Jiaoyang Li

Curriculum Vitae

Powell Hall of Engineering 410
3737 Watt Way
Los Angeles, CA, 90089
✉ *jiaoyanl@usc.edu*
https://jiaoyangli.me

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*, Beijing, China.
- GPA: 91/100; Rank: 5/118.
- Excellent Graduate Awards of Department of Automation, Tsinghua and of Beijing.
- Thesis: Group decision making in car-following and lane-changing maneuvers for autonomous vehicles.

Research Experience

02/2020 Visiting Researcher (11 months), **Monash University**, Australia.
- Advisor: Daniel Harabor and Peter J. Stuckey, Faculty of Information Technology.
- Project: Symmetry Breaking and Large Neighborhood Search for Multi-Agent Path Finding.

05/2019 Research Intern (14 weeks), **Amazon Robotics**, USA.
- Mentor: Andrew Tinka.
- Project: Multi-Agent Path Finding for Large-Scale Warehouses.

12/2018, 11/2019 Visiting Student (5 weeks in total), **Ben-Gurion University**, Israel.
- Advisor: Ariel Felner, Department of Software and Information Systems Engineering.
- Project: Heuristics for Multi-Agent Path Finding.

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.

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.

2014-2017 Undergraduate Research Assistant (30 months), **Tsinghua University**, China.
- Advisor: Jianming Hu, Department of Automation.
- Project 1: Bus Routing and Scheduling Problem.
- Project 2 (Bachelor Thesis): Decision Making and Trajectory Planning for Teams of Autonomous Vehicles. Nominated for Best Bachelor Thesis Award in Tsinghua.

Honors and Awards

Fellowships, Scholarships, and Research Awards

2021 Selected Participant for Rising Stars: An Academic Career Workshop in EECS, *MIT*.
2021 Best System Demonstration Award, *International Conference on Automated Planning and Scheduling*.
2021 WiSE Merit Award for Doctoral Students (4 recipients in Viterbi School of Engineering), *USC*.
2021 Best Research Assistant Award (2 recipients in Computer Science Department), *USC*.
2020 Outstanding Student Paper Award, *International Conference on Automated Planning and Scheduling*.
2020 WiSE Qualcomm Top-Off Fellowship (8 recipients in Viterbi School of Engineering), *USC*.
2018 Technology Commercialization Award, *USC*.
2017 Viterbi/Graduate School Fellowship, *USC*.

2017 Excellent Graduate Award of Beijing, *Beijing Municipal Education Commission*.
2017 Excellent Graduate Award of Department of Automation, *Tsinghua*.
2016 Fellowship of USC-Tsinghua Summer Research Program (3 recipients in Department of Automation), *Tsinghua and USC*.
2016 Top Open Program Summer Research Funding (200 recipients in Tsinghua), *Tsinghua*.
2016 Tsinghua-AVIC Scholarship (top 5% in Department of Automation), *Tsinghua*.
2014-2016 3x Academic Excellence Award, *Tsinghua*.
2015 Fellowship of Spark Talents Program (50 recipients in Tsinghua), *Tsinghua*.
2015 "12.9" Scholarship (1 recipient in Department of Automation), *Tsinghua*.
2015 Weimin Zheng Scholarship (2 recipients in Department of Automation), *Tsinghua*.
2014 Tsinghua-Evergrande Scholarship (top 5% in Department of Automation), *Tsinghua*.

Competition Awards

2020 Winner Team (team leader) of both rounds of the Flatland Challenge: NeurIPS'20 Competition on Multi-Agent Reinforcement Learning on Trains (>700 participants).
2016 Honorable Mention of Interdisciplinary Contest in Modeling.
2015 Third Price of the 26th Beijing College Students Math Competition.
2014 Third Price of the 31th Chinese National College Physics Competition.
2013 Silver Medal of the 28th Chinese Mathematical Olympiad (ranked 4th in Gansu Province).
2012 Silver Medal of the 26th Chinese Chemistry Olympiad (ranked 2nd in Gansu Province).
2012 First Price of the 29th Chinese Physics Olympiad in Gansu Province (ranked 22nd in Gansu Province).
2012 Silver Medal of the 11th Chinese Girls' Mathematical Olympiad.

Publications

Conferences

2021 [C28] **Anytime Multi-Agent Path Finding via Large Neighborhood Search**.
Jiaoyang Li, Zhe Chen, Daniel Harabor, Peter J. Stuckey and Sven Koenig.
International Joint Conference on Artificial Intelligence (**IJCAI**), pages 4127-4135, 2021. Acceptance rate: $587/4204 = 13.9\%$.

[C27] **Scalable Rail Planning and Replanning: Winning the 2020 Flatland Challenge**. Winner of the NeurIPS'20 Flatland Challenge and the Best System Demonstration Award at ICAPS 2021.
Jiaoyang Li, Zhe Chen, Yi Zheng, Shao-Hung Chan, Daniel Harabor, Peter J. Stuckey, Hang Ma and Sven Koenig.
International Conference on Automated Planning and Scheduling (**ICAPS**), pages 477-485, 2021.

[C26] **Conflict-Based Increasing Cost Search**.
Thayne T. Walker, Nathan R. Sturtevant, Han Zhang, **Jiaoyang Li**, Ariel Felner and T. K. Satish Kumar.
International Conference on Automated Planning and Scheduling (**ICAPS**), pages 385-395, 2021.

[C25] **EECBS: Bounded-Suboptimal Search for Multi-Agent Path Finding**.
Jiaoyang Li, Wheeler Ruml and Sven Koenig.
AAAI Conference on Artificial Intelligence (**AAAI**), pages 12353-12362, 2021. Acceptance rate: $1692/7911 = 21.4\%$.

[C24] **Lifelong Multi-Agent Path Finding in Large-Scale Warehouses**.
Jiaoyang Li, Andrew Tinka, Scott Kiesel, Joseph W. Durham, T. K. Satish Kumar and Sven Koenig.
AAAI Conference on Artificial Intelligence (**AAAI**), pages 11272-11281, 2021. Acceptance rate: $1692/7911 = 21.4\%$.

[C23] **Scalable and Safe Multi-Agent Motion Planning with Nonlinear Dynamics and Bounded Disturbances**.
Jingkai Chen, **Jiaoyang Li**, Chuchu Fan and Brian Williams.
AAAI Conference on Artificial Intelligence (**AAAI**), pages 11237-11245, 2021. Acceptance rate: $1692/7911 = 21.4\%$.

[C22] **Symmetry Breaking for k-Robust Multi-Agent Path Finding**.
Zhe Chen, Daniel Harabor, **Jiaoyang Li** and Peter J. Stuckey.
AAAI Conference on Artificial Intelligence (**AAAI**), pages 12267-12274, 2021. Acceptance rate: $1692/7911 = 21.4\%$.

2020 [C21] **Flatland Competition 2020: MAPF and MARL for Efficient Train Coordination on a Grid World**.
Florian Laurent, Manuel Schneider, Christian Scheller, Jeremy Watson, **Jiaoyang Li**, Zhe Chen, Yi Zheng, Shao-Hung Chan, Konstantin Makhnev, Oleg Svidchenko, Vladimir Egorov, Dmitry Ivanov, Aleksei Shpilman, Evgenija Spirovska, Oliver Tanevski, Aleksandar Nikov, Ramon Grunder, David Galevski, Jakov Mitrovski, Guillaume Sartoretti, Zhiyao Luo, Mehul Damani, Nilabha Bhattacharya, Shivam Agarwal, Adrian Egli, Erik Nygren and Sharada Mohanty.
NeurIPS 2020 Competition and Demonstration Track, Proceedings of Machine Learning Research (**PMLR**), volume 133, pages 275-301, 2020.

[C20] **Mutex Propagation for SAT-Based Multi-Agent Path Finding**.
Pavel Surynek, **Jiaoyang Li**, Han Zhang, T. K. Satish Kumar and Sven Koenig.
International Conference on Principles and Practice of Multi-Agent Systems (**PRIMA**), 2020. Acceptance rate: $19/50 = 38.0\%$.

[C19] **Multi-Directional Heuristic Search**.
Dor Atzmon, **Jiaoyang Li**, Ariel Felner, Eliran Nachmani, Shahaf Shperberg, Nathan R. Sturtevant and Sven Koenig.
International Joint Conference on Artificial Intelligence (**IJCAI**), pages 4062-4068, 2020. Acceptance rate: $592/4717 = 12.6\%$.

[C18] **Iterative-Deepening Conflict-Based Search**.
Eli Boyarski, Ariel Felner, Daniel Harabor, Peter J. Stuckey, Liron Cohen, **Jiaoyang Li** and Sven Koenig.
International Joint Conference on Artificial Intelligence (**IJCAI**), pages 4084-4090, 2020. Acceptance rate: $592/4717 = 12.6\%$.

[C17] **New Techniques for Pairwise Symmetry Breaking in Multi-Agent Path Finding**.
Jiaoyang Li, Graeme Gange, Daniel Harabor, Peter J. Stuckey, Hang Ma and Sven Koenig.
International Conference on Automated Planning and Scheduling (**ICAPS**), pages 193-201, 2020. Acceptance rate: $69/216 = 31.9\%$.

[C16] **Multi-Agent Pathfinding with Mutex Propagation**. Outstanding Student Paper Award.
Han Zhang, **Jiaoyang Li**, Pavel Surynek, Sven Koenig and T. K. Satish Kumar.
International Conference on Automated Planning and Scheduling (**ICAPS**), pages 323-332, 2020. Acceptance rate: $69/216 = 31.9\%$.

[C15] **Moving Agents in Formation in Congested Environments**.
Jiaoyang Li, Kexuan Sun, Hang Ma, Ariel Felner, T. K. Satish Kumar and Sven Koenig.
International Joint Conference on Autonomous Agents and Multiagent Systems (**AAMAS**), pages 726-734, 2020. Acceptance rate: $186/808 = 23.0\%$.

[C14] **Model AI Assignments 2020**.
TTodd W.Neller, Stephen Keeley, Michael Guerzhoy, Wolfgang Hoenig, **Jiaoyang Li**, Sven Koenig, Ameet Soni, Krista Thomason, Lisa Zhang, Bibin Sebatian, Cinjon Resnick, Avital Oliver, Surya Bhupatiraju, Kumar Krishna Agrawal, James Allingham, Sejong Yoon, Johnathan Chen, Tom Larsen, Marion Neumann, Narges Norouzi, Ryan Hausen and Matthew Evett.
Symposium on Educational Advances in Artificial Intelligence (**EAAI**), 2020.

2019 [C13] **Scheduling and Airport Taxiway Path Planning under Uncertainty**.
Jiaoyang Li, Han Zhang, Mimi Gong, Zi Liang, Weizi Liu, Zhongyi Tong, Liangchen Yi, Robert Morris, Corina Pasareanu and Sven Koenig.
AIAA Aviation and Aeronautics Forum and Exposition (**AIAA AVIATION Forum**), 2019.

[C12] **Multi-Agent Pathfinding: Definitions, Variants, and Benchmarks** (position paper).
Roni Stern, Nathan R. Sturtevant, Ariel Felner, Sven Koenig, Hang Ma, Thayne T. Walker, **Jiaoyang Li**, Dor Atzmon, Liron Cohen, T. K. Satish Kumar, Eli Boyarski and Roman Bartak.
Symposium on Combinatorial Search (**SoCS**), pages 151-159, 2019. Acceptance rate: $14/31 = 45.2\%$.

[C11] **Improved Heuristics for Conflict-Based Search for Multi-Agent Path Finding**.
Jiaoyang Li, Eli Boyarski, Ariel Felner, Hang Ma and Sven Koenig.
International Joint Conference on Artificial Intelligence (**IJCAI**), pages 442-449, 2019. acceptance rate: $850/4752 = 17.9\%$.

[C10] **Using FastMap to Solve Graph Problems in a Euclidean Space** (short paper).
Jiaoyang Li, Ariel Felner, Sven Koenig and T. K. Satish Kumar.
International Conference on Automated Planning and Scheduling (**ICAPS**), pages 273-278, 2019.

[C9] **Disjoint Splitting for Multi-Agent Path Finding with Conflict-Based Search** (short paper).
Jiaoyang Li, Daniel Harabor, Peter J. Stuckey, Ariel Felner, Hang Ma and Sven Koenig.
International Conference on Automated Planning and Scheduling (**ICAPS**), pages 279-283, 2019.

[C8] **Task and Path Planning for Multi-Agent Pickup and Delivery**.
Minghua Liu, Hang Ma, **Jiaoyang Li** and Sven Koenig.
International Joint Conference on Autonomous Agents and Multiagent Systems (**AAMAS**), pages 1152-1160, 2019. Acceptance rate: $189/781 = 24.2\%$.

[C7] **Multi-Agent Path Finding for Large Agents**.
Jiaoyang Li, Pavel Surynek, Ariel Felner, Hang Ma, T. K. Satish Kumar and Sven Koenig.
AAAI Conference on Artificial Intelligence (**AAAI**), pages 7627-7634, 2019. Acceptance rate: $1150/7095 = 16.2\%$.

[C6] **Symmetry Breaking Constraints for Grid-Based Multi-Agent Path Finding**.
Jiaoyang Li, Daniel Harabor, Peter J. Stuckey, Hang Ma and Sven Koenig.
AAAI Conference on Artificial Intelligence (**AAAI**), pages 6087-6095, 2019. Acceptance rate: $1150/7095 = 16.2\%$.

[C5] **Searching with Consistent Prioritization for Multi-Agent Path Finding**.
Hang Ma, Daniel Harabor, Peter J. Stuckey, **Jiaoyang Li** and Sven Koenig.
AAAI Conference on Artificial Intelligence (**AAAI**), pages 7643-7650, 2019. Acceptance rate: $1150/7095 = 16.2\%$.

2018 [C4] **Adding Heuristics to Conflict-Based Search for Multi-Agent Path Finding** (short paper).
Ariel Felner, **Jiaoyang Li**, Eli Boyarski, Hang Ma, Liron Cohen, T. K. Satish Kumar and Sven Koenig.
International Conference on Automated Planning and Scheduling (**ICAPS**), pages 83-87, 2018. Acceptance rate: $69/209 = 33.0\%$.

[C3] **Multi-Agent Path Finding with Deadlines**.
Hang Ma, G. Wagner, Ariel Felner, **Jiaoyang Li**, T. K. Satish Kumar and Sven Koenig.
International Joint Conference on Artificial Intelligence (**IJCAI**), pages 417-423, 2018. Acceptance rate: $710/3470 = 20.5\%$.

2017 [C2] **Lifelong Multi-Agent Path Finding for Online Pickup and Delivery Tasks**.
Hang Ma, **Jiaoyang Li**, T. K. Satish Kumar and Sven Koenig.
International Joint Conference on Autonomous Agents and Multiagent Systems (**AAMAS**), pages 837-845, 2017. Acceptance rate: $155/595 = 26.1\%$.

[C1] **Planning for Electric Taxi Charging System from the Perspective of Transport Energy Supply Chain: A Data-Driven Approach in Beijing**.
Yinghao Jia, Huimiao Chen, **Jiaoyang Li**, Fang He, Meng Li, Zechun Hu and Zuo-Jun Max Shen.
Proceedings of IEEE Transportation Electrification Conference & EXPO Asia-Pacific (**ITEC-AP**), pages 1-6, 2017.

Journals

2021 [J2] **Pairwise Symmetry Reasoning for Multi-Agent Path Finding Search**.
Jiaoyang Li, Daniel Harabor, Peter J. Stuckey, Hang Ma, Graeme Gange and Sven Koenig.
Artificial Intelligence, volume 301, 2021.

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

Workshops

* Workshop papers with a conference version are not listed below.

2021 [W2] **A Hierarchical Approach to Multi-Agent Path Finding**.
Han Zhang, Mingze Yao, Ziang Liu, **Jiaoyang Li**, Lucas Terr, Shao-Hung Chan, T. K. Satish Kumar and Sven Koenig.
ICAPS Workshop on Hierarchical Planning (**HPLAN**), 2021.

2020 [W1] **Nested ECBS for Bounded Suboptimal Multi-Agent Path Finding**.
Shao-Hung Chan, **Jiaoyang Li**, Daniel Harabor, Peter J. Stuckey, Graeme Gange, Liron Cohen and Sven Koenig.
IJCAI-20 Workshop on Multi-Agent Path Finding (**WoMAPF**), 2020.

Extended Abstracts

* Extended abstracts with a conference or workshop version are not listed below.

2021 [E2] **ECBS with Flex Distribution for Bounded Suboptimal Multi-Agent Path Finding** (extended abstract).
Shao-Hung Chan, **Jiaoyang Li**, G. Gange, Daniel Harabor, Peter J. Stuckey and Sven Koenig.
Symposium on Combinatorial Search (**SoCS**), pages 159-161, 2021.

2019 [E1] **A New Constraint Satisfaction Perspective on Multi-Agent Path Finding: Preliminary Results** (extended abstract).
Jiangxing Wang, **Jiaoyang Li**, Hang Ma, Sven Koenig and T. K. Satish Kumar.
International Joint Conference on Autonomous Agents and Multiagent Systems (**AAMAS**), pages 2253-2255, 2019. Acceptance rate: 407/781=52.1%.

Book Chapters

2021 [B1] **Artificial Intelligence and Automation**.
Sven Koenig, Shao-Hung Chan, **Jiaoyang Li** and Yi Zheng.
In Handbook of Automation, Shimon Y. Nof (editor), Springer, 2021.

Media Coverage

03/2021 **Making the (Virtual) Trains Run On Time: USC Team World Champs in AI Challenge**, *USC Press*, `https://viterbischool.usc.edu/news/2021/03/making-the-virtual-trains-run-on-time-usc-team-world-champs-in-ai-challenge/`.

05/2020 **Amazon studies anti-collision method for robots to increase throughput**, *Supply Chain Dive*, `https://www.supplychaindive.com/news/amazon-robots-from-colliding-increasing-throughput-warehouse/578599/`.

05/2020 **Amazon's AI tool can plan collision-free paths for 1,000 warehouse robots**, *Venture Beat*, `https://venturebeat.com/2020/05/18/amazons-ai-tool-can-plan-collision-free-paths-for-1000-warehouse-robots/`, (also distributed via ACM TechNews).

Teaching and Mentoring Experience

Teaching

Summer 2021 Research Coach at Viterbi Summer Institute (VSI). USC

Spring 2021 Teaching Assistant at Advanced Analysis of Algorithms, CSCI670. USC

Fall 2019 Teaching Assistant at Introduction to Artificial Intelligence, CSCI360. USC
Our class project on multi-agent path finding was chosen as Model AI Assignment 2020 by the Symposium on Educational Advances in Artificial Intelligence.

Summer 2019 Lab Assistant at the Third Summer School on Cognitive Robotics. USC
Helped organizing a lab on multi-agent path finding.

Mentoring

Summer 2021 Sumanth Varambally (Undergraduate Student in Computer Science at Indian Insititute of Technologt (IIT) Delhi), *IUSSTF-Viterbi summer research program*.

2021 Shuyang Zhang (Undergraduate Student in Computer Science at USC), *Center for Undergraduate Research in Viterbi Engineering (CURVE) Program*. Her poster was selected as a winner of the CURVE Symposium, 2021.

Spring 2021 Qinghong Xu (Master Student in Computer Science at Simon Fraser University).

Fall 2020 Xinyi Zhong (Master Student in Computer Science at Simon Fraser University).

Fall 2020 Wooju Yim (Undergraduate Student in Computer Science at USC).

Fall 2020 Leon Durrenberger (Undergraduate Student in Computer Science at USC), *Directed Research Project*.

2020-2021 Eugene (Zijun) Lin (Master Student in Computer Science at USC).

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*. Paper published at AAMAS, 2019.

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 Organizing Committee

2020 Co-chair at IJCAI Workshop on Multi-Agent Path Finding (WoMAPF)

Conference and Workshop (Senior) Program Committee

2021, 2022 PC at AAAI Conference on Artificial Intelligence (AAAI)

2021 PC of both the main track and the system demonstrations track at International Conference on Automated Planning and Scheduling (ICAPS)

2021,2022 PC of the special track on Autonomous Robots and Agents at International Conference of the Florida Artificial Intelligence Research Society (FLAIRS)

2020-2024 PC (2020), SPC (2021), and PC Board (2022-2024) at International Joint Conference on Artificial Intelligence (IJCAI)

2019, 2020 PC at International Conference on Autonomic and Autonomous Systems (ICAS)

2019 PC at IJCAI Workshop on Multi-Agent Path Finding (WoMAPF)

Conference and Workshop Reviewer (of Individual Papers)

2021 2x International Symposium on Multi-Robot and Multi-Agent Systems (MRS)

2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

2021 IEEE International Conference on Robotics and Automation (ICRA)

2021 Undergraduate Consortium at AAAI Conference on Artificial Intelligence (AAAI-UC)

2018-2021 3x AAAI/ACM Conference on Artificial Intelligence, Ethics, and Society (AIES)

2020 Workshop on the Algorithmic Foundations of Robotics (WAFR)

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 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

2021 Artificial Intelligence (AIJ)

2021 Journal of Artificial Intelligence Research (JAIR)

2019-2021 4x IEEE Robotics and Automation Letters (RA-L)

2020 IEEE Transactions on Automation Science and Engineering (T-ASE)

2020 IEEE Transactions on Control of Network Systems (TCNS)

2020 Journal of Aerospace Information Systems (JAIS)

2020 Aerospace Lab (AL)

2017 Tsinghua Science and Technology (TST)

Invited Panelist

2021 Grad Student Panel at AAAI-2021 Undergraduate Consortium

2020 Flatland Townhall Panel at NeurIPS-2020 Competition Track

Talks and Presentations

Invited Talks

03/2021 **Large Scale Multi-Agent Path Finding** (virtual, in Chinese). AI TIME. https://www.bilibili.com/video/BV1X54y1h7qm

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

Presentations at Conferences and Symposiums

08/2021 **Anytime Multi-Agent Path Finding via Large Neighborhood Search** (virtual). International Joint Conference on Artificial Intelligence (IJCAI).

08/2021 **Scalable Rail Planning and Replanning: Winning the 2020 Flatland Challenge** (virtual). International Conference on Automated Planning and Scheduling (ICAPS).

02/2021 **EECBS: A Bounded-Suboptimal Search on Multi-Agent Path Finding** (virtual). AAAI Conference on Artificial Intelligence (AAAI).

02/2021 **Lifelong Multi-Agent Path Finding in Large-Scale Warehouses** (virtual). AAAI Conference on Artificial Intelligence (AAAI).

12/2020 **Winning the 2020 Flatland Challenge** (virtual). Conference on Neural Information Processing Systems (NeurIPS). https://slideslive.com/38942745/2020-flatland-challenge

10/2020 **New Techniques for Pairwise Symmetry Breaking in Multi-Agent Path Finding** (virtual). International Conference on Automated Planning and Scheduling (ICAPS). https://youtu.be/ClmfMNErYo8

10/2020 **Pairwise Symmetry Reasoning for Multi-Agent Path Finding** (virtual). Doctoral Consortium at the International Conference on Automated Planning and Scheduling (ICAPS).

05/2020 **Moving Agents in Formation in Congested Environments** (virtual). Symposium on Combinatorial Search (SoCS). https://youtu.be/snTG2yL-dgI

05/2020 **New Techniques for Pairwise Symmetry Breaking in Multi-Agent Path Finding** (virtual). Symposium on Combinatorial Search (SoCS). https://youtu.be/ckdSb750gEc

05/2020 **Moving Agents in Formation in Congested Environments** (virtual). International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS). https://underline.io/lecture/375-moving-agents-in-formation-in-congested-environments

05/2020 **Lifelong Multi-Agent Path Finding in Large-Scale Warehouses** (virtual). International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS). https://underline.io/lecture/356-lifelong-multi-agent-path-finding-in-large-scale-warehouses

02/2020 **A Project on Multi-Agent Path Finding**. Educational Advances in Artificial Intelligence (EAAI).

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).