

Kaiyu Zheng

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RESEARCH INTERESTS

Robot planning & learning	Partial observability and uncertainty	Machine Learning / Deep Learning
Human-robot interaction	Natural language	Object search

EDUCATION

<i>Present</i>	Brown University	Providence, RI
	Ph.D. in COMPUTER SCIENCE	
SEPT 2018	Adviser: Stefanie Tellex	
JUNE 2018	University of Washington	Seattle, WA
	M.S. in COMPUTER SCIENCE	
SEPT 2017	Coursework: ML, database, networks, convex opt., compiler, distributed systems.	
JUNE 2017	B.S. in COMPUTER SCIENCE, Minor in MATHEMATICS	
	Cum laude, with honors in Computer Science	
SEPT 2013	Coursework: algo, OS, vision, graphics, AI, ML, Entrepreneurship.	
	Thesis: <i>“Learning Large-Scale Topological Maps Using Sum-Product Networks”</i>	
	Advisers: Andrzej Pronobis, Rajesh P. N. Rao	

EXPERIENCE

<i>2018 - Present</i>	Research Assistant, Humans To Robots Lab , Brown University Adviser: Stefanie Tellex
MAR 2021	Visiting Student, Learning & Intelligent Systems Lab , MIT CSAIL
	Mentors: Yoonchang Sung, Rohan Chitnis
JUNE 2020	Advisers: Leslie Kaelbling, Tomás Lozano-Pérez
<i>2016 - 2018</i>	Research Assistant, Robotics State-Estimation Lab , Neural Systems Lab , UW Advisers: Andrzej Pronobis, Rajesh P. N. Rao Project: Probabilistic deep networks for large-scale semantic mapping Contribution: TopoNets (IROS 2019) Project: Structured prediction over graphs using Sum-Product Networks Contribution: Graph-Structured Sum-Product Networks (AAAI 2018) Project: Database of annotated robot laser scan observations and localization Contribution: Cognitive rBot Localization Database (COLD) https://www.coldb.org Project: Improving ROS-based navigation system for the SCITOS G5 mobile robot Contribution: ROS navigation tuning guide (Springer ROS Book Vol. 6)
JUNE - SEPT 2015	Software Engineering Intern, CME Group Inc. , Chicago, IL Worked in the trading-floor technology team and developed a planning & allocation web application to substitute for an Excel-driven workflow, using Java and Groovy.

- APRIL - JUNE 2015 Student Researcher, **Movement Control Lab**, UW
Advisers: Vikash Kumar, Emanuel Todorov
Project: Device integration between the Myo armband and a 3D-printed wearable robotic arm
- JUNE 2015 Student Web Developer, **UW Information Technology**, Seattle, WA
| Developed and maintained university websites including IT Connect, eScience,
OCT 2014 Labgeeks, etc. Workflow followed agile development cycle using JIRA. Technologies involved included HTML, CSS, JavaScript, Python, PHP, Perl, Django, MySQL, git, Linux, etc.
- MARCH - MAY 2014 Student Researcher, **ATLAS Alignment Group**, Dept. of Physics, UW
Adviser: Shih-Chieh Hsu
Project: Study of the global χ^2 algorithm for three-plane track fitting in the ATLAS LHC experiment

PUBLICATIONS

Towards Optimal Correlational Object Search

Kaiyu Zheng, Rohan Chitnis, Yoonchang Sung, George Konidaris, Stefanie Tellex

Preprint. In submission, 2021

Spatial Language Understanding for Object Search in Partially Observed Cityscale Environments

Kaiyu Zheng, Deniz Bayazit, Rebecca Mathew, Ellie Pavlick, Stefanie Tellex

Preprint. In submission, 2021

Multi-Resolution POMDP Planning for Multi-Object Search in 3D

Kaiyu Zheng, Yoonchang Sung, George Konidaris, Stefanie Tellex

Preprint. In submission, 2021

pomdp_py: A Framework to Build and Solve POMDPs

Kaiyu Zheng, Stefanie Tellex

ICAPS Workshop on Planning and Robotics, 2020

ICAPS = The International Conference on Automated Planning and Scheduling

From Pixels to Buildings: End-to-end Probabilistic Deep Networks for Large-scale Semantic Mapping

Kaiyu Zheng and Andrzej Pronobis

IEEE/RSJ International Conference on Intelligent Robots and Systems, 2019

Learning graph-structured sum-product networks for probabilistic semantic maps.

Kaiyu Zheng, Andrzej Pronobis, and Rajesh P. N. Rao

AAAI Conference on Artificial Intelligence. 2018.

Learning Large-Scale Topological Maps Using Sum-Product Networks

Kaiyu Zheng.

Senior Thesis, University of Washington; arXiv:1706.03416, 2017

ROS navigation tuning guide.

Kaiyu Zheng

Chapter in Robot Operating System (ROS) - The Complete Reference (Volume 6), Springer, 2021

arXiv preprint arXiv:1706.09068, 2017.

OTHER PROJECTS (SELECTED)

- JUNE 2019 - PRESENT the *Working Robots* podcast
- SEPT - DEC 2020 (Multi-agent) POMDP as Probabilistic Programs with Pyro (exploratory)
- MAR - JUNE 2020 Dynamic and adversarial object search in a grid world (exploratory)
- JAN - FEB 2019 Controlling a Jaco robotic arm to write with a brush
- JAN - MAR 2018 Storage and retrieval of robotic laser range data in database systems
Course project for CSE 544 (grad-level Database Systems)
- OCT - DEC 2017 Forecasting solar irradiance by learning from time series data
Course project for CSE 546 (grad-level Machine Learning)
- JAN - MAY 2017 Pipeline for collecting fully-annotated robot sensory and localization data
Cognitive rObot Localization Database (COLD) <https://www.coldb.org>
- APR - DEC 2016 Improving ROS-based navigation system for the SCITOS G5 mobile robot
ROS navigation tuning guide (see [ROS navigation tutorials](#))
- JUNE 2015 - JAN 2019 Koolio.io: *Share, in a flippable fashion* (Founder) <https://koolio.io> (outdated);
[Youtube 1](#), [Youtube 2](#), [Youtube 3](#)
- MAR 2015 Transformer using Solidworks
Course project for ME 123 (Introduction to Visualization and Computer-Aided Design)
Course contest winner; [Github Repo](#)
- JUL 2014 Dance Dance Revolution on an FPGA board using Verilog
Course project for EE 271 (Introduction to Digital Circuits and Systems)

HONORS AND AWARDS

- Brown Graduate School Conference Travel Fund (2019)
Andrew W. Mellon Foundation Future of Work Seed Grant (2019)
Graduated cum laude, with honors in Computer Science (2017)
Annual Dean's List (2013-2014, 2014-2015, 2015-2016)

PRESENTATIONS

- JULY 10ND 2020 **Multi-Resolution POMDP Planning for Multi-Object Search in 3D**, at *Learning and Intelligent Systems Group, MIT CSAIL*, virtual. (oral presentation)
- SEPT 23ND 2019 **End-to-end Probabilistic Deep Networks for Large-scale Semantic Mapping**, at *Brown Visual Computing Seminar* in Providence, RI. (oral presentation)
- MAR 22ND 2019 **An Introduction to Semantic Mapping in Robotics**, at *Brown Robotics Labs* in Providence, RI. (oral presentation)
- NOV 15TH 2017 **Probabilistic Semantic Mapping Using Graph-Structured Sum-Product Networks**, at *Industry Affiliates Research Day at the University of Washington Computer Science & Engineering* in Seattle, WA. (oral and poster presentation)
- SEPT 28TH 2017 **Learning Semantic Maps with Topological Spatial Relations Using Graph-Structured Sum-Product Networks**, at *IROS 2017 2nd Workshop on Machine Learning Methods for High-Level Cognitive Capabilities* in Vancouver, BC, Canada. (oral and poster presentation)
- MAY 19TH 2017 **Training Deep Probabilistic Models for Semantic Mapping with Mobile Robots**, at *20th Undergraduate Research Symposium at the University of Washington* in Seattle, WA. (poster presentation)

TEACHING AND MENTORSHIP

Teaching Assistant, University of Washington

SPRING 2018	CSE 311: <i>Foundation of Computing I</i> . Instructors: Paul Beame, Kevin Zatloukal
WINTER 2018	CSE 446: <i>Machine Learning</i> . Instructor: Sham M. Kakade
FALL 2017	CSE 373: <i>Data Structures and Algorithms</i> . Instructor: Evan McCarty
WINTER 2017	CSE 446: <i>Machine Learning</i> . Instructor: Emily Fox
FALL 2016	CSE 311: <i>Foundation of Computing I</i> . Instructors: Paul Beame, Shayan Oveis Grahani

Students Mentored, Brown University

2021/02-present	Monica Roy, Undergraduate
2020/09-present	Semanti Basu, PhD student
2020/09-2020/12	Thomas Ottaway, Undergraduate
2020/04-2021/03	Deniz Bayazit, Undergraduate & Master's
2020/04-2021/03	Rebecca Mathew, Undergraduate

SKILLS

Programming Language:	Python, C/C++, Cython, JavaScript, Java, Shell Script, Latex, Lisp, Verilog
Libraries and Tools:	ROS, PyTorch, Pyro, Tensorflow, pandas, OpenCV, OpenGL, Emacs, Linux, Git, Docker, Solidworks, Unreal Engine 4, Unity
Web and Databases	HTML, CSS, PHP, Ruby on Rails, MySQL, PostgreSQL, MongoDB
Language:	English, Chinese (Mandarin and Cantonese)

SERVICE

Lab functions

2021 Organizer, Brown Robotics Group Seminar Series

University functions

2020 Moderator, PhD Alumni Panel, Dept. of Computer Science, Brown University
2019-2020 Representative, Graduate Student Council, Dept. of Computer Science.

Research

2021 Reviewer, IEEE Robotics and Automation Letters (RA-L)
2019, 2021 Reviewer, International Conference on Robotics and Automation (ICRA)
2019, 2021 Reviewer, International Conference on Intelligent Robots and Systems (IROS)

Volunteering & Outreach

2019 Peer mentor, *International Graduate Orientation*, Providence, RI
2019 Table Demonstrator, *Rhode Island Robot Block Party*, Providence, RI
2018 Programming teacher, *Asa Messer Elementary School*, Providence, RI
2017 Tutor, *Allen School of Computer Science & Engineering*, UW, Seattle, WA
2014 Food Packer, *Food Lifeline*, Seattle, WA
2014 Table Demonstrator, *Paws-on Science Husky Weekend*, Seattle, WA