

ZACHARY K. KINGSTON

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EDUCATION

RICE UNIVERSITY <i>Houston, TX</i>	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 <i>Houston, TX</i>	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 <i>Houston, TX</i>	B.S. in Computer Science	Aug. 2012 – May 2016



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 http://kavrakilab.org/
KAVRAKI LAB <i>at Rice University, Houston, TX</i>	Graduate Student <i>Advisor: Dr. Lydia Kavraki</i>	Aug. 2016 – Dec. 2021 http://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 http://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://mrs1.rice.edu/



PUBLICATIONS

All publications are available at <http://zkingston.com>

PEER-REVIEWED JOURNAL ARTICLES

- J1. 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](https://doi.org/10.1109/LRA.2021.3133603)

- J2. [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](https://doi.org/10.1177/0278364919868530)
- J3. 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)
- J4. [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)

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](https://doi.org/10.1007/978-3-642-41610-1_174-1)

PEER-REVIEWED CONFERENCE PAPERS

- C1. [Zachary Kingston](#) and Lydia E. Kavraki. Robowflex: Robot motion planning with *MoveIt* made easy. In *IEEE/RSJ International Conference on Intelligent Robots and Systems*, 2022. URL <https://arxiv.org/abs/2103.12826>. Under Review
- C2. [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)
- C3. 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)
- C4. 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)
- C5. 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)
- C6. [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)
- C7. [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)
- C8. 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](https://doi.org/10.1007/978-3-319-73008-0_15)

- C₉. 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](#)
- C₁₀. 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](#)
- C₁₁. [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](#)
- C₁₂. 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](#)
- C₁₃. 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](#)

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



AWARDS AND HONORS

C₅ . Nominated for Best Paper in Cognitive Robotics	IEEE-RAS ICRA 2021
Future Faculty Fellowship 2020-21	Rice Engineering
Best Presentation in COMP 600 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



SELECTED FUNDING

- CO-AUTHORED
 NSF IIS 2008720 *RI: Small: A Novel Framework for Informed Manipulation Planning*
 PI: Dr. Lydia Kavraki 2020–2023 \$425,000

INVITED TALKS

2022 MOVEIT COMMUNITY MEETING <i>virtual</i> Title: <i>Robowflex: Simplifying Planning and Benchmarking with MoveIt</i>	Feb. 2022
LEARNING AND INTELLIGENT SYSTEMS LAB <i>at TU Berlin</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

TEACHING

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

PROFESSIONAL SERVICE

Maintainer of OMPL Motion Planning Software	Dec. 2021 – Present
Core Contributor to the <i>MoveIt</i> Robot Motion Planning Software	Mar. 2019 – Jun. 2020
Maintainer of the <i>MoveIt</i> Robot Motion Planning Software	Sep. 2018 – Mar. 2019
Referee for the Following:	
✦ IEEE Transactions on Robotics (T-RO), 2022	
✦ IEEE/ASME Transactions on Mechatronics, 2020	
✦ IEEE Transactions on Automation Science and Engineering (T-ASE), 2020	
✦ IEEE Robotics and Automation Letters (RA-L), 2020, 2021, 2022	
✦ Workshop on the Algorithmic Foundations of Robotics (WAFR), 2020	
✦ IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2020, 2021	
✦ IEEE International Conference on Robotics and Automation (ICRA), 2018, 2022	
✦ International Symposium on Robotics Research (ISRR), 2017	

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

OUTREACH

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



OPEN SOURCE SOFTWARE

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