TAOAN HUANG

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EDUCATION

University of Southern California — Los Angeles, CA, USA
Ph.D. student in Computer Science — Aug 2019 - May 2024 (expected)

- Overall GPA: 4/4
- Recipient of a USC Annenberg Graduate Fellowship

Tsinghua University — Beijing, China
B.Eng. in Computer Science — Sep 2015 - Jul 2019

- Overall GPA: 3.6/4, Institute for Interdisciplinary Information Sciences
- Selected to Yao Class (a special pilot computer science class, directed by Professor Andrew Yao)
- 2015-2018 Tsinghua Xuetang Program Fellowship
- Research intern at the University of Hong Kong from Jul 2018 to Aug 2018 (hosted by Professor Zhiyi Huang), and Carnegie Mellon University from Feb 2018 to Jul 2018 (hosted by Professor Fei Fang)

EMPLOYMENT

Meta AI Research, FAIR Labs — Menlo Park, CA, USA
Research scientist intern mentored by Benoit Steiner and Dr. Yuandong Tian — May 2022 - Present

Amazon Robotics — Remote, USA
Research scientist intern mentored by Dr. Vikas Shivashankar — May 2021 - Aug 2021

RESEARCH INTEREST

My research interest lies in artificial intelligence, with particular attention to: multi-agent system, combinatorial optimization, machine learning, computational game theory and computational sustainability,

PUBLICATIONS

1. **Taoan Huang**, Aaron Ferber, Yuandong Tian, Bistra Dilkina, Benoit Steiner. **Searching Large Neighborhoods for Integer Linear Programs with Contrastive Learning.** In submission to ICML-23.
2. Aaron Ferber, **Taoan Huang**, Daochen Zha, Martin Schubert, Benoit Steiner, Bistra Dilkina, Yuandong Tian. **SurCo: Learning Linear Surrogates For Combinatorial Nonlinear Optimization Problems.** In submission to ICML-23.
3. **Taoan Huang**, Vikas Shivashankar, Michael Caldara, Joseph Durham, Jiaoyang Li, Bistra Dilkina, Sven Koenig. **Deadline-Aware Multi-Agent Tour Planning.** In submission to ICAPS-23.
4. **Taoan Huang**, Aaron Ferber, Yuandong Tian, Bistra Dilkina, Benoit Steiner. **Local Branching Relaxation Heuristics for Integer Linear Programs.** In Proceedings of CPAIOR-23.
5. Shuyang Zhang, Jiaoyang Li, **Taoan Huang**, Sven Koenig, Bistra Dilkina. **Learning a Priority Ordering for Prioritized Planning in Multi-Agent Path Finding.** In Proceedings of the Symposium on Combinatorial Search 2022.

6. Sumedh Pendurkar, **Taoan Huang**, Sven Koenig and Guni Sharon. **A Discussion on the Scalability of Heuristic Approximators.** In the Symposium on Combinatorial Search 2022 (Extended Abstract).
7. **Taoan Huang**, Jiaoyang Li, Bistra Dilkina, Sven Koenig. **Anytime Multi-Agent Path Finding via Machine Learning-Guided Large Neighborhood Search.** In Proceedings of AAAI-22.
8. **Taoan Huang**, Bistra Dilkina, Sven Koenig. **Learning to Select Nodes for Bounded-Suboptimal Conflict-Based Search for Multi-Agent Path Finding.** In Proceedings of AAMAS-21.
9. **Taoan Huang**, Bistra Dilkina, Sven Koenig. **Learning to Resolve Conflicts for Multi-Agent Path Finding with Conflict-Based Search.** In Proceedings of AAAI-21.
10. **Taoan Huang**, Bistra Dilkina: **Enhancing Seismic Resilience of Water Pipe Networks.** In Proceedings of COMPASS-20.
11. Weiran Shen, Weizhe Chen, **Taoan Huang**, Rohit Singh, Fei Fang. **When to Follow the Tip: Security Games with Strategic Informants.** In Proceedings of IJCAI-20.
12. **Taoan Huang**, Weiran Shen, David Zeng, Tianyu Gu, Rohit Singh, Fei Fang. **Green Security Game with Community Engagement.** In Proceedings of AAMAS-20.
13. **Taoan Huang**, Bohui Fang, Xiaohui Bei, Fei Fang. **Dynamic Trip-Vehicle Dispatch with Scheduled and On-Demand Requests.** In Proceedings of UAI-19
14. **Taoan Huang**, Bohui Fang, Hoon Oh, Xiaohui Bei, Fei Fang. **Optimal Trip-Vehicle Dispatch with Multi-Type Requests**. In Proceedings of AAMAS-19 (Extended Abstract).

RESEARCH EXPERIENCE

Facebook AI Research — Menlo Park, USA
Mentee to Benoit Steiner and Yuandong Tian — May 2022 - Dec 2022
Machine Learning for Combinatorial Optimization

- Designed heuristics in Large Neighborhood Search for integer linear programs. Outperformed state-of-the-art hand-crafted methods and were competitive with state-of-the-art ML-based methods.
- Used contrastive learning to learn heuristics in Large Neighborhood Search for Integer Linear Programs. Outperformed state-of-the-art methods.
- Used machine learning to learn a linear surrogate objective function to solve non-linear combinatorial optimization problems. Achieved state-of-the-art performance on two industry problems.

Amazon Robotics — Remote, USA
Mentee to Dr. Vikas Shivashankar — May 2021 - Aug 2021
Multi-Goal Multi-Agent Path Planning in Congested Environments

- Designed and implemented a local search algorithm for multi-goal multi-agent path planning in congested environments with queuing delays at goal locations.
- Showed that a global long-term multi-agent planning approach is scalable for a specific business problem and is 28% more effective than a myopic single-agent planning approach.

University of Southern California — Los Angeles, CA, USA
Mentee to Professor Sven Koenig and Professor Bistra Dilkina — Mar 2020 - Present
Machine Learning-Guided Search for Multi-Agent Path Finding

- Applied machine learning to learn to resolve conflicts in Conflict-Based Search (CBS). Our approach outperforms the state-of-the-art optimal solver on multiple benchmark datasets. A paper published in AAAI-21.
- Applied imitation learning and curriculum learning to learn to select search tree nodes in bounded suboptimal CBS. Our approach outperforms the state-of-the-art bounded suboptimal solver on multiple benchmark datasets. A paper published in AAMAS-21.
- Applied machine learning to an anytime solver based on Large Neighborhood Search. A paper published in AAAI-22.

University of Southern California Los Angeles, CA, USA
Mentee to Professor Bistra Dilkina Sep 2019 - Present
Enhancing Seismic Resilience of Water Pipe Networks

- Modeled the problem of building a system-wide seismic resilience network as a network design problem.
- Provided an efficient mixed-integer program to find the optimal solution and a dynamic programming-based sequential planning algorithm to plan network installments.
- Demonstrated the effectiveness of our approaches through a case study on a water service zone in Los Angeles.

Carnegie Mellon University Pittsburgh, PA, USA
Mentee to Professor Fei Fang Apr 2018 - Jun 2019
Green Security Game with Community Engagement

- Provided the first study in security games which took community engagement into account
- Proposed a novel two-stage game model
- Provided complexity results, and developed exact, approximate, and heuristic algorithms for finding the equilibria
- The algorithms and analysis from this study provides useful insights and guidance for law enforcement agencies wanting to allocate their budget towards recruiting informants, in order to protect wildlife

Carnegie Mellon University Pittsburgh, PA, USA
Mentee to Professor Fei Fang and Professor Xiaohui Bei Apr 2018 - Sep 2018
Dynamic Trip-Vehicle Dispatch with Scheduled and On-Demand Requests

- Introduced a novel two-stage model for the dynamic trip-vehicle dispatch problem, by taking into account both scheduled and on-demand requests
- Proposed algorithms for both stages, that took into account demand distributions and came with theoretical guarantees
- Demonstrated the effectiveness of the algorithms through extensive experiments

University of Hong Kong Hong Kong, China
Mentee to Professor Zhiyi Huang Jul 2018 - Aug 2018
Online Algorithms in Real-World Task Assignments

- Derived an optimal deterministic online algorithm, for a general case in the pre-scheduled trip booking problem
- Derived 3-competitive online algorithms, for two cases in the on-demand food delivery problem

Carnegie Mellon University Pittsburgh, PA, USA
Mentee to Professor Fei Fang Mar 2018 - Apr 2018
Multi-Model Ridesharing

- Studied the multi-model ridesharing problem, where scheduled and on-demand requests were put into consideration
- Provided complexity results for different settings
- Developed an exact algorithm, as well as several heuristic approaches

ADDITIONAL INFORMATION

Teaching Experiences

- Olympiad in Informatics, Invited Lecturer (2012-2018): Invited to give lectures on algorithms and programming to high school students, which ranged from 50 to 80 attendees each year

Programming Skills

- Languages: C++, Python, C, Java and Pascal
- Software: Gurobi, PyTorch, LaTeX, QGIS.
- Awards: Gold medalist (top 50 contestants) in China National Olympiad in Informatics 2014; Gold medalist (top 25 contestants) in Asia-Pacific Informatics Olympiad 2014 (China Region)