

Shangtong Zhang

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| Research Interest | The goal of my research is to solve sequential decision making problems in a scalable and reliable way. Currently, I focus on reinforcement learning as a solution method. | |
| Academic Employments | Assistant Professor Department of Computer Science University of Virginia, United States | Aug. 2022 - Present |
| Education | University of Oxford , United Kingdom Doctor of Philosophy in Computer Science Advisor: Prof. Shimon Whiteson | Oct. 2018 - July. 2022 |
| | University of Alberta , Canada Master of Science in Computer Science, Advisor: Prof. Richard S. Sutton | Sept. 2016 - Aug. 2018 |
| | Fudan University , China Bachelor of Science in Computing Science | Sept. 2012 - Jun. 2016 |
| Publications | <ol style="list-style-type: none"><u>Direct Gradient Temporal Difference Learning</u> Xiaochi Qian^[advisee], Shangtong Zhang arXiv:2308.01170, 2023.<u>Improving Monte Carlo Evaluation with Offline Data</u> Shuze Liu^[advisee], Shangtong Zhang arXiv:2301.13734, 2023.<u>On the Convergence of SARSA with Linear Function Approximation</u> Shangtong Zhang, Remi Tachet des Combes, Romain Laroche. International Conference on Machine Learning (ICML), 2023. Acceptance rate: 28%<u>Global Optimality and Finite Sample Analysis of Softmax Off-Policy Actor Critic under State Distribution Mismatch</u> Shangtong Zhang, Remi Tachet des Combes[†], Romain Laroche[‡]. Journal of Machine Learning Research (JMLR), 2022.<u>Truncated Emphatic Temporal Difference Methods for Prediction and Control</u> Shangtong Zhang, Shimon Whiteson. Journal of Machine Learning Research (JMLR), 2022.<u>A Deeper Look at Discounting Mismatch in Actor-Critic Algorithms</u> Shangtong Zhang, Romain Laroche, Harm van Seijen, Shimon Whiteson, Remi Tachet des Combes. International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2022. Acceptance rate: 26%<u>Learning Expected Emphatic Traces for Deep RL</u> Ray Jiang, Shangtong Zhang, Veronica Chelu, Adam White, Hado van Hasselt. | |

AAAI Conference on Artificial Intelligence (**AAAI**), 2022.
Acceptance rate: 15%.

8. StarCraft II Unplugged: Large Scale Offline Reinforcement Learning
Michael Mathieu*, Sherjil Ozair*, Srivatsan Srinivasan, Caglar Gulcehre,
Shangdong Zhang, Ray Jiang, Tom Le Paine, Konrad Zolna, Richard Powell,
Julian Schrittwieser, David Choi, Petko Georgiev, Daniel Kenji Toyama,
Aja Huang, Roman Ring, Igor Babuschkin, Timo Ewalds, Mahyar Bordbar,
Sarah Henderson, Sergio Gomez Colmenarejo, Aaron van den Oord,
Wojciech M. Czarnecki, Nando de Freitas, Oriol Vinyals.
Deep RL Workshop at NeurIPS, 2021
9. Breaking the Deadly Triad with a Target Network
Shangdong Zhang, Hengshuai Yao, Shimon Whiteson.
International Conference on Machine Learning (**ICML**), 2021.
Acceptance rate: 21.5%.
10. Average-Reward Off-Policy Policy Evaluation with Function Approximation
Shangdong Zhang*, Yi Wan*, Richard S. Sutton, Shimon Whiteson.
International Conference on Machine Learning (**ICML**), 2021.
Acceptance rate: 21.5%.
11. Mean-Variance Policy Iteration for Risk-Averse Reinforcement Learning
Shangdong Zhang, Bo Liu, Shimon Whiteson.
AAAI Conference on Artificial Intelligence (**AAAI**), 2021.
Acceptance rate: 21.4%.
12. Learning Retrospective Knowledge with Reverse Reinforcement Learning
Shangdong Zhang, Vivek Veeriah, Shimon Whiteson.
Conference on Neural Information Processing Systems (**NeurIPS**), 2020.
Acceptance rate: 20.1%.
13. GradientDICE: Rethinking Generalized Offline Estimation of Stationary Values
Shangdong Zhang, Bo Liu, Shimon Whiteson.
International Conference on Machine Learning (**ICML**), 2020.
Acceptance rate: 21.8%.
14. Provably Convergent Two-Timescale Off-Policy Actor-Critic with Function Approximation
Shangdong Zhang, Bo Liu, Hengshuai Yao, Shimon Whiteson.
International Conference on Machine Learning (**ICML**), 2020.
Acceptance rate: 21.8%.
15. Deep Residual Reinforcement Learning
Shangdong Zhang, Wendelin Boehmer, Shimon Whiteson.
International Conference on Autonomous Agents and Multiagent Systems (**AAMAS**), 2020.
Acceptance rate: 23%.
Best Paper Award.
16. Mega-Reward: Achieving Human-Level Play without Extrinsic Rewards
Yuhang Song, Jianyi Wang, Thomas Lukasiewicz, Zhenghua Xu,
Shangdong Zhang, Andrzej Wojcicki, Mai Xu
AAAI Conference on Artificial Intelligence (**AAAI**), 2020.
Acceptance rate: 20.6%.
17. DAC: The Double Actor-Critic Architecture for Learning Options
Shangdong Zhang, Shimon Whiteson.
Conference on Neural Information Processing Systems (**NeurIPS**), 2019.
Acceptance rate: 21.2%.

18. Generalized Off-Policy Actor-Critic
Shangtong Zhang, Wendelin Boehmer, Shimon Whiteson.
 Conference on Neural Information Processing Systems (**NeurIPS**), 2019.
 Acceptance rate: 21.2%.
19. Distributional Reinforcement Learning for Efficient Exploration
 Borislav Mavrin, **Shangtong Zhang**[†], Hengshuai Yao, Linglong Kong,
 Kaiwen Wu, Yaoliang Yu
 International Conference on Machine Learning (**ICML**), 2019.
 Acceptance rate: 22.6%.
 A short version is accepted as an extended abstract at AAMAS 2019.
20. ACE: An Actor Ensemble Algorithm for Continuous Control with Tree Search
Shangtong Zhang, Hao Chen, Hengshuai Yao.
 AAAI Conference on Artificial Intelligence (**AAAI**), 2019.
 Acceptance rate: 16.2%.
21. QUOTA: The Quantile Option Architecture for Reinforcement Learning
Shangtong Zhang, Borislav Mavrin, Linglong Kong, Bo Liu, Hengshuai Yao.
 AAAI Conference on Artificial Intelligence (**AAAI**), 2019.
 Acceptance rate: 16.2%.
22. MLPack 3: A Fast, Flexible Machine Learning Library
 Ryan Curtin, Marcus Edel, Mikhail Lozhnikov, Yannis Mentekidis, Sumedh Ghaisas,
Shangtong Zhang
 Journal of Open Source Software (**JOSS**), 2018.
23. Crossprop: Learning Representations by Stochastic Meta-Gradient Descent
in Neural Networks
 Vivek Veeriah*, **Shangtong Zhang***, Richard S. Sutton.
 European Conference on Machine Learning and Principles and Practice of Knowledge
 Discovery in Databases (**ECML-PKDD**), 2017.
 Acceptance rate: 27.1%.
24. A Deeper Look at Experience Replay
Shangtong Zhang, Richard S. Sutton.
Deep RL Symposium at NIPS, 2017.
25. Comparing Deep Reinforcement Learning and Evolutionary Methods
in Continuous Control
Shangtong Zhang, Osmar R. Zaiane
Deep RL Symposium at NIPS, 2017.
26. A Demon Control Architecture with Off-Policy Learning and Flexible Behavior
Policy
Shangtong Zhang, Richard S. Sutton.
Hierarchical RL Workshop at NIPS, 2017.
27. A Deep Neural Network for Modeling Music
 Pengjing Zhang, Xiaoqing Zheng, Wenqiang Zhang, Siyan Li, Sheng Qian,
 Wenqi He, **Shangtong Zhang**, Ziyuan Wang
 International Conference on Multimedia Retrieval (**ICMR**), 2015.
 Acceptance rate: 31%.

*: Equal contribution

[‡]: Equal advising

[†] : My name does not appear in the ICML proceedings due to a mistake in submission.
 See Acknowledgments, arXiv, or AAMAS proceedings for clarification.

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| Services | Meta Reviewer & Area Chair | | |
| | ACML 2022, 2023 | | |
| | Expert Reviewer | | |
| | ICML 2021 | | |
| | Reviewer & Program Committee | | |
| | Transactions on Pattern Analysis and Machine Intelligence (1) | | |
| | Transaction of Machine Learning Research (2) | | |
| | Journal of Machine Learning Research (3) | | |
| | Artificial Intelligence Journal (2) | | |
| | Transactions on Intelligent Systems and Technology (2) | | |
| | IJCAI 2023 | | |
| | AISTATS 2022 | | |
| | NeurIPS 2020, 2021, 2022, 2023 | | |
| | ICML 2020, 2022, 2023 | | |
| | AAAI 2020, 2021, 2022, 2023 | | |
| | ICLR 2021, 2022, 2023 | | |
| | SIGCOMM 2022 | | |
| | Offline Reinforcement Learning Workshop at NeurIPS 2020, 2021, 2022 | | |
| | Deep Reinforcement Learning Workshop at NeurIPS 2019, 2020, 2021, 2022 | | |
| | Adaptive and Learning Agents Workshop at AAMAS 2019, 2020 | | |
| | Optimization Foundations for Reinforcement Learning Workshop at NeurIPS 2019 | | |
| | Reinforcement Learning for Real Life Workshop at ICML 2019, 2021 | | |
| | Reinforcement Learning for Real Life Workshop at NeurIPS 2022 | | |
| | Departmental Services | | |
| | Graduate Admission Committee at CS of UVA, 2022 - 2023 AY | | |
| Honours | <i>Runner-Up for the IFAAMAS Victor Lesser Dissertation Award</i> | | 2022 |
| | <i>Alf Weaver Junior Faculty Fellowship, University of Virginia</i> | | 2022 - 2027 |
| | <i>EPSRC Studentship, University of Oxford</i> | | 2018 - 2022 |
| | <i>AAMAS Student Scholarship</i> | | 2022 |
| | <i>ICLR Outstanding Reviewer</i> | | 2021 |
| | <i>NeurIPS Reviewer Award</i> | | 2020 |
| | <i>ICML Reviewer Award</i> | | 2020 |
| | <i>Light Senior Scholarship, St Catherine's College, University of Oxford</i> | | 2020 |
| | <i>AAMAS Travel Award</i> | | 2020 |
| | <i>AAMAS Best Paper Award</i> | | 2020 |
| | <i>NeurIPS Optimization Foundations for RL Workshop Travel Award</i> | | 2019 |
| | <i>NeurIPS Travel Award</i> | | 2019 |
| | <i>AAAI Travel Award</i> | | 2019 |
| | <i>NIPS Hierarchical RL Workshop Travel Award</i> | | 2017 |
| | <i>EMC Scholarship, Fudan University</i> | | 2014 |
| Supervision | PhD Students | | |
| | Shuze Liu (2022 -) | | |
| | Master Students | | |
| | Zhengkun Xiao (2022 -) | | |
| | Undergraduates | | |

Ja-Zhua Cheng (2022 -)

Selected Research Assistants

Jiuqi Wang (2022 -)

Xiaochi Qian (2022 -)

PhD Committees

Ingy ElSayed-Aly (Advised by Prof. Lu Feng at UVA)

Sudhir Shenoy (Advised by Prof. Afsaneh Doryab at UVA)

Chuanhao Li (Advised by Prof. Hongning Wang at UVA)

Qualification:

Zeyu Mu (Advised by Prof. Brian Park at UVA)

Dane Williamson (Advised by Prof. Yangfeng Ji at UVA)

Matthew Landers (Advised by Prof. Afsaneh Doryab at UVA)

Ethan Harrison Blaser (Advised by Prof. Hongning Wang at UVA)

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| Invited Talks | <i>Offline Reinforcement Learning: Current and Future</i> | 2023 |
| | AAAI New Faculty Highlight Program | |
| | <i>Breaking the Deadly Triad in Off-Policy Reinforcement Learning</i> | |
| | School of Computing Science, Simon Fraser University | 2022 |
| | Department of Electrical & Computer Engineering, University of Waterloo | 2022 |
| | Department of Computer Science, University of Virginia | 2022 |
| | School of Informatics, University of Edinburgh | 2021 |
| | <i>Breaking the Deadly Triad in Reinforcement Learning</i> | 2021 |
| | RL team, DeepMind, hosted by Hado van Hasselt | |
| | <i>Breaking the Deadly Triad with a Target Network</i> | 2021 |
| | Microsoft Research Summit | |
| | <i>Off-Policy Evaluation</i> | 2020 |
| | Data Fest 2020, Open Data Science | |
| | <i>Off-Policy Evaluation and Control</i> | 2020 |
| | ByteDance AI Lab, Shanghai | |
| Teaching | <i>Off-Policy Actor-Critic Algorithms</i> | 2019 |
| | Latent Logic LTD, Oxford | |
| | <i>Generalized Off-Policy Actor-Critic</i> | 2019 |
| | Noah's Ark Lab, Huawei, Edmonton | |
| | <i>Exploration with Quantile Options</i> | 2018 |
| | Huawei RL Workshop, Edmonton | |
| | <i>Coding Deep RL Papers</i> | 2017 |
| | NIPS MLTrain Workshop, Long Beach | |
| Teaching | <i>University of Virginia, Instructor</i> | |
| | CS6501: Topics in Reinforcement Learning | Fall 2022 |

University of Oxford, Teaching Assistant
AIMS CDT Lectures

Michaelmas 2019

University of Alberta, Teaching Assistant
CMPUT 229 Computer Organization and Architecture

Fall 2016

Research Internships

Microsoft Research Montreal, Canada Jun. 2021 - Sept. 2021
Collaboration: Remi Tachet des Combes, Romain Laroche, and Harm van Seijen

DeepMind London, United Kingdom Feb. 2021 - Jun. 2021
Collaboration: AlphaStar team (Michael Mathieu, Oriol Vinyals, etc)
Collaboration: Adam White and Hado van Hasselt

DeepDrive, Edmonton, Canada Sept. 2020 - Dec. 2020
Collaboration: Hengshuai Yao

Microsoft Research Montreal, Canada Jun. 2020 - Aug. 2020
Collaboration: Remi Tachet des Combes, Romain Laroche, and Harm van Seijen

Noah's Ark Lab, Huawei, Edmonton, Canada May. 2018 - Aug. 2018
Collaboration: Hengshuai Yao

Code

PyTorch Deep RL
A zoo of popular deep RL algorithms in PyTorch with **2.8k stars** in Github.

Reinforcement Learning: An Introduction
Python implementation of the book *Reinforcement Learning: An Introduction*
with **11.7k stars** in Github.

Google Summer of Code (GSoC) 2017
Contributed to MLPack by implementing a deep RL framework.

Google Summer of Code (GSoC) 2014
Contributed to Xapian by optimizing the post list and the position list.