Zi **Wang**

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Research Interests

I am broadly interested in machine learning for sequential decision making, robot learning, active learning for robot planning, Bayesian optimization, autoML, behavioral science, social media, game theory and cognitive science. 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 – 2020 **Ph.D.** Candidate in EECS, ***Massachusetts Institute of Technology*** Cambridge, MA
- GPA: 5.0/5.0; Completed both TQE and RQE (qualifying examinations); Minor in Japanese
- Advisors: Prof. Stefanie Jegelka, Prof. Leslie Pack Kaelbling and Prof. Tomás Lozano-Pérez
- Thesis topic: Human Intelligence Assisted Artificial Intelligence with Applications to Robot Learning
- GWAMIT Mentor 2015 – now: Dr. Irene Greif

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)
- Outstanding Graduates Award; GPA: 92/100; rank: 2/129; 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 MIT Graduate Women of Excellence 2019, *top 1%.* Cambridge, MA

2018 Rising Stars in EECS. Cambridge, MA

2018 Student Travel Award, *NeurIPS.* Montreal, Canada

2017 Student Travel Award, *ICML.* 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

b. 2010 Various awards on swimming, dancing, aircraft modeling, optimal parking lot design, website and poster design, mathematical modeling for fake photo recognition, optimal keyboard layout design, literature, art, acting, chorus, societal and political commentary, and public speech. Asia

Academic Experiences

Research/Engineering Experience

Jun 2019 – Sep 2019

Research Intern, *Microsoft Research New England.* Cambridge, MA
- Will work on foundations and theories for Human Intelligence Assisted AI, autoML and Bayesian optimization.

Sep 2014 – now

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.

Jul – Aug 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.

Jun – Jul 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.

Jul 2013 – May 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.

Mar 2013 – Jul 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.

Dec 2012 – May 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.

1997-2000

Video Game Tester, *Xiamen Pioneersoft Software LLC (Founded in 1994).* Xiamen, China
- Tested several single-player Chinese history based video games before their public releases and discovered bugs such as buying 0 items but being able to use these items to replenish HP in those RPG games.

Teaching Experiences

Fall 2015

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

2015-now

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

Professional Services

Founder of Intelligence Hacks LLC, a proprietary firm that aims to increase the joint intelligence of the humanity with the assistance of artificial intelligence, machine learning and social media.

Co-founder and organizer of Machine Learning Across MIT 2018-2019.

Reviewer of JMLR, IEEE T-RO, NeurIPS, ICML, AISTATS, ICLR, AAAI, UAI, IROS.

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

Organizer of MIT Graduate Women Book Club in 2019.

Supervisor of undergraduate students:
- Michael Amoako (2016). Project: Robot Motion Mapping with PR2.
- Kevin Chen (2018). Project: Learning for Task and Motion Planning.
- Skye Thompson (2018-2019). Project: Learning for Task and Motion Planning.
- Ivan Jutamulia (2018). Project: Learning for Task and Motion Planning.

Supervisor of Master/MEng students:
- Victoria Xia (2018). Project: Learning structured transition models for multi-object manipulation.

Supervisor of visiting students:

- Nishad Gothoskar (2018). Project: Learning for Task and Motion Planning.
- Jingxi Xu (2018). Project: Learning for Task and Motion Planning.
- Jiayuan Mao (2018-2019). Project: Learning for Task and Motion Planning.

Invited Talks and Tutorials (Selected)

S. Jegelka and Z. Wang. **Bayesian Optimization for Global Optimization of Expensive Black-box Functions**. *Machine Learning Summer School (MLSS), England, UK, Jul 2019.*

Z. Wang. **Machine Intelligence Assisted Human Bayesian Optimizers**. *2nd Uber Science Symposium, San Francisco, CA, May 2019.*

Z. Wang. **Active model learning and diverse action sampling for task and motion planning**. *University of Washington, Seattle, WA, Sep 2018.*

Z. Wang. **Regret bound of Bayesian optimization with unknown GP priors**. *Microsoft Research AI Breakthroughs Workshop, Redmond, WA, Sep 2018.*

Z. Wang. **Bayesian Optimization Guided by Max-values**. *International Symposium on Mathematical Programming (ISMP), Bordeaux, France, Jul 2018.*

Z. Wang. **Bayesian Optimization and How to Scale It Up**. *Computer Science Colloquium, University of Southern California, Los Angeles, CA, Nov 2017.*

Z. Wang. **Max-value Entropy Search for Efficient Bayesian Optimization**. *International Conference on Machine Learning (ICML), Sydney, Australia, Aug 2017.*

Z. Wang. **Batched High-dimensional Bayesian Optimization via Structural Kernel Learning**. *International Conference on Machine Learning (ICML), Sydney, Australia, Aug 2017.*

Z. Wang. **Scaling up Bayesian Optimization with Ensembles**. *DeepMind, London, UK (remote talk), Jun 2017.*

Z. Wang. **Focused Model-Learning and Planning for Non-Gaussian Continuous State-Action Systems**. *The Manipulation Lab at Carnegie Mellon University Robotics Institute* and *Uber ATG, Pittsburgh, PA, Jun 2017,* and *IEEE Conference on Robotics and Automation (ICRA), Singapore, May 2017.*

Z. Wang. **Optimization as Estimation with Gaussian Processes in Bandit Settings**. *Machine Learning Seminar, MIT, Cambridge, MA* and *International Conference on Artificial Intelligence and Statistics (AISTATS), Cadiz, Spain, May 2016.*

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. Wang, B. Zhou, S. Jegelka. **Optimization as estimation with Gaussian processes in bandit settings**. *Neural Information Processing Systems Workshop on Bayesian Optimization, 2015.*

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.*

Skills

Programming Languages and Platforms

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

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

Dabbled (<1 year) in VHDL, Verilog HDL, Assembly.

Human Languages and Music Instruments

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

Body languages/acting/speech (intermediate). Clarinet (>8 years).