Yi Tian

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EDUCATION

Massachusetts Institute of Technology, *Cambridge, MA, USA* *Sep. 2019 – Present*
Ph.D. Student in Electrical Engineering and Computer Science
Advisor: Suvrit Sra

Massachusetts Institute of Technology, *Cambridge, MA, USA* *Sep. 2019 – May 2021*
M.S. in Electrical Engineering and Computer Science | GPA: **5.0/5.0**
Advisor: Suvrit Sra
Selected courses: Inference and Information, Computer Vision, Optimization for ML, Robotic Manipulation

Tsinghua University, *Beijing, China* *Aug. 2015 – Jul. 2019*
B.E. in Automation | GPA: **3.93/4.0** | Graduation with honors
Advisors: Jiwen Lu and Keyou You
Selected courses: Control Theory, Operations Research, Machine Learning, Deep Reinforcement Learning

RESEARCH INTERESTS

Machine/Reinforcement Learning, Control, Robotics, Optimization, Game Theory, and their intersections.

RESEARCH EXPERIENCE

Research Assistant, MIT, *Cambridge, MA, USA* *Sep. 2019 – Present*
Advisor: Suvrit Sra, *Laboratory for Information and Decision Systems*

Can Direct Latent Model Learning Solve Linear Quadratic Gaussian Control (LQG)?
- Studied cost-driven representation (latent state) learning using LQG systems as an example
- Proved that efficient state representation learning in LQG is possible without reconstructing observations

Online Learning in Unknown Markov Games (a.k.a. Stochastic Games)
- Studied regret bounds of online learning in Markov games without observing opponents' actions
- Proved statistical hardness of this setting for competing against best policy in hindsight
- Provided first algorithm with $\tilde{\mathcal{O}}(T^{2/3})$ regret against minimax value of the game

Towards Minimax Optimal Reinforcement Learning in Factored Markov Decision Processes (FMDPs)
- Studied learning algorithms with optimal regret (sample efficiency) in MDPs with factored structure
- Derived correct form of bonus as key algorithmic ingredient that leads to efficient exploration in FMDPs
- Proved structure-dependent lower bound on regret, showing optimality of proposed algorithms

Research Assistant, Tsinghua University, *Beijing, China* *Oct. 2018 – Jun. 2019*
Advisor: Keyou You, *Institute of System Integration*

Asynchronous and Decentralized Distributed Training of Deep Learning Models
- Studied Asynchronous Stochastic Gradient Push (ASGP) for distributed optimization on big data
- Implemented ASGP using MPI (Message Passing Interface) and PyTorch, conducted sensitivity analysis, and compared it with state-of-the-art algorithm (Stochastic Gradient Push) on CIFAR-10

Research Assistant, Tsinghua University, *Beijing, China* *Nov. 2016 – Jun. 2018*
Advisor: Jiwen Lu, *Intelligent Vision Group*

Deep Progressive Reinforcement Learning (RL) for Skeleton-Based Action Recognition
- Formulated iterative refinement of (most informative) frame selection as MDP; used deep RL to solve it
- Drew on Graph CNNs to model skeletal structure and give predictions;
- Achieved competitive results with state-of-the-art methods on three widely used benchmarks

Egocentric Hand Segmentation and its Facilitation for Action Recognition

- Released largest RGB-D egocentric action dataset THU-READ (with 40 actions & 343, 626 frames)
- Applied FCNs to segment hands as temporal attention, boosting recognition accuracy by 2% on average

TEACHING EXPERIENCE

Teaching Assistant, MIT, *Cambridge, MA, USA* *Jan. 2022 – May 2022*
Instructor: John N. Tsitsiklis
Course: 6.231 Dynamic Programming and Reinforcement Learning

- Offered for the first time in recent years by Prof. John Tsitsiklis; many materials were newly designed.
- Proofread newly written lecture notes, prepared new problem sets and exams with solutions, hosted two office hours per week, answered questions on Piazza, gave recitations and a lecture on offline reinforcement learning, graded exams and course projects.
- Class size about 70. Overall subject rating 6.0/7.0 and TA rating 6.6/7.0.

INDUSTRIAL EXPERIENCE

Applied Scientist Intern, Amazon Robotics AI, *Cambridge, MA, USA* *May. 2022 – Aug. 2022*
Manager: Paul Birkmeyer, Mentor: Yifan Hou

Bin Manipulation with Dense Descriptors

- Studied using NeRFs to provide training examples for dense descriptors, and using dense descriptors to predict keypoints for bin manipulation in Amazon warehouse

Applied Scientist Intern, Amazon Search, *Palo Alto, CA, USA* *Jun. 2021 – Aug. 2021*
Manager: Sujay Sanghavi, Mentor: Han Cheng

Multi-Task Training of Ranking Models

- Studied using auxiliary tasks to improve ranking models for business metrics
- Demonstrated empirically the superiority of multi-task training to pre-training on auxiliary tasks

PUBLICATIONS AND MANUSCRIPTS

[1] Can Direct Latent Model Learning Solve Linear Quadratic Gaussian Control?
Yi Tian, Kaiqing Zhang, Russ Tedrake, Suvrit Sra.
Under review. [arXiv]

[2] Byzantine-Robust Federated Linear Bandits.
Ali Jadbabaie, Haochuan Li, Jian Qian, **Yi Tian**.
61st IEEE Conference on Decision and Control (*CDC*), 2022. [arXiv] [PDF]

[3] Complexity Lower Bounds for Nonconvex-Strongly-Concave Min-Max Optimization.
Haochuan Li, **Yi Tian**, Jingzhao Zhang, Ali Jadbabaie.
35th Conference on Neural Information Processing Systems (*NeurIPS*), 2021. [arXiv] [PDF]

[4] Provably Efficient Algorithms for Multi-Objective Competitive RL.
Tiancheng Yu, **Yi Tian**, Jingzhao Zhang, Suvrit Sra.
38th International Conference on Machine Learning (*ICML*), 2021. (**Long talk**) [arXiv] [PDF]

[5] Online Learning in Unknown Markov Games.
Yi Tian*, Yuanhao Wang*, Tiancheng Yu*, Suvrit Sra.
38th International Conference on Machine Learning (*ICML*), 2021. [arXiv] [PDF]

[6] Towards Minimax Optimal Reinforcement Learning in Factored Markov Decision Processes.
Yi Tian*, Jian Qian*, Suvrit Sra.
34th Conference on Neural Information Processing Systems (*NeurIPS*), 2020. (**Spotlight**) [arXiv] [PDF]

[7] Towards Understanding the Trade-off Between Accuracy and Adversarial Robustness.
Congyue Deng*, **Yi Tian***.
International Conference on Machine Learning Workshop on Security and Privacy (*ICMLW*), 2019. [PDF]

[8] Deep Progressive Reinforcement Learning for Skeleton-Based Action Recognition.
Yansong Tang*, **Yi Tian***, Peiyang Li, Jiwen Lu, Jie Zhou.
IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2018. [PDF]

[9] Action Recognition in RGB-D Egocentric Videos.
Yansong Tang, **Yi Tian**, Jiwen Lu, Jianjiang Feng, Jie Zhou.
IEEE International Conference on Image Processing (ICIP), 2017. [PDF]

AWARDS

Presidential Fellowship | *Massachusetts Institute of Technology* *2019*

Excellent Graduate Awards | *Both Tsinghua University and City of Beijing* *2019*

Top Grade Scholarship (10/3600) | *Tsinghua University* *2018*

Silver Medal in 30th National Physics Olympiad | *Chinese Physics Society* *2013*

COMMUNITY SERVICE

Reviewer, *ICML 2022 (top 10% reviewer) & 2023, NeurIPS 2022, AISTATS 2023*

Cultural Chair, *Sidney-Pacific Graduate Residence, MIT* *May 2021 – Present*

Board Chair, *11th Spark Talent Program, Tsinghua University* *Sep. 2017 – Jun. 2019*

VP, *Student Assoc. of Sci. and Tech., Dept. of Automation, Tsinghua University* *Sep. 2017 – Jun. 2018*

SKILLS

Programming: Python (incl. Pytorch/TensorFlow/Keras), C/C++, MATLAB
Communication: English (fluent), Chinese (native), German/French/Spanish (elementary)