

Lantao Liu – Curriculum Vitae

Indiana University-Bloomington
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Research Interests

My research interests include planning, learning, and coordination techniques for autonomous systems with potential applications in environmental monitoring, search and rescue, surveillance and security, as well as smart transportation.

Academic Positions

2017 –	Assistant Professor	Indiana University	Intelligent Systems Engr.
2015 – 2017	Research Associate	University of Southern California	Computer Science
2013 – 2015	Postdoc Fellow	Carnegie Mellon University	Robotics Institute
2008 – 2013	Research Assistant	Texas A& M University	Computer Science and Engr.

Education

- 2008 – 2013 **Doctor of Philosophy, Texas A&M University**
Department of Computer Science and Engineering
[\[UNIVERSITY DISSERTATION FELLOW\]](#)
- 2003 – 2007 **Bachelor of Engineering, Beijing Institute of Technology**
Department of Automatic Control
[\[SILVER MEDAL GRADUATE\]](#)

Publications

1. Junhong Xu, Kai Yin, Lantao Liu. Value Function Approximation for Continuous-State Markov Decision Processes. Robotics: Science and Systems (**RSS**). Virtual Conference. 2020.
2. Junhong Xu, Kai Yin, Lantao Liu. State-Continuity Approximation of Markov Decision Processes via Finite Element Analysis for Autonomous System Planning. IEEE Robotics and Automation Letters (**RA-L**). 2020.
3. Junhong Xu, Kai Yin, Lantao Liu. An Online Planning Algorithm for Uncertain and Dynamic Environment with the Presence of Other Mobile Vehicles. IEEE International Conference on Robotics and Automation (**IROS**). 2020
4. Qian Lou, Feng Guo, Minje Kim, Lantao Liu, Lei Jiang. AutoQ: Automated Kernel-Wise Neural Network Quantization. International Conference on Learning Representations (**ICLR**). Addis Ababa, Ethiopia. 2020.

5. Weizhe Chen, Lantao Liu. Pareto Monte Carlo Tree Search for Multi-Objective Informative Planning. Robotics: Science and Systems (**RSS**). Messe Freiburg, Germany. June, 2019.
6. Junhong Xu, Kai Yin, Lantao Liu. Reachable Space Characterization of Markov Decision Processes with Time Variability. Robotics: Science and Systems (**RSS**). Messe Freiburg, Germany. June, 2019.
7. Weizhe Chen, Lantao Liu. Multi-Objective and Model-Predictive Tree Search for Spatiotemporal Informative Planning. IEEE Conference on Decision and Control (**CDC**). Nice, France, 2019.
8. Junhong Xu, Lantao Liu. Learning Features for Coral Detection and Species Classification. The OCEANS Conference. Seattle, WA, 2019.
9. Weizhe Chen, Lantao Liu. Long-Term Autonomous Ocean Monitoring with Streaming Samples. The OCEANS Conference. Seattle, WA, 2019.
10. Malintha Fernando, Lantao Liu. Formation Control and Navigation of a Quadrotor Swarm. International Conference on Unmanned Aircraft Systems (**ICUAS**). Atlanta, GA. June, 2019.
11. Zheng Chen, Malintha Fernando, Lantao Liu. A Visual Feature based Obstacle Avoidance Method for Autonomous Navigation. 48th Annual IEEE Applied Imagery and Pattern Recognition (AIPR) Workshop: Cognition, Collaboration, and Cloud. Washington, D.C., 2019.
12. Shoubhik Debnath, Gaurav Sukhatme, Lantao Liu. Accelerating Goal-Directed Reinforcement Learning by Model Characterization. IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**). Madrid, Spain, 2018.
13. Shoubhik Debnath, Lantao Liu, Gaurav Sukhatme. Solving Markov Decision Processes with Reachability Characterization from Mean First Passage Times. IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**). Madrid, Spain, 2018.
14. Lantao Liu, Gaurav Sukhatme. A Solution to Time-Varying Markov Decision Processes. IEEE Robotics and Automation Letters (**RA-L**). vol. 3, no. 3. pp. 1631-1638, 2018.
15. Chen Huang, Kai Yin, Lantao Liu. Learning Partially Structured Environmental Dynamics for Marine Robotic Navigation. The OCEANS Conference. Charleston, SC, 2018.
16. Chen Huang, Lantao Liu. Learning to Act in Partially Structured Dynamic Environment AAI 2018 Spring Symposium on Integrating Representation, Reasoning, Learning, and Execution for Goal Directed Autonomy. Stanford University, CA. Mar 2018.
17. Kai-Chieh Ma, Lantao Liu, Hordur K. Heidarsson, Gaurav Sukhatme. Data-Driven Planning and Learning for Environmental Sampling. Journal of Field Robotics (**JFR**). Nov 2017. [[IMPACT FACTOR 4.5](#)]
18. Shoubhik Debnath, Lantao Liu, Gaurav Sukhatme. Reachability and Differential based Heuristics for Solving Markov Decision Processes International Symposium on Robotics Research (**ISRR**). Chile, 2017.
19. Zhibei Ma, Kai Yin, Lantao Liu, Gaurav Sukhatme. A Spatio-Temporal Representation for the Orienteering Problem with Time-Varying Profits. IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**). Vancouver, Canada, Sept, 2017.
20. Kai-Chieh Ma, Lantao Liu, Gaurav Sukhatme. Informative Planning and Online Learning with Sparse Gaussian Processes. IEEE International Conference on Robotics and Automation (**ICRA**). Singapore, 2017.
21. Kai-Chieh Ma, Lantao Liu, Gaurav Sukhatme. An Information-Driven and Disturbance-Aware Planning Method for Long-Term Ocean Monitoring. IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**). Korea, Oct, 2016.

[[BEST APPLICATION PAPER AWARD FINALIST \(1 OF 4\)](#)]

[[BEST STUDENT PAPER AWARD FINALIST \(1 OF 6\)](#)]

22. Kai-Chieh Ma, Zhibei Ma, Lantao Liu, Gaurav Sukhatme. Multi-Robot Informative and Adaptive Planning for Persistent Environmental Monitoring. International Symposium on Distributed Autonomous Robotic Systems (**DARS**). London, UK, Nov, 2016.
23. Zhibei Ma, Lantao Liu, Gaurav Sukhatme. An Adaptive k-opt Method for Solving Traveling Salesman Problem. IEEE Conference on Decision and Control (**CDC**). Las Vegas, Dec, 2016.
24. Lantao Liu, Nathan Michael. An MDP-based Approximation Method for Goal Constrained Multi-MAV Planning under Action Uncertainty. IEEE International Conference on Robotics and Automation (**ICRA**), Stockholm, Sweden, 2016.
25. Kai-Chieh Ma, Lantao Liu, Gaurav Sukhatme. Multi-robot Informative Planning for Long-Term Ocean Monitoring. IEEE International Conference on Robotics and Automation (ICRA). Workshop: AI for Long-term Autonomy, Stockholm, Sweden, 2016.
26. Lantao Liu, Nathan Michael, Dylan Shell. Communication Constrained Task Allocation with Optimized Local Task Swaps. Autonomous Robots (**AURO**). vol. 39, no. 3, pp. 429-444, 2015. [[IMPACT FACTOR 3.6](#)]
27. Vishnu R. Desaraju, Lantao Liu, Nathan Michael. Multi-Vehicle Adaptive Planning with Online Estimated Cost due to Disturbances. International Conference on Intelligent Autonomous Systems (**IAS**), Padova, Italy. July 2014.
28. Lantao Liu, Nathan Michael, Dylan Shell. Fully Decentralized Task Swaps with Optimized Local Searching. Robotics: Science and Systems Conference (**RSS**). Berkeley, California. July 2014. [[AMONG 10 SELECTED/INVITED FOR AAAI ROBOTICS-TRACK TALKS](#)]
29. Lantao Liu, Nathan Michael. Energy-Aware Aerial Vehicle Deployment via Bipartite Graph Matching. International Conference on Unmanned Aircraft Systems (**ICUAS**). Orlando, Florida. May 2014.
30. Lantao Liu, Dylan Shell, Nathan Michael. From Selfish Auctioning to Incentivized Marketing. Autonomous Robots (**AURO**). vol. 37, no. 4, pp. 417-430, 2014. [[IMPACT FACTOR 3.6](#)]
31. Lantao Liu, Dylan Shell. Physically Routing Robots in a Multi-robot Network: Flexibility through a Three Dimensional Matching Graph. International Journal of Robotics Research (**IJRR**). vol. 32, no. 12, pp. 1475-1494, 2013. [[IMPACT FACTOR 5.3](#)]
32. Lantao Liu, Dylan Shell. An Anytime Assignment Algorithm: From Local Task Swapping to Global Optimality. Autonomous Robots (**AURO**). vol. 35, no. 4, pp. 271-286, 2013. [[IMPACT FACTOR 3.6](#)]
33. Yixiang Zhang, Peng Gao, Zhuo Xing, Shumei Jin, Zhide Chen, Lantao Liu, Nasie Constantino, Xin-wang Wang, Weibin Shi, Joshua S. Yuan, Susie Y. Dai. Application of an Improved Proteomics Method for Abundant Protein Cleanup: Molecular and Genomic Mechanisms Study in Plant Defense. Molecular & Cellular Proteomics (**MCP**). vol. 12, no. 11, pp. 3431-3442, 2013. [[IMPACT FACTOR 6.5](#)]
34. Lantao Liu, Dylan Shell. Optimal Market-based Multi-Robot Task Allocation via Strategic Pricing. Robotics: Science and Systems Conference (**RSS**). Berlin, Germany. June 2013. [[AMONG 5 SELECTED FOR LONG TALKS](#)]
35. Weibing Shi, Shangxian Xie, Su Sun, Xueyan Chen, Xin Zhou, Lantao Liu, Peng Gao, Nikos C. Kyprides, En-Gyu No, Joshua S. Yuan. Comparative Genomic Analysis of the Endosymbionts of Herbivorous Insects Reveals Eco-Environmental Adaptations: Biotechnology Applications. **PLoS Genetics**. vol. 9, no. 1. 2012. [[IMPACT FACTOR 6.1](#)]

36. Lantao Liu, Dylan Shell. An Efficient Distributed Topo-Geometric Spatial Density Estimation Method for Multi-Robot Systems. IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**). Algarve, Portugal. Oct 2012.
37. Lantao Liu, Dylan Shell. Multi-robot Formation Morphing through Matching Graph. International Symposium on Distributed Autonomous Robotic Systems (**DARS**). Baltimore, MD. Nov 2012. [[BEST STUDENT PAPER RUNNER-UP AWARD](#)]
38. Lantao Liu, Dylan Shell. Tackling Task Allocation Uncertainty via a Combinatorial Method. IEEE International Symposium on Safety, Security, and Rescue Robotics (**SSRR**). College Station, TX. Nov 2012.
39. Lantao Liu, Dylan Shell. Large-Scale Multi-Robot Task Allocation via Dynamic Partitioning and Distribution. Autonomous Robots (**AURO**). vol. 33, no. 3, pp. 291-307, 2012. [[IMPACT FACTOR 3.6](#)]
40. Lantao Liu, Dylan Shell. A Distributable and Computation-Flexible Assignment Algorithm: From Local Task Swapping to Global Optimality. Robotics: Science and Systems Conference (**RSS**). Sydney, Australia. July 2012.
41. Lantao Liu, Dylan Shell. Tunable Routing Solutions for Multi-Robot Navigation via the Assignment Problem: A 3D Representation of the Matching Graph. IEEE International Conference on Robotics and Automation (**ICRA**). Saint Paul, Minnesota. May 2012.
42. Lantao Liu, Dylan Shell. Assessing Optimal Assignment under Uncertainty: An Interval-based Algorithm. International Journal of Robotics Research (**IJRR**). vol. 30, no. 7, pp. 936-953, 2011. [[IMPACT FACTOR 5.3](#)]
43. Lantao Liu, Benjamin Fine, Dylan Shell, Andreas Klappenecker. Approximate Characterization of Multi-Robot Swarm ‘Shape’ in Sublinear-Time. IEEE International Conference on Robotics and Automation (**ICRA**). Shanghai, China. May 2011.
44. Lantao Liu, Dylan Shell. Multi-level Partitioning and Distribution of the Assignment Problem for Large-scale Multi-robot Task Allocation. Robotics: Science and Systems Conference (**RSS**). Los Angeles, California. Jun 2011. [[AMONG 20 SELECTED FOR LONG TALKS](#)]
45. Lantao Liu, Sanmin Liu (co-first), Ugur Uzunner, Xin Zhou, Manxi Gu, Weibing Shi, Yixiang Zhang, Susie Y. Dai, Joshua S. Yuan. HDX-Analyzer: A Novel Package for Statistical Analysis of Protein Structure Dynamics. Journal of **BMC** Bioinformatics. 12(S1):S43, 2011.
46. Sanmin Liu, Lantao Liu, Ugur Uzunner, Xin Zhou, Manxi Gu, Weibing Shi, Yixiang Zhang, Susie Dai, Joshua Yuan. HDX-Analyzer: A Novel Package for Statistical Analysis of Protein Structure Dynamics. The 9th Asia Pacific Bioinformatics Conference (**APBC**). Incheon, Korea. Jan 2011.
47. Lantao Liu, Dylan Shell. Assessing Optimal Assignment under Uncertainty: An Interval-based Algorithm. Robotics: Science and Systems Conference (**RSS**). Zaragoza, Spain. Jun 2010. [[16% ACCEPTANCE RATE](#)]
[[AMONG 10 SELECTED/RECOMMENDED TO IJRR, RATE≈ 4%](#)]
48. Lantao Liu, Dylan Shell. Task Insertion and Reassignment in Networked Robots for Topological Morphing. ICRA Workshop of Network Science and Systems. Anchorage, AK. May 2010.
49. Ugur Uzuner, Weibing Shi, Lantao Liu, Sanmin Liu, Susie Y. Dai, Joshua S. Yuan. Enzyme Structure Dynamics of Xylanase I from *Trichoderma longibrachiatum*. Journal of BMC Bioinformatics 11(S6):S12, 2010.

Other Refereed Contributions

1. Tingyi Wanyan, Lantao Liu, Eleftherios Garyfallidis. Tractography using Reinforcement Learning and Adaptive-Expanding Graphs. International Symposium on Biomedical Imaging (**ISBI**) . Washington DC. Apr 2018.
2. Kai-Chieh Ma, Lantao Liu, Gaurav S. Sukhatme. A Hierarchical Informative Path Planning Method for Ocean Monitoring. The 1st Southern California Robotics Symposium (**SCR**). San Diego, CA. Apr 2016.
3. Lantao Liu. Toward the Desired Performance for Multi-robot Task Allocation. IEEE International Symposium on Safety, Security, and Rescue Robotics (**SSRR**). Sweden. Oct 2013.
4. Lantao Liu, Dylan Shell. Distribute the Task Swapping Assignment Method under Communication Constraints. The 2012 Symposium on Emerging Topics in Control and Modeling: Networked Systems (**CMNS**). Urbana- Champaign, IL. Oct 2012.
5. Lantao Liu, Xin Zhou, Ugur Uzuner, Susie Dai, Joshua Yuan. Novel Software Package for HDX Mass Spectrometry Analysis. The 7th Annual MidSouth Computational Biology and Bioinformatics Society (**MCBIOS**) Conference. Jonesboro, AR. Feb 2010.
6. Ugur Uzuner, Weibing Shi, Lantao Liu, Susie Dai, Joshua Yuan. Structure Dynamics Analysis of Xylanases. The 7th Annual MidSouth Computational Biology and Bioinformatics Society (**MCBIOS**) Conference. Jonesboro, AR. Feb 2010.
7. Weibing Shi, Yingxiang Zhang, Lantao Liu, Susie Dai, Joshua Yuan. Structure Dynamics Analysis of Cellulase Enzymes. The 7th Annual MidSouth Computational Biology and Bioinformatics Society (**MCBIOS**) Conference. Jonesboro, AR. Feb 2010.

Honors, Awards, Distinctions

2020	Amazon AWS Machine Learning Research Award
2016	Best Application Paper Finalist of IROS
2016	Best Student Paper Finalist of IROS
2012 – 2013	Texas A&M University Dissertation Fellowship (10 / TAMU)
2012	Best Student Paper Runner-up Award of DARS
2011	Outstanding Student Research Award for TAMU National Robotics Week
2009 – 2010	Industrial Affiliate Program scholarship & CSE Ambassador Honor
2007	Silver Medal (highest distinction 3 / College)
2003 – 2007	Renmin Scholarship (top 10%) 4 years
2007	Honors of Beijing Excellent Graduate (top 5%) and BIT Excellent Graduate (top 10%)
2007	Outstanding Thesis Award
2007	College Star Honor (1 / College)
2007	Department Star Honor for undergrad research (1 / Dept)
2004, 2006	BIT Excellent Student Honor (top 2%) twice
2004-2007	BIT University Robot Soccer team leader; ranked 8th among 78 teams in 2007 FIRA robot soccer championship

Teaching Experiences

E599/399	Special Topics on Autonomous Robots	Fall 2020
E502/399	Introduction to Cyber-Physical Systems	Spring 2018, 2019, 2020, Fall 2019

E503	Introduction to Intelligent Systems	Fall 2018
E599	Special Topics in Robotics Planning and Learning	Fall 2017
E599	Introduction to Intelligent Systems Engineering (Co-Instructor)	Fall 2017, 2018

Student Advising

Weizhe Chen	PhD student	Indiana University	2018	Fall-
Zheng Chen	PhD student	Indiana University	2018	Fall-
Junhong Xu	PhD student	Indiana University	2018	Fall-
Ben Zhang	PhD student	Indiana University	2020	Fall-
Manuja Sanjay Bandal	Master student	Indiana University	2019	Fall-
Shreyas Bhujbal	Master student	Indiana University	2019	Fall-
Liam Donohue	Undergrad student	Indiana University	2019	Fall-
Andrew Gostomelsky	Undergrad student	Indiana University	2019	Fall-
Rowan Lavelle	Undergrad student	Indiana University	2019	Fall-
Kaiju Lv	Undergrad student	Indiana University	2019	Fall-
Jason Ryu	Undergrad student	Indiana University	2019	Fall-
Grant Waldow	Undergrad student	Indiana University	2019	Fall-

Student Graduated

Sam Migirditch	Master	IU	2019 – 2020	Metron Scientific Solutions (Unmanned systems)
Saptarshi Sinha	Master	IU	2019 – 2020	Oregon State U (Oceanography research engineer)
Kristopher Jung	Undergrad	IU	2019 – 2020	General Motors
Rushabh Patel	Master	IU	2018 – 2019	Uber (ML group)
Jay Patel	Master	IU	2018 – 2019	Unity (CV/ML group)
Gabrielle Gantor	Undergrad	IU	2018 – 2019	Boeing (Robotics group, intern)
Paula Madetzke	Undergrad	IU	2018 – 2019	National Security Innovation Network (intern)
Isaiah Makonnen	Undergrad	IU	2019 summer	IU Accelerated Master program
Nawaz Khazielakha	Master	IU	2018 – 2019	IBM
Jamon Gaines	Undergrad	IU	2019 summer	IU Accelerated Master program
Yezhen Zhao	Master	USC	2016 – 2018	AutoX (Self-driving)
Chen Huang	Master	USC	2016 – 2018	Microsoft (NLP group)
Shoubhik Debnath	Master	USC	2016 – 2018	Nvidia (Robotics group)
Kai-Chieh Ma	Master	USC	2015 – 2017	Brain Corp. (Robotics group)
Steven Ly	Master	USC	2016 – 2017	Lawrence Livermore National Laboratory
Zhibei Ma	Master	USC	2015 – 2017	TuSimple (Self-driving)
Hesen Zhang	Master	USC	2015 – 2016	Google

Professional Service

Symposium Founding Co-organizer:

Inaugural Southern California Robotics Symposium (SCR16), San Diego, April 2016, with a total number of 300 participants from both academia and industry. We got an amazing line-up of 16 speakers, 20 posters, and 16 exhibition booths.

URL: <http://robotics.usc.edu/scr/2016/speakers.html>

Symposium Co-organizer, Local Chair:

Second Southern California Robotics Symposium (SCR17), Los Angeles, April 2017. We had over 300 attendees. There were 15 speakers, 25 accepted posters (50% acceptance rate), and 16 exhibition booths, from both academia and industry.

URL: <http://robotics.usc.edu/scr/>

Workshop Co-organizer:

Indiana National Lab Day, Indianapolis, 2019. We organized a TED-talk style AI workshop where speakers are well-known professors and scientists from Purdue, Notre Dame, Indiana University, IUPUI, and 5 National Labs

Associate Editor:

IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2014, 2015, 2016.

IEEE International Conference on Robotics and Automation (ICRA) 2019.

Conference Session Chairing:

Robotics: Science and Systems (RSS) 2019

IEEE Conference on Decision and Control (CDC) 2019

IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2017, 2020

Program Committee:

International Joint Conference on Artificial Intelligence (IJCAI) (2015, 2021)

AAAI Conference on Artificial Intelligence (AAAI) (2021)

RSS Workshop on Informative Path Planning and Adaptive Sampling (2019)

International Symposium on Multi-Robot and Multi-Agent Systems (2019)

ICRA Workshop on Informative Path Planning and Adaptive Sampling (2018)

ACM Symposium on Applied Computing, Intelligent Robotics & Multi-Agent Systems (IRMAS) (2015, 2016, 2017, 2018)

RSS Workshop on Distributed Control and Estimation for Robotic Vehicle Networks (2014)

IEEE International Symposium on Safety, Security and Rescue Robotics (SSRR) (2013, 2014, 2015).

Paper Reviewer: T-RO, T-ASE, IJRR, AURO, ICRA, IROS, RSS, ISRR, ISER, IJCAI, AAAI, NIPS, JAA-MAS, RA-L, NIPS, CDC, ACC, SSRR, DARS, ICUAS, IAVS, SAC, MRS, Physics Letters, and many other symposium and workshop venues.