arrangement member

- Sep. 2015

Trends in Machine Learning, A Workshop at Kyoto University

Kyoto, Japan

A member of the organization team

Mar. 2014

Machine Learning Summer School 2012

Kyoto, Japan

The web master and a local arrangement member

- Sep. 2012

The Kyoto School Project

Kyoto, Japan

A web developer

2011-2012

- Arranged and created electrical archive Web pages for famous philosophers worked in Kyoto University