Zi **Wang**

32-G414, MIT
Cambridge, MA 02139
ziw@mit.edu
ziw.mit.edu

Research Interests

I am broadly interested in machine learning for sequential decision making, robot learning, active learning for robot planning, Bayesian optimization and autoML. My work in my PhD can be summarized as instances of Human-Intelligence-Assisted Artificial Intelligence, where I develop approaches to integrate human intelligence seamlessly with statistical machine learning methods to achieve state-of-the-art performance on complex long-horizon robot manipulation tasks.

Education

2014 – 2019 **Ph.D.** Candidate in EECS, ***Massachusetts Institute of Technology*** Cambridge, MA
- Thesis: Human Intelligence Assisted Robot Learning
- Advisors: Prof. Leslie Pack Kaelbling and Prof. Tomás Lozano-Pérez

2014 – 2016 **S.M.** in EECS, ***Massachusetts Institute of Technology*** Cambridge, MA
- Thesis: Optimization as Estimation with Gaussian Process Bandits
- Advisors: Prof. Stefanie Jegelka and Prof. Leslie Pack Kaelbling

2010 – 2014 **B.Eng.** in Computer Science and Technology, ***Tsinghua University*** Beijing, China
- Thesis: Fast Dropout Training for Deep Neural Networks (in Chinese)
- Advisors: Prof. Fei Sha and Prof. Jun Zhu

2007 – 2010 **High School Diploma**, ***Jiading No.1 High School*** Shanghai, China
- Thesis: Optimal Keyboard Layout Design Based on Chinese Pinyin Inputs (in Chinese)
- Shanghai's Best High School Student Award; Principal's Award; science advisor: Mr. Zhiqin Wang

Honors & Awards

2019 Robotics: Science and Systems (RSS) Pioneers 2019. Freiburg, Germany

2019 MIT Graduate Women of Excellence 2019. Cambridge, MA

2018 Rising Stars in Electrical Engineering & Computer Science 2019. Cambridge, MA

2018 Student Travel Award, *Neural Information Processing Systems.* Montreal, Canada

2017 Student Travel Award, *International Conference on Machine Learning.* Sydney, Australia

2014-2015 Greater China Computer Science Fellowship, *MIT.* Cambridge, MA

Jul. 2014 Outstanding Graduates Award, *Tsinghua.* Beijing, China

Nov. 2013 Science and Innovation Scholarship, *awarded to 3% students.* Beijing, China

Sep. 2013 Anita Borg Scholarship, *Google China.* Beijing, China

Oct. 2012 Friendship of Tsinghua - ESS Scholarship, *awarded to 2% students.* Beijing, China

Oct. 2011 Friendship of Tsinghua - Tung OOCL Scholarship, *awarded to 3% students.* Beijing, China

May 2010 Tomorrow's Star of Shanghai's Science and Technology, *top 0.02%.* Shanghai, China

Feb. 2009 Mathematical Contest in Modeling (MCM), *Honorable Mention.* Bedford, MA

Professional Experience

Research and Industry Experience

2019 **Research Intern**, *Microsoft Research New England.* Cambridge, MA
- Host: Nicolo Fusi. Theories for Human-Intelligence-Assisted AI, autoML and Bayesian optimization.

2014 – 2019 **Research Assistant**, *Learning and Intelligent Systems Group, CSAIL, MIT.* Cambridge, MA
- Developed integrated learning and planning frameworks to solve long-horizon problems.
- Designed practical algorithms for global optimization in high dimensions with large scale observations.

2017 **Software Engineering Intern**, *Motion Planning Team @ Uber ATG.* Pittsburgh, PA
- Worked with Mike Phillips, David Bradley and Kalin Gochev on a decision making module that enables safe, reliable and intelligent motion planning for the autonomous Uber vehicles.

2017 **Software Engineering Intern**, *Prediction Team @ Uber ATG.* Pittsburgh, PA
- Worked with Thi Nguyen, Vladan Radosavljevic and Nemanja Djuric on trajectory predictions via statistical machine learning methods and contributed to the code base for the self-driving fleet of Uber.

2013 – 2014 **Research Assistant**, *Theoretical and Empirical Data Sciences Group, USC.* Los Angeles, CA
- Derived and implemented a fast training algorithm with regularizer for neural nets via noise marginalization.
- Developed a discriminative non-negative matrix factorization algorithm for speech separation.

2013 – 2014 **Research Assistant**, *State Key Lab of Intelligent Tech. & Systems, Tsinghua.* Beijing, China
- Researched scalable inference algorithms for correlated/dynamic topic models, and created visualizations.

2012 – 2013 **Research Assistant**, *Future Internet Technology Sub-interest Group, Tsinghua.* Beijing, China
- Researched matrix factorization and random forest for movie recommendation for Baidu Inc.

2010-2011 **Research Assistant**, *Dr. Liu's Brain and Cognitive Science Group, Tsinghua.* Beijing, China
- Researched human intelligence and human behavior in reaction to external stimulants via psychological experimental design and EEG/FMRI monitoring on the frontal cortex.

Entrepreneurial Experience

2019 **Founder**, *Intelligence Hacks LLC.* Cambridge, MA
- A proprietary firm that focuses on consulting for individuals and small business owners.

Teaching Experience

2015 **Teaching Assistant**, *6.883 Learning with Discrete and Combinatorial Structure*, MIT

2015-2019 **Volunteer Lecturer**, *US-China Cultural and Educational Foundation*, MA, USA

Selected Publications

Books and Chapters

Z. Wang. **Neverland at Heart**. *Exceptional Articles on the Deep Thoughts and Mindset Growth of the Best 100 Middle-school Students in Megacities, East China Normal University Press, 2007.*

Journal Papers

Z. Wang, S. Jegelka. **Bayesian optimization guided by max-values**. *In preparation.*

Z. Wang, C. R. Garrett, J. Mao, K. Chen, S. Thompson, A. LaGrassa, N. Gothoskar, I. Jutamulia, J. Xu, L. P. Kaelbling, T. Lozano-Pérez. **Learning for task and motion planning**. *In preparation.*

B. Kim, **Z. Wang**, L. P. Kaelbling, T. Lozano-Pérez. **Learning to guide task and motion planning using score-space representation**. *International Journal of Robotics Research (IJRR), 2019.*

Conference Papers

V. Xia*, **Z. Wang***, K. Allen, T. Silver, L. P. Kaelbling. **Learning sparse relational transition models**. *International Conference on Learning Representations (ICLR), 2019.*

Z. Wang*, B. Kim*, L. P. Kaelbling. **Regret bounds for meta Bayesian optimization with an unknown Gaussian process prior**. *Advances in Neural Information Processing Systems (NeurIPS), 2018. Spotlight talk (3.5% acceptance rate).*

Z. Wang, C. R. Garrett, L. P. Kaelbling, T. Lozano-Pérez. **Active model learning and diverse action sampling for task and motion planning**. *International Conference on Intelligent Robots and Systems (IROS), 2018.*

Z. Wang, C. Gehring, P. Kohli, S. Jegelka. **Batched large-scale Bayesian optimization in high-dimensional spaces**. *International Conference on Artificial Intelligence and Statistics (AIStats), 2018.*

Z. Wang, S. Jegelka. **Max-value entropy search for efficient Bayesian optimization**. *International Conference on Machine Learning (ICML), 2017.*

Z. Wang*, C. Li*, S. Jegelka, P. Kohli. **Batched high-dimensional Bayesian optimization via structural kernel learning**. *International Conference on Machine Learning (ICML), 2017.*

Z. Wang, S. Jegelka, L. P. Kaelbling, T. Lozano-Pérez. **Focused model-learning and planning for non-Gaussian continuous state-action systems**. *IEEE Conference on Robotics and Automation (ICRA), 2017.*

Z. Wang, B. Zhou, S. Jegelka. **Optimization as estimation with Gaussian processes in bandit settings**. *International Conference on Artificial Intelligence and Statistics (AIStats), 2016. Oral presentation (6% acceptance rate).*

Z. Wang, F. Sha. **Discriminative non-negative matrix factorization for single-channel speech separation**. *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2014.*

J. Chen, J. Zhu, **Z. Wang**, X. Zheng, B. Zhang. **Scalable inference for logistic-normal topic models**. *Neural Information Processing Systems (NIPS), 2013.*

Abstracts and Contributions to Peer-reviewed Workshops

V. Xia, **Z. Wang**, L. P. Kaelbling. **Learning structured transition models for multi-object manipulation**. *IROS Workshop on Machine Learning in Robot Motion Planning, 2018.*

Z. Wang, C. Gehring, P. Kohli, S. Jegelka. **Ensemble Bayesian optimization**. *Neural Information Processing Systems Workshop on Bayesian Optimization, 2017.*

Z. Lu*, **Z. Wang***, F. Sha. **Fast learning with noise in deep neural nets**. *Neural Information Processing Systems Workshop on Perturbations, Optimization, and Statistics, 2014.* ***Spotlight presentation.***

Z. Wang, F. Sha. **Discriminative non-negative matrix factorization for single-channel speech separation**. *Women in Machine Learning Workshop, 2013.*

Invited Talks, Tutorials and Other Presentations

Human intelligence assisted robot learning.
- AI Colloquium, University Stuttgart, Stuttgart, Germany, Jun 2019.
- Shift Technology, Paris, France, Jun 2019.
- Robotics: Science and Systems (RSS) Pioneers Workshop, Freiburg, Germany, Jun 2019.

Active model learning and diverse action sampling for task and motion planning.
- University of Washington, Seattle, WA, Sep 2018.
- International Conference on Intelligent Robots and Systems, Madrid, Spain, Oct 2018.

Regret bound of Bayesian optimization with unknown GP prior.
- Microsoft Research AI Breakthroughs Workshop, Redmond, WA, Sep 2018.

Bayesian optimization guided by max-values.
- International Symposium on Mathematical Programming (ISMP), Bordeaux, France, Jul 2018.

Bayesian optimization and how to scale it up.
- Computer Science Colloquium, University of Southern California, Los Angeles, CA, Nov 2017.

Max-value entropy search for efficient Bayesian optimization.
- International Conference on Machine Learning (ICML), Sydney, Australia, Aug 2017.

Batched high-dimensional Bayesian optimization via structural kernel learning.
- International Conference on Machine Learning (ICML), Sydney, Australia, Aug 2017.

Scaling up Bayesian optimization with ensembles.
- DeepMind, London, UK (remote talk), Jun 2017.

Focused model-learning and planning for non-Gaussian continuous state-action systems.
- The Manipulation Lab at Carnegie Mellon University Robotics Institute, Pittsburgh, PA, Jun 2017.
- Uber ATG, Pittsburgh, PA, Jun 2017.
- IEEE Conference on Robotics and Automation (ICRA), Singapore, May 2017.

Optimization as estimation with Gaussian processes in bandit settings.
- Machine Learning Seminar, MIT, Cambridge, MA, May, 2016.
- International Conference on Artificial Intelligence and Statistics (AIStats), Cadiz, Spain, May 2016.

Research Supervision

Supervisor of undergraduate students (MIT Undergraduate Research Opportunities Program):
- Michael Amoako (2016-2017; now at Microsoft). Robot Motion Mapping with PR2.
- Kevin Chen (2018). Learning for Task and Motion Planning.
- Skye Thompson (2018-2019). Learning for Task and Motion Planning & Learning Abstract Models for Pushing Differently Shaped Objects.
- Ivan Jutamulia (2018 Summer). Learning for Task and Motion Planning.

Supervisor of Master/MEng students at MIT CSAIL:
- Victoria Xia (2017-2018; now at Confluent). Model Learning for Multi-object Manipulation.
- Alex LaGrassa (2018-2019; now PhD student at CMU). Learning for Task and Motion Planning.

Supervisor of visiting students at MIT CSAIL:
- Nishad Gothoskar (2018 Summer; now at Vicarious). Learning for Task and Motion Planning.
- Jingxi Xu (2018 Summer). Learning for Task and Motion Planning.
- Jiayuan Mao (2018-2019; now PhD student at MIT). Learning for Task and Motion Planning & Hierarchical Symbolic Robot Learning.

Academic Service

Co-president of Graduate Women in Course 6 (GW6) in 2016.

Organizer and founding member of Machine Learning Across MIT 2018-2019.

Organizer of MIT Graduate Women Book Club in 2019.

Member of Graduate Student Focus Group for MIT EECS Visiting Committee in 2017&2019.
- Surveyed key issues related to graduate students, e.g. mental health and financial support.
- Wrote reports on what worked well, what could be improved and key concerns in the department.

Program Committee and Review Service
- Journal of Machine Learning Research (JMLR) 2018
- IEEE Transactions on Robotics (T-RO) 2018
- Neural Information Processing Systems (NeurIPS) 2018
- International Conference on Machine Learning (ICML) 2018&2019
- Artificial Intelligence and Statistics (AIStats) 2019
- International Conference on Learning Representations (ICLR) 2019
- AAAI Conference on Artificial Intelligence 2019
- Uncertainty in Artificial Intelligence (UAI) 2018
- International Conference on Intelligent Robots and Systems (IROS), 2017

Skills and Others

Programming Languages and Platforms

Most experienced (>5 years) with Python, Matlab and LaTeX.

Some experience (>2 years) with ROS, Java, C/C++, JavaScript, HTML.

Languages

Chinese (native), English (fluent), Japanese (beginner).