

Jiaoyang Li

Curriculum Vitae

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Education

- 2017-Present **Ph.D. in Computer Science**, *University of Southern California (USC)*, Los Angeles, CA, USA.
- Advisor: Sven Koenig.
- Viterbi/Graduate School Fellowship.
- 2013-2017 **B.Eng. in Automation**, *Tsinghua University (THU)*, Beijing, China.
- GPA: 91/100; Rank: 5/118.
- Excellent Graduate Awards of Department of Automation, Tsinghua and of Beijing.

Research Interests

I am interested in many topics related to Artificial Intelligence, such as combinatorial algorithms, heuristic search, constraint reasoning, machine learning, scheduling and planning for robotics and transportation. My current research topic focuses on multi-agent planning.

Professional Skills

- Programming Proficient in C/C++, Python and MATLAB. Familiar with C#, Java and R.
- Languages Proficient in English. Native in Mandarin Chinese.

Research and Work Experience

- 2017-Present Research Assistant, **University of Southern California, USA**
- Advisor: Sven Koenig, Department of Computer Science.
- 05/2019 Research Intern (14 weeks), **Amazon Robotics, USA**
- Mentor: Andrew Tinka.
- Project: Large-Scale Multi-Agent Path Finding for Warehouse Applications. Extended abstract published at AAMAS 2020.
- 12/2018 Visiting Student (3 weeks), **Ben-Gurion University, Israel**
- Advisor: Ariel Felner, Department of Software and Information Systems Engineering.
- Project: Heuristics for Multi-Agent Path Finding. Paper published at IJCAI 2019.
- 08/2016 Visiting Student (5 weeks), **University of California, Berkeley, USA**
- Advisor: Zuojun (Max) Shen, Department of Industrial Engineering and Operations Research.
- Supported by Tsinghua Top Open Program and Tsinghua Spark Talents Program.
- Project: Electric Taxi Fleets Dispatching System. Paper published at ITEC-AP 2017.
- 06/2016 Visiting Student (6 weeks), **University of Southern California, USA**
- Advisor: Sven Koenig, Department of Computer Science.
- Supported by USC-Tsinghua Summer Research Program.
- Project: Lifelong Multi-Agent Pickup and Delivery Problem. Paper published at AAMAS 2017.

2014-2017 Research Assistant, Tsinghua University, China
 - Advisor: Jianming Hu, Department of Automation.
 - Project 1: Bus Routing and Scheduling Problem. Paper published at TST 2017.
 - Project 2 (Bachelor Thesis): Decision Making and Trajectory Planning for Teams of Autonomous Vehicles. Nominated for Best Bachelor Thesis Award in Tsinghua.

Publications

Conferences

- 2020 [C12] **J. Li**, K. Sun, H. Ma, A. Felner, T. K. S. Kumar and S. Koenig. **Moving Agents in Formation in Congested Environments**. In *Proceedings of the International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS)*, (in print), 2020. acceptance rate: 186/808=23.0%.
- 2019 [C11] **J. Li**, E. Boyarski, A. Felner, H. Ma and S. Koenig. **Improved Heuristics for Conflict-Based Search for Multi-Agent Path Finding**. In *Proceedings of the International Joint Conference on Artificial Intelligence (IJCAI)*, pages 442-449, 2019. acceptance rate: 850/4752=17.9%.
- [C10] **J. Li**, A. Felner, S. Koenig and T. K. S. Kumar. **Using FastMap to Solve Graph Problems in a Euclidean Space** (short paper). In *Proceedings of the International Conference on Automated Planning and Scheduling (ICAPS)*, pages 273-278, 2019.
- [C9] **J. Li**, D. Harabor, P. Stuckey, A. Felner, H. Ma and S. Koenig. **Disjoint Splitting for Multi-Agent Path Finding with Conflict-Based Search** (short paper). In *Proceedings of the International Conference on Automated Planning and Scheduling (ICAPS)*, pages 279-283, 2019.
- [C8] M. Liu, H. Ma, **J. Li** and S. Koenig. **Task and Path Planning for Multi-Agent Pickup and Delivery**. In *Proceedings of the International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS)*, pages 1152-1160, 2019. Acceptance rate: 189/781=24.2%.
- [C7] **J. Li**, P. Surynek, A. Felner, H. Ma, T. K. S. Kumar and S. Koenig. **Multi-Agent Path Finding for Large Agents**. In *Proceedings of the AAAI Conference on Artificial Intelligence (AAAI)*, pages 7627-7634, 2019. Acceptance rate: 1150/7095=16.2%.
- [C6] **J. Li**, D. Harabor, P. Stuckey, H. Ma and S. Koenig. **Symmetry Breaking Constraints for Grid-Based Multi-Agent Path Finding**. In *Proceedings of the AAAI Conference on Artificial Intelligence (AAAI)*, pages 6087-6095, 2019. Acceptance rate: 1150/7095=16.2%.
- [C5] H. Ma, D. Harabor, P. Stuckey, **J. Li** and S. Koenig. **Searching with Consistent Prioritization for Multi-Agent Path Finding**. In *Proceedings of the AAAI Conference on Artificial Intelligence (AAAI)*, pages 7643-7650, 2019. Acceptance rate: 1150/7095=16.2%.
- 2018 [C4] A. Felner, **J. Li**, E. Boyarski, H. Ma, L. Cohen, T. K. S. Kumar and S. Koenig. **Adding Heuristics to Conflict-Based Search for Multi-Agent Path Finding** (short paper). In *Proceedings of the International Conference on Automated Planning and Scheduling (ICAPS)*, pages 83-87, 2018. Acceptance rate: 69/209=33.0%.
- [C3] H. Ma, G. Wagner, A. Felner, **J. Li**, T. K. S. Kumar and S. Koenig. **Multi-Agent Path Finding with Deadlines**. In *Proceedings of the International Joint Conference on Artificial Intelligence (IJCAI)*, pages 417-423, 2018. Acceptance rate: 710/3470=20.5%.
- 2017 [C2] H. Ma, **J. Li**, T. K. S. Kumar and S. Koenig. **Lifelong Multi-Agent Path Finding for Online Pickup and Delivery Tasks**. In *Proceedings of the International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS)*, pages 837-845, 2017. Acceptance rate: 155/595=26.1%.
- [C1] Y. Jia, H. Chen, **J. Li**, F. He, M. Li, Z. Hu, and Z. Shen. **Planning for Electric Taxi Charging System from the Perspective of Transport Energy Supply Chain: A Data-Driven Approach in Beijing**. In *Proceedings of IEEE Transportation Electrification Conference & EXPO Asia-Pacific (ITEC-AP)*, pages 1-6, 2017.

Journals

- 2017 [J1] J. Li, J. Hu and Y. Zhang. **Optimal Combinations and Variable Departure Intervals for Micro Bus System**. *Tsinghua Science and Technology (TST)*, 22(3):282-292, 2017.

Symposiums, Forums and Workshops

- 2020 [W5] T. Neller, S. Keeley, M. Guerzhoy, W. Hoenig, J. Li, S. Koenig, A. Soni, K. Thomason, L. Zhang, B. Sebatian, C. Resnick, A. Oliver, S. Bhupatiraju, K. Agrawal, J. Allingham, S. Yoon, J. Chen, T. Larsen, M. Neumann, N. Norouzi, R. Hausen and M. Evett. **Model AI Assignments 2020**. In *Proceedings of the Symposium on Educational Advances in Artificial Intelligence (EAAI)*, 2020.
- 2019 [W4] E. Boyarski, L. Cohen, J. Li, A. Felner and S. Koenig. **Using Incremental Search for the Low Level of Conflict-Based Search**. In *Proceedings of the IJCAI-19 Workshop on Multi-Agent Path Finding (WoMAPF)*, 2019.
- [W3] J. Li, D. Harabor, P. Stuckey, A. Felner, H. Ma and S. Koenig. **Disjoint Splitting for Multi-Agent Path Finding with Conflict-Based Search**. In *Proceedings of the IJCAI-19 Workshop on Multi-Agent Path Finding (WoMAPF)*, 2019.
- [W2] R. Stern, N. R. Sturtevant, A. Feler, S. Koenig, H. Ma, T. Walker, J. Li, D. Atzmon, L. Cohen, T. K. S. Kuamr, E. Boyarski and R. Bartak. **Multi-Agent Pathfinding: Definitions, Variants, and Benchmarks** (position paper). In *Proceedings of the Symposium on Combinatorial Search (SoCS)*, pages 151-159, 2019. Acceptance rate: 14/31=45.2%.
- [W1] J. Li, H. Zhang, M. Gong, Z. Liang, W. Liu, Z. Tong, L. Yi, R. Morris, C. Pasareanu and S. Koenig. **Scheduling and Airport Taxiway Path Planning under Uncertainty**. In *Proceedings of the AIAA Aviation and Aeronautics Forum and Exposition (AIAA AVIATION Forum)*, 2019.

Extended Abstracts

- 2020 [E7] J. Li, A. Tinka, S. Kiesel, J. W. Durham, T. K. S. Kumar and S. Koenig. **Large-Scale Lifelong Multi-Agent Path Finding in Warehouses: Preliminary Results** (extended abstract). In *Proceedings of the International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS)*, (in print), 2020.
- 2019 [E6] J. Li, E. Boyarski, A. Felner, H. Ma and S. Koenig. **Improved Heuristics for Conflict-Based Search for Multi-Agent Path Finding: Preliminary Results** (extended abstract). In *Proceedings of the Symposium on Combinatorial Search (SoCS)*, pages 182-183, 2019.
- [E5] H. Ma, D. Harabor, P. Stuckey, J. Li and S. Koenig. **Extended Abstract: Searching with Consistent Prioritization for Multi-Agent Path Finding** (extended abstract). In *Proceedings of the Symposium on Combinatorial Search (SoCS)*, pages 188-189, 2019.
- [E4] J. Li, P. Surynek, A. Felner, H. Ma, T. K. S. Kumar and S. Koenig. **Multi-Agent Path Finding for Large Agents** (extended abstract). In *Proceedings of the Symposium on Combinatorial Search (SoCS)*, pages 186-187, 2019.
- [E3] J. Li, D. Harabor, P. Stuckey, H. Ma and S. Koenig. **Symmetry Breaking Constraints for Grid-Based Multi-Agent Path Finding** (extended abstract). In *Proceedings of the Symposium on Combinatorial Search (SoCS)*, pages 184-185, 2019.
- [E2] J. Wang, J. Li, H. Ma, S. Koenig and T. K. S. Kumar. **A New Constraint Satisfaction Perspective on Multi-Agent Path Finding: Preliminary Results** (extended abstract). In *Proceedings of the International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS)*, pages 2253-2255, 2019.
- 2018 [E1] H. Ma, G. Wagner, A. Felner, J. Li, T. K. S. Kumar and S. Koenig. **Multi-Agent Path Finding with Deadlines: Preliminary Results** (extended abstract). In *Proceedings of the International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS)*, pages 2004-2006, 2018.

Honors and Awards

Fellowships and Scholarships

- 2019 Technology Commercialization Award, *USC Stevens Center for Innovation Technology*.
- 2018 Nomination of Microsoft Research Ada Lovelace Fellowship, *CS Department, USC*.
- 2017 Viterbi/Graduate School Fellowship, *USC*.
- 2017 Excellent Graduate Award of Beijing, *Beijing Municipal Education Commission*.
- 2016 Fellowship of USC-Tsinghua Summer Research Program, *Tsinghua and USC*.
- 2016 Top Open Program Summer Research Funding, *Tsinghua*.
- 2016 Tsinghua-AVIC Scholarship, *Tsinghua*.
- 2014-2016 3x Academic Excellence Award, *Tsinghua*.
- 2015 Fellowship of Spark Talents Program, *Tsinghua*.
- 2015 "12.9" Scholarship, *Tsinghua*.
- 2015 Weimin Zheng Scholarship, *Tsinghua*.
- 2014 Tsinghua-Evergrande Scholarship, *Tsinghua*.

Competition Awards

- 2016 Honorable Mention of Interdisciplinary Contest in Modeling.
- 2015 3rd Price in the 26th Beijing College Students Math Competition.
- 2014 3rd Price in the 31th Chinese National College Physics Competition.
- 2013 Silver Medal of the 28th Chinese Mathematical Olympiad (CMO) (Top 4 in Gansu Province).
- 2012 Silver Medal of the 26th Chinese Chemistry Olympiad (CChO) (Top 2 in Gansu Province).
- 2012 Silver Medal of the 11th Chinese Girls' Mathematical Olympiad (CGMO).

Teaching and Mentoring Experience

Teaching Assistant

- Fall 2019 Introduction to Artificial Intelligence, CSCI360 at USC.

Student Mentor

- Fall 2019 Moli Yang (Master Student in Computer Science at Melbourne University), *Visiting student*.
- Summer, Fall 2018 Jiangxing Wang (Undergraduate Student in Computer Science at USC), *Directed Research Project*.
- Summer 2018 Minghua Liu (Undergraduate Student in Computer Science at Tsinghua University, Now a PhD student at UCSD), *USC-Tsinghua Summer Research Program*. Paper published at AAMAS, 2019.

Academic Activities

Conference and Workshop Program Committee

- 2020 International Joint Conference on Artificial Intelligence (IJCAI)
- 2019 IJCAI Workshop on Multi-Agent Path Finding (WoMAPF)
- 2019 International Conference on Autonomic and Autonomous Systems (ICAS)

Conference and Workshop Reviewer (of Individual Papers)

- 2019 Global Conference on Artificial Intelligence (GCAI)
- 2019 International Joint Conference on Artificial Intelligence (IJCAI)
- 2019 International Conference on Automated Planning and Scheduling (ICAPS)
- 2019 International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS)
- 2018, 2019 AAAI/ACM Conference on Artificial Intelligence, Ethics, and Society (AIES)

- 2018, 2019 International Symposium on Combinatorial Search (SoCS)
- 2018 AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment (AIIDE)
- 2018 ACM Siggraph Conference on Motion, Interaction and Games (MIG)
- 2018 IEEE Conference on Computational Intelligence and Games (CIG)
- 2018 ICAPS Workshop on Planning and Robotics (PlanRob)

Journal Reviewer

- 2020 Aerospace Lab (AL)
- 2019,2020 IEEE Robotics and Automation Letters (RA-L)
- 2017 Tsinghua Science and Technology (TST)

Talks and Presentations

Invited Talks

- 10/2019 **Fast and Realistic Multi-Agent Path Finding.** Amazon Research Awards - Robotics Symposium.

Presentations at Conferences

- 08/2019 **Improved Heuristics for Conflict-Based Search for Multi-Agent Path Finding.** International Joint Conference on Artificial Intelligence (IJCAI).
- 08/2019 **Disjoint Splitting for Multi-Agent Path Finding with Conflict-Based Search.** IJCAI-19 Workshop on Multi-Agent Path Finding (WoMAPF).
- 07/2019 **Using FastMap to Solve Graph Problems in a Euclidean Space.** International Conference on Automated Planning and Scheduling (ICAPS).
- 07/2019 **Disjoint Splitting for Multi-Agent Path Finding with Conflict-Based Search.** International Conference on Automated Planning and Scheduling (ICAPS).
- 01/2019 **Multi-Agent Path Finding for Large Agents.** AAAI Conference on Artificial Intelligence (AAAI).
- 01/2019 **Symmetry Breaking Constraints for Grid-Based Multi-Agent Path Finding.** AAAI Conference on Artificial Intelligence (AAAI).