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*

- Research Mentors: 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.

Selected 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 Sounthern 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

- 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

- George Cazenavette (M.S. '22; now Ph.D. student at MIT) — *2021 - 2023*

Summer Geometry Initiative (SGI)

- 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 assitant 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 (100-200 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, 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*

Graduated with High Distinction for my undergraduate study at *UC Berkeley* — *2017*

Publications (Complete List)

(* indicates equal contribution)

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].
- Webpage arXiv

Generalizing Dataset Distillation via Deep Generative Prior

George Cazenavette, **Tongzhou Wang**, Antonio Torralba, Alexei A. Efros, Jun-Yan Zhu — *2023*

- IEEE/CVF Conference on Computer Vision and Pattern Recognition 2023 [CVPR 2023].

Steerable Equivariant Representation Learning

Sangnie Bhardwaj, Willie McClinton, **Tongzhou Wang**, Guillaume Lajoie, Chen Sun, Phillip Isola, Dilip Krishnan — *2023*

- arXiv

Improved Representation of Asymmetrical Distances with Interval Quasimetric Embeddings

Tongzhou Wang, Phillip Isola — *2022*

- Workshop on Symmetry and Geometry in Neural Representations at NeurIPS 2022 [NeurReps Workshop at NeurIPS 2022].
- PyTorch Package for Quasimetric Learning Webpage OpenReview arXiv

Procedural Image Programs for Representation Learning

Manel Baradad, Chun-Fu Chen, Jonas Wulff, **Tongzhou Wang**, Rogerio Feris, Antonio Torralba, Phillip Isola — *2022*

- Conference on Neural Information Processing Systems 2022 [NeurIPS 2022].
- Code & Datasets Webpage OpenReview arXiv

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].
- Code Webpage arXiv

On the Learning and Learnability of Quasimetrics

Tongzhou Wang, Phillip Isola — *2022*

- International Conference on Learning Representations 2022 [ICLR 2022].
- Code Webpage OpenReview arXiv

Dataset Distillation by Matching Training Trajectories

George Cazenavette, **Tongzhou Wang**, Antonio Torralba, Alexei A. Efros, Jun-Yan Zhu — *2022*

- IEEE/CVF Conference on Computer Vision and Pattern Recognition 2022 [CVPR 2022].
- Code Webpage arXiv

Wearable ImageNet: Synthesizing Tileable Textures via Dataset Distillation

George Cazenavette, **Tongzhou Wang**, Antonio Torralba, Alexei A. Efros, Jun-Yan Zhu — *2022*

- 5th Workshop on Computer Vision for Fashion, Art, and Design at CVPR 2022 [CVFAD Workshop at CVPR 2022].
- Code Webpage Paper

Totems: Physical Objects for Verifying Visual Integrity

Jingwei Ma, Lucy Chai, Minyoung Huh, **Tongzhou Wang**, Ser-Nam Lim, Phillip Isola, Antonio Torralba — *2022*

- European Conference on Computer Vision 2022 [ECCV 2022].
- Code Webpage arXiv

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].
- Code & Datasets Webpage arXiv

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].
- Oral presentation at ICML 2017 AutoML workshop.
- 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