

Tongzhou Wang

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EDUCATION

Massachusetts Institute of Technology

Ph.D. in Computer Science

2019 - 2024 (expected)

- Advisors: Antonio Torralba, Phillip Isola

University of California, Berkeley

B.A. in Computer Science and Statistics

2013 - 2017

- Advisors: Stuart J. Russell, Ren Ng, Alexei A. Efros

EMPLOYMENTS

Facebook AI Research (FAIR)

Research Intern

2021

- Mentor: Yuandong Tian. Minimal representation for reinforcement learning. Paper appeared in ICML 2022.

Facebook AI Research (FAIR)

Full-time Engineer on Machine Learning Framework

2017 - 2019

- Built data loading pipelines and machine learning operators for PyTorch, a now leading framework for deep learning.

RESEARCH INTERESTS

Machine Learning, Artificial Intelligence, Perception, Decision-Making.

I study machine learning problems and algorithms via **structures** they exhibit and require. My research focuses on perception and decision-making in artificial intelligence, and aims to (🏠) learn fundamental structures for better AI systems and (🔍) discover and analyze useful structures.

FEATURED PUBLICATIONS

(* indicates equal contribution)

Understanding Contrastive Representation Learning through Alignment and Uniformity on the Hypersphere (🏠)

Tongzhou Wang, Phillip Isola

2020

International Conference on Machine Learning 2020 [ICML 2020].

Denoised MDPs: Learning World Models Better Than the World Itself (🏠)

Tongzhou Wang, Simon S. Du, Antonio Torralba, Phillip Isola, Amy Zhang, Yuandong Tian

2022

International Conference on Machine Learning 2022 [ICML 2022]

Optimal Goal-Reaching Reinforcement Learning via Quasimetric Learning (🏠)

Tongzhou Wang, Antonio Torralba, Phillip Isola, Amy Zhang

2023

International Conference on Machine Learning 2023 [ICML 2023]

Dataset Distillation (🔍)

Tongzhou Wang, Jun-Yan Zhu, Antonio Torralba, Alexei A. Efros

2018

Learning to See by Looking at Noise (🔍)

Manel Baradad*, Jonas Wulff*, Tongzhou Wang, Phillip Isola, Antonio Torralba

2021

Advances in Neural Information Processing Systems 2021 [NeurIPS 2021]

INVITED TALKS

Structured Representations for Active Agents

Stanford Vision and Learning Lab, Stanford University

November 2023

Guest Lecture, University of Southern California

November 2023

Quasimetric Reinforcement Learning

Brown University

November 2023

AI Seminar, Carnegie Mellon University

October 2023

Vector Institute for Artificial Intelligence

September 2023

Deep Learning: Classics and Trends (DLCT)

June 2023

Machine Learning Advances Symposium, Massachusetts Institute of Technology

May 2023

University of Texas, Austin

April 2023

Northeastern University

April 2023

Technical Talks on PyTorch

PyTorch Developer Conference, San Francisco, CA, USA

October 2019

Global Mobile Internet Conference, Beijing, China

April 2018

MENTORING

Massachusetts Institute of Technology

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|---|-----------------------|
| Hyojin Bahng (Ph.D. student) | Summer 2023 - PRESENT |
| David X. Wu (B.S. & M.S. '22; now Ph.D. student at UC Berkeley) | Summer & Fall 2021 |
| Jingwei Ma (B.S. & M.S. '21; now Ph.D. student at University of Washington) | 2019 - 2022 |
| Steven Liu (B.S. & M.S. '21; now at TwoSigma) | 2019 - 2020 |

Carnegie Mellon University

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| George Cazenavette (M.S. '22; now Ph.D. student at MIT) | 2021 - 2023 |
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Summer Geometry Initiative (SGI)

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| Daniel Perazzo (master student at IMPA, Brazil) | Summer 2023 - PRESENT |
| Biruk Abere (B.S. student at University of Gondar, Ethiopia) | Summer 2023 |
| Gabriele Dominici (master student at University of Cambridge, UK) | Summer 2023 |
| Sana Arastehfar (master student at Queen's University, Canada) | Summer 2023 |
| Sanowar Raihan (research assistant at Center for Computational & Data Sciences, Bangladesh) | Summer 2023 |

TEACHING

6.S898: Deep Learning, *Massachusetts Institute of Technology* Fall 2022

Teaching Assistant (Co-Designed Curriculum and Assignments for 1st Undergraduate Offering)

Professional Development Course on Deep Learning, *Massachusetts Institute of Technology* Summer 2019

Lab Session Instructor

Deep Learning Tutoring Spring & Summer 2023

Volunteer Tutoring for a Data Science Professional in Boston, MA, USA

Deep Learning with PyTorch Spring 2018

Tutorial and Lab Session Instructor (200-300 participants) at Global Mobile Internet Conference, Beijing, China

Middle-School Mathematics and English Summer 2011

Volunteer Teaching for Low-Income Students in Northwestern China

SERVICES

Reviewer ICML 2020, ICML 2021, ICML 2022, ICML 2023, NeurIPS 2020, NeurIPS 2021, NeurIPS 2022, NeurIPS 2023, ICLR 2022, CVPR 2021, TMLR, TPAMI, GCRL Workshop 2023.

Workshop Organizer Goal-Conditioned Reinforcement Learning (GCRL) Workshop at NeurIPS 2023.

OPEN-SOURCE PROJECTS (96k stars on GitHub combined over projects that I made significant contributions to)

PyTorch Framework for Hardware-Accelerated Machine Learning and Scientific Computing 2017-2020

Developed data loading pipelines, CUDA/CPU kernels, ML ops, API design, autograd optimization, Python binding, etc.

CycleGAN and pix2pix in PyTorch 2018-PRESENT

Maintaining a popular machine learning repository on image-to-image translation

torchreparam 2019-2020

Developed one of the first toolkits for re-parametrizing neural networks and meta-learning

torchqmet 2022-PRESENT

Developed the first toolkit for parametrizing quasimetric functions for deep learning

HONORS AND AWARDS

Meta Ph.D. Fellowship Finalist 2023

Outstanding Reviewer for ICML 2022 2022

Top Reviewer for ICML 2020 2020

Merrill Lynch Graduate Fellowship 2019

UC Berkeley High Distinction in General Scholarship 2017

Best Summer Social Practice of Shanghai for my volunteer teaching in northwestern China 2011

SOFTWARE ENGINEERING EXPERIENCES

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| Airbnb, Inc. Software Engineer Intern on Machine Learning Infrastructure | 2016 |
| Facebook, Inc. Software Engineer Intern on Ads API Platform | 2015 |
| Grue, Inc. Co-Founder | 2015 |

PUBLICATIONS (COMPLETE LIST)

(* indicates equal contribution)

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| Optimal Goal-Reaching Reinforcement Learning via Quasimetric Learning <u>Tongzhou Wang</u> , Antonio Torralba, Phillip Isola, Amy Zhang • International Conference on Machine Learning 2023 [ICML 2023]. • Code Webpage arXiv | 2023 |
| Generalizing Dataset Distillation via Deep Generative Prior George Cazenavette, <u>Tongzhou Wang</u> , Antonio Torralba, Alexei A. Efros, Jun-Yan Zhu • IEEE/CVF Conference on Computer Vision and Pattern Recognition 2023 [CVPR 2023]. • Code Webpage arXiv | 2023 |
| Steerable Equivariant Representation Learning Sangnie Bhardwaj, Willie McClinton, <u>Tongzhou Wang</u> , Guillaume Lajoie, Chen Sun, Phillip Isola, Dilip Krishnan • arXiv | 2023 |
| Improved Representation of Asymmetrical Distances with Interval Quasimetric Embeddings <u>Tongzhou Wang</u> , Phillip Isola • Workshop on Symmetry and Geometry in Neural Representations at NeurIPS 2022 [NeurReps Workshop at NeurIPS 2022]. • PyTorch Package for Quasimetric Learning Webpage OpenReview arXiv | 2022 |
| Procedural Image Programs for Representation Learning Manel Baradad, Chun-Fu Chen, Jonas Wulff, <u>Tongzhou Wang</u> , Rogerio Feris, Antonio Torralba, Phillip Isola • Conference on Neural Information Processing Systems 2022 [NeurIPS 2022]. • Code & Datasets Webpage OpenReview arXiv | 2022 |
| Denoised MDPs: Learning World Models Better Than the World Itself <u>Tongzhou Wang</u> , Simon S. Du, Antonio Torralba, Phillip Isola, Amy Zhang, Yuandong Tian • International Conference on Machine Learning 2022 [ICML 2022]. • Code Webpage arXiv | 2022 |
| On the Learning and Learnability of Quasimetrics <u>Tongzhou Wang</u> , Phillip Isola • International Conference on Learning Representations 2022 [ICLR 2022]. • Code Webpage OpenReview arXiv | 2022 |
| Dataset Distillation by Matching Training Trajectories George Cazenavette, <u>Tongzhou Wang</u> , Antonio Torralba, Alexei A. Efros, Jun-Yan Zhu • IEEE/CVF Conference on Computer Vision and Pattern Recognition 2022 [CVPR 2022]. • Code Webpage arXiv | 2022 |
| Wearable ImageNet: Synthesizing Tileable Textures via Dataset Distillation George Cazenavette, <u>Tongzhou Wang</u> , Antonio Torralba, Alexei A. Efros, Jun-Yan Zhu • 5th Workshop on Computer Vision for Fashion, Art, and Design at CVPR 2022 [CVFAD Workshop at CVPR 2022]. • Code Webpage Paper | 2022 |
| Totems: Physical Objects for Verifying Visual Integrity Jingwei Ma, Lucy Chai, Minyoung Huh, <u>Tongzhou Wang</u> , Ser-Nam Lim, Phillip Isola, Antonio Torralba • European Conference on Computer Vision 2022 [ECCV 2022]. • Code Webpage arXiv | 2022 |
| Learning to See by Looking at Noise Manel Baradad*, Jonas Wulff*, <u>Tongzhou Wang</u> , Phillip Isola, Antonio Torralba • Advances in Neural Information Processing Systems 2021 [NeurIPS 2021]. • Code & Datasets Webpage arXiv | 2021 |

Understanding Contrastive Representation Learning through Alignment and Uniformity on the Hypersphere

Tongzhou Wang, Phillip Isola

2020

- International Conference on Machine Learning 2020 [[ICML 2020](#)].
- [🔗 Code](#) [Webpage](#) [arXiv](#)

Rewriting a Deep Generative Model

David Bau, Steven Liu, Tongzhou Wang, Jun-Yan Zhu, Antonio Torralba

2020

- European Conference on Computer Vision 2020 [[ECCV 2020](#)].
- [🔗 Code](#) [Webpage](#) [arXiv](#)

Diverse Image Generation via Self-Conditioned GANs

Steven Liu, Tongzhou Wang, David Bau, Jun-Yan Zhu, Antonio Torralba

2020

- Conference on Computer Vision and Pattern Recognition 2020 [[CVPR 2020](#)].
- [🔗 Code](#) [Webpage](#) [arXiv](#)

Dataset Distillation

Tongzhou Wang, Jun-Yan Zhu, Antonio Torralba, Alexei A. Efros

2018

- [🔗 Code](#) [Webpage](#) [arXiv](#)

Meta-Learning MCMC Proposals

Tongzhou Wang, Yi Wu, David A. Moore, Stuart J. Russell

2017

- Advances in Neural Information Processing Systems 2018 [[NeurIPS 2018](#)].
- Automatic Machine Learning Workshop at ICML 2017 (Oral) [[AutoML Workshop at ICML 2017 \(Oral\)](#)].
- [🔗 arXiv](#)

Learning to Synthesize a 4D RGBD Light Field from a Single Image

Pratul Srinivasan, Tongzhou Wang, Ashwin Sreelal, Ravi Ramamoorthi, Ren Ng

2017

- International Conference on Computer Vision 2017 [[ICCV 2017](#)].
- [🔗 Code](#) [arXiv](#)