
Education

Rice University Houston, TX	Ph.D. in Computer Science Thesis: <i>Toward Efficient and General Multi-Modal Planning</i> Advisor: Dr. Lydia Kavraki	Aug. 2016–Dec. 2021
Rice University Houston, TX	M.S. in Computer Science Thesis: <i>A Unifying Framework for Constrained Sampling-Based Planning</i> Advisor: Dr. Lydia Kavraki	Aug. 2016–Dec. 2017
Rice University Houston, TX	B.S. in Computer Science	Aug. 2012–May 2016

Publications

All publications are available on my website: <https://zkingston.com>.

Preprints Under Review

- P₁. Wil Thomason[†], **Zachary Kingston**[†], and Lydia E. Kavraki. Motions in microseconds via vectorized sampling-based planning, 2024. URL <https://arxiv.org/abs/2309.14545>. [†] Equal Contribution. Under Review
- P₂. Carlos Quintero-Peña, Wil Thomason, **Zachary Kingston**, Anastasios Kyrillidis, and Lydia E. Kavraki. Stochastic implicit neural signed distance functions for safe motion planning under sensing uncertainty, 2024. URL <https://arxiv.org/pdf/2309.16862.pdf>. Under Review

Peer-Reviewed Journal Articles

- J₁. S. Bora Bayraktar, Andreas Orthey, **Zachary Kingston**, Marc Toussaint, and Lydia E. Kavraki. Solving rearrangement puzzles using path defragmentation in factored state spaces. *IEEE Robotics and Automation Letters*, 8(8):4529–4536, 2023. doi:10.1109/LRA.2023.3282788
- J₂. **Zachary Kingston** and Lydia E. Kavraki. Scaling multi-modal planning: Using experience and informing discrete search. *IEEE Transactions on Robotics*, 39(1):128–146, 2023. doi:10.1109/TRO.2022.3197080
- J₃. Constantinos Chamzas, Carlos Quintero-Peña, **Zachary Kingston**, Andreas Orthey, Daniel Rakita, Michael Gleicher, Marc Toussaint, and Lydia E. Kavraki. MotionBenchMaker: A tool to generate and benchmark motion planning datasets. *IEEE Robotics and Automation Letters*, 7(2):882–889, 2021. doi:10.1109/LRA.2021.3133603
- J₄. **Zachary Kingston**, Mark Moll, and Lydia E. Kavraki. Exploring implicit spaces for constrained sampling-based planning. *The International Journal of Robotics Research*, 38(10–11):1151–1178, 2019. doi:10.1177/0278364919868530

- J5. Neil T. Dantam, **Zachary Kingston**, Swarat Chaudhuri, and Lydia E. Kavraki. An incremental constraint-based framework for task and motion planning. *The International Journal of Robotics Research*, 37(10):1134–1151, 2018. doi:[10.1177/0278364918761570](https://doi.org/10.1177/0278364918761570)
- J6. **Zachary Kingston**, Mark Moll, and Lydia E. Kavraki. Sampling-based methods for motion planning with constraints. *Annual Review of Control, Robotics, and Autonomous Systems*, 1(1):159–185, 2018. doi:[10.1146/annurev-control-060117-105226](https://doi.org/10.1146/annurev-control-060117-105226)

Peer-Reviewed Conference Papers

- C1. Rahul Shome, **Zachary Kingston**, and Lydia E. Kavraki. Robots as AI double agents: Privacy in motion planning. In *IEEE/RSJ International Conference on Intelligent Robots and Systems*, 2023. URL <https://arxiv.org/abs/2308.03385>. To Appear
- C2. Carlos Quintero-Peña, **Zachary Kingston**, Tianyang Pan, Rahul Shome, Anastasios Kyrillidis, and Lydia E. Kavraki. Optimal grasps and placements for task and motion planning in clutter. In *IEEE International Conference on Robotics and Automation*, pages 3707–3713, 2023. doi:[10.1109/ICRA48891.2023.10161455](https://doi.org/10.1109/ICRA48891.2023.10161455)
- C3. Yiyuan Lee, Wil Thomason, **Zachary Kingston**, and Lydia E. Kavraki. Object reconfiguration with simulation-derived feasible actions. In *IEEE International Conference on Robotics and Automation*, pages 8104–8111, 2023. doi:[10.1109/ICRA48891.2023.10160377](https://doi.org/10.1109/ICRA48891.2023.10160377)
- C4. **Zachary Kingston** and Lydia E. Kavraki. Robowflex: Robot motion planning with MoveIt made easy. In *IEEE/RSJ International Conference on Intelligent Robots and Systems*, pages 3108–3114, 2022. doi:[10.1109/IROS47612.2022.9981698](https://doi.org/10.1109/IROS47612.2022.9981698)
- C5. **Zachary Kingston**, Constantinos Chamzas, and Lydia E. Kavraki. Using experience to improve constrained planning on foliations for multi-modal problems. In *IEEE/RSJ International Conference on Intelligent Robots and Systems*, pages 6922–6927, 2021. doi:[10.1109/IROS51168.2021.9636236](https://doi.org/10.1109/IROS51168.2021.9636236)
- C6. Mark Moll, Constantinos Chamzas, **Zachary Kingston**, and Lydia E. Kavraki. HyperPlan: A framework for motion planning algorithm selection and parameter optimization. In *IEEE/RSJ International Conference on Intelligent Robots and Systems*, pages 2511–2518, 2021. doi:[10.1109/IROS51168.2021.9636651](https://doi.org/10.1109/IROS51168.2021.9636651)
- C7. Andrew M. Wells, **Zachary Kingston**, Morteza Lahijanian, Lydia E. Kavraki, and Moshe Y. Vardi. Finite horizon synthesis for probabilistic manipulation domains. *IEEE International Conference on Robotics and Automation*, pages 6336–6342, 2021. doi:[10.1109/ICRA48506.2021.9561297](https://doi.org/10.1109/ICRA48506.2021.9561297)
- C8. Constantinos Chamzas, **Zachary Kingston**, Carlos Quintero-Peña, Anshumali Shrivastava, and Lydia E. Kavraki. Learning sampling distributions using local 3D workspace decompositions for motion planning in high dimensions. In *IEEE International Conference on Robotics and Automation*, pages 1283–1289, 2021. doi:[10.1109/ICRA48506.2021.9561104](https://doi.org/10.1109/ICRA48506.2021.9561104)
- C9. **Zachary Kingston**, Andrew M. Wells, Mark Moll, and Lydia E. Kavraki. Informing multi-modal planning with synergistic discrete leads. In *IEEE International Conference on Robotics and Automation*, pages 3199–3205, 2020. doi:[10.1109/ICRA40945.2020.9197545](https://doi.org/10.1109/ICRA40945.2020.9197545)
- C10. **Zachary Kingston**, Mark Moll, and Lydia E. Kavraki. Decoupling constraints from sampling-based planners. In Nancy M. Amato, Greg Hager, Shawna Thomas, and Miguel Torres-Torriti, editors, *Robotics Research*, pages 913–928. Springer International Publishing, Cham, 2020. ISBN 978-3-030-28619-4. doi:[10.1007/978-3-030-28619-4_62](https://doi.org/10.1007/978-3-030-28619-4_62)

- C₁₁. Golnaz Habibi, Sándor P. Fekete, **Zachary Kingston**, and James McLurkin. Distributed object characterization with local sensing by a multi-robot system. In Roderich Groß, Andreas Kolling, Spring Berman, Emilio Frazzoli, Alcherio Martinoli, Fumitoshi Matsuno, and Melvin Gauci, editors, *Distributed Autonomous Robotic Systems: The 13th International Symposium*, volume 6, pages 205–218. Springer Proceedings in Advanced Robotics, 2018. doi:10.1007/978-3-319-73008-0_15
- C₁₂. William Baker, **Zachary Kingston**, Mark Moll, Julia Badger, and Lydia E. Kavraki. Robonaut 2 and you: Specifying and executing complex operations. In *IEEE Workshop on Advanced Robotics and its Social Impacts*, pages 1–8, Austin, TX, March 2017. doi:10.1109/ARSO.2017.8025204
- C₁₃. Neil T. Dantam, **Zachary Kingston**, Swarat Chaudhuri, and Lydia E. Kavraki. Incremental task and motion planning: A constraint-based approach. In *Robotics: Science and Systems*, Ann Arbor, MI, June 2016. doi:10.15607/RSS.2016.XII.002
- C₁₄. **Zachary Kingston**, Neil T. Dantam, and Lydia E. Kavraki. Kinematically constrained workspace control via linear optimization. In *IEEE-RAS International Conference on Humanoid Robots*, pages 758–764, Nov 2015. doi:10.1109/HUMANOIDS.2015.7363455
- C₁₅. Golnaz Habibi, **Zachary Kingston**, Zijian Wang, Mac Schwager, and James McLurkin. Pipelined consensus for global state estimation in multi-agent systems. In *Proceedings of the 2015 International Conference on Autonomous Agents and Multiagent Systems*, pages 1315–1323. International Foundation for Autonomous Agents and Multiagent Systems, 2015. ISBN 9781450334136. doi:10.5555/2772879.2773320
- C₁₆. Golnaz Habibi, **Zachary Kingston**, William Xie, Mathew Jellins, and James McLurkin. Distributed centroid estimation and motion controllers for collective transport by multi-robot systems. In *IEEE International Conference on Robotics and Automation*, pages 1282–1288, 2015. doi:10.1109/ICRA.2015.7139356

Book Chapters

- B₁. **Zachary Kingston**. *Encyclopedia of Robotics*, chapter Planning Under Manifold Constraints, pages 1–9. Springer Berlin Heidelberg, 2020. ISBN 978-3-642-41610-1. doi:10.1007/978-3-642-41610-1_174-1

Theses

- T₁. **Zachary Kingston**. *Toward Efficient and General Multi-Modal Planning*. PhD thesis, Rice University, Houston, TX, 2021
- T₂. **Zachary Kingston**. A unifying framework for constrained sampling-based planning. Master’s thesis, Rice University, Houston, TX, 2017



Selected Funding

Co-Authored

NSF HRD 2222876	<i>Collaborative Research: FW-HTF-R: The Future of Robot-Assisted Nursing: Interactive AI Frameworks for Upskilling Nurses and Customizing Robot Assistance</i>	PI: Dr. Lydia Kavraki, CO-PI: Dr. Vaibhav Unhelkar	2022–2023	\$121,713
NSF IIS 2008720	<i>RI: Small: A Novel Framework for Informed Manipulation Planning</i>	PI: Dr. Lydia Kavraki	2020–2023	\$441,000

Awards and Honors

C4. Nominated, Best Paper in Industrial Robotics Research for Practicality	IEEE/RSJ IROS 2022
C8. Nominated, Best Paper in Cognitive Robotics	IEEE-RAS ICRA 2021
Future Faculty Fellowship 2020–21	Rice Engineering
Best Presentation in COMP 600 for 2018 & 2020	Rice University Computer Science Department
NASA Space Technology Research Fellowship	NASA
NSF Graduate Research Fellowship Program	NSF
Graduate Research Fellowship	Rice University Computer Science Department
Distinction in Research and Creative Works	Rice University
President’s Honor Roll 2015–2016	Rice University



Experience

Kavraki Lab <i>at Rice University, Houston, TX</i>	Post-Doctoral Researcher and Lab Manager <i>Supervisor: Dr. Lydia Kavraki</i>	Dec. 2021–Present https://kavrakilab.org/
Kavraki Lab <i>at Rice University, Houston, TX</i>	Graduate Student <i>Advisor: Dr. Lydia Kavraki</i>	Aug. 2016–Dec. 2021 https://kavrakilab.org/
Dexterous Robotics Lab <i>at NASA JSC, Houston, TX</i>	NSTRF Fellow <i>Supervisor: Dr. Julia Badger</i>	Aug. 2017–Aug. 2021 https://er.jsc.nasa.gov/er4/
Dexterous Robotics Lab <i>at NASA JSC, Houston, TX</i>	USRA Intern <i>Supervisor: Dr. Julia Badger</i>	May. 2017–Aug. 2017 https://er.jsc.nasa.gov/er4/
Dexterous Robotics Lab <i>at NASA JSC, Houston, TX</i>	Guest Researcher <i>Supervisor: Dr. Julia Badger</i>	Jul. 2016–Aug. 2016 https://er.jsc.nasa.gov/er4/
Kavraki Lab <i>at Rice University, Houston, TX</i>	Undergraduate Researcher <i>Advisor: Dr. Lydia Kavraki</i>	Feb. 2015–Aug. 2016 https://kavrakilab.org/
Multi-Robot Systems Lab <i>at Rice University, Houston, TX</i>	Undergraduate Researcher <i>Advisor: Dr. James McLurkin</i>	May 2014–May 2015 http://mrsl.rice.edu/



Research Supervision

Graduate Students	Clayton Ramsey, Evan Dramko, Thomas Herring, Yiyuan Lee
Undergraduate Students	Stefan Bukorovic, Sofia Paola Medina-Chica, Andreja Andrejic, Aedan Cullen, Luis Leal ¹

¹ Award for Excellence in Poster Presentations, Rice Summer Undergraduate Research Symposium

Professional Service

Associate Editor:

- ✦ IEEE International Conference on Robotics and Automation (ICRA), 2024

Organizer:

- ✦ [Evaluating Motion Planning Performance Workshop](#), IROS 2022

Referee:

- ✦ IEEE Transactions on Robotics (T-RO), 2022–2023
- ✦ IEEE Robotics and Automation Letters (RA-L), 2020–2023
- ✦ IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2020–2023
- ✦ IEEE International Conference on Robotics and Automation (ICRA), 2018, 2022, 2023
- ✦ IEEE/ASME Transactions on Mechatronics, 2020
- ✦ IEEE Transactions on Automation Science and Engineering (T-ASE), 2020
- ✦ Workshop on the Algorithmic Foundations of Robotics (WAFR), 2020
- ✦ International Symposium on Robotics Research (ISRR), 2017

Maintainer of OMPL Motion Planning Software

Dec. 2021–Present

Core Contributor to the *MoveIt* Robot Motion Planning Software

Mar. 2019–Jun. 2020

Maintainer of the *MoveIt* Robot Motion Planning Software

Sep. 2018–Mar. 2019



Teaching

Algorithmic Robotics <i>COMP/ELEC/MECH 450/550 at Rice University</i>	Lecturer	Fall 2020	https://www.clear.rice.edu/comp450/
Algorithmic Robotics <i>COMP/ELEC/MECH 450/550 at Rice University</i>	Teaching Assistant	Fall 2016–2019, 2022	https://www.clear.rice.edu/comp450/
Intro. to Computer Systems <i>COMP 321 at Rice University</i>	In-Lab Teaching Assistant	Spring 2015, 2018	https://www.clear.rice.edu/comp321/
Intro. to Computational Thinking <i>COMP 140 at Rice University</i>	In-Class Teaching Assistant	Fall 2015	
Intro. to Engineering Systems <i>ENGI 128 at Rice University</i>	In-Class Teaching Assistant	Fall 2014	https://www.clear.rice.edu/engi128/



Other Service

Computer Science Representative for the Graduate Student Association	Mar. 2018–May 2020
Consultant for Rice's Center for Academic and Professional Communication	Aug. 2018–May 2019
Treasurer for Computer Science Graduate Student Association	Aug. 2017–May 2019

Invited Talks

AI, ML, and Friends Seminar at the ANU School of Computing <i>virtual</i>	Title: <i>TBD</i>	Dec. 2023
Intelligent Autonomous Systems at TU Darmstadt <i>virtual, with Wil Thomason</i>	Title: <i>TBD</i>	Nov. 2023
International Workshop on AI-Powered Space <i>at the ION, Houston, TX</i>	Title: <i>Autonomy for Robonaut 2: Planning for Complex Systems</i>	Nov. 2023
University of Utah Robotics Seminar <i>virtual</i>	Title: <i>Scaling Multi-Modal Planning</i>	Feb. 2023
2022 MoveIt Community Meeting <i>virtual</i>	Title: <i>Robowflex: Simplifying Planning and Benchmarking with MoveIt</i>	Feb. 2022
Learning and Intelligent Systems Lab at TU Berlin <i>virtual</i>	Title: <i>Toward Efficient and General Multi-Modal Planning</i>	Jul. 2021
Humanoid Users Conference <i>at NASA JSC</i>	Title: <i>Robonaut 2 and You: Specifying and Executing Complex Operations</i>	May 2017



Outreach

Museum Exhibit <i>at the Museum of Science and Industry, Chicago, IL</i>	Consultant	Jan. 2015–May 2015	http://www.msichicago.org/... /robot-revolution/
Summer Swarm Camp <i>at Rice University, Houston, TX</i>	Summer Camp Staff	Jul. 2014	http://mrsl.rice.edu/robot-camp



Open Source Software

<i>The Open Motion Planning Library</i>	https://ompl.kavrakilab.org/
<i>MoveIt Robot Motion Planning Software</i>	https://moveit.ros.org/
<i>Robowflex</i>	https://github.com/KavrakiLab/robowflex
<i>MotionBenchMaker</i>	https://github.com/KavrakiLab/motion_bench_maker
<i>HyperPlan</i>	https://github.com/KavrakiLab/hyperplan