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 world model for reinforcement learning. Paper published in ICML 2022.

Facebook AI Research (FAIR)
Full-time Engineer   *2017 - 2019*
- Built `PyTorch`, a leading software framework for deep learning. Data pipelines, autograd, machine learning operators, *etc*.

RESEARCH INTERESTS

Learning world representations for generalist agents.

I am interested in learning structured representations that aggregate and select information about the world from various data sources, improve multi-task training, and enable autonomous adaptation to new tasks.

FEATURED PUBLICATIONS   (* indicates equal contribution)

The Platonic Representation Hypothesis
Minyoung Huh*, Brian Cheung*, **Tongzhou Wang***, Phillip Isola*   *2024*
International Conference on Machine Learning 2024 `[ICML 2024 (Position Paper)]`

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]`

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]`

Understanding Contrastive Representation Learning through Alignment and Uniformity on the Hypersphere
Tongzhou Wang, Phillip Isola   *2020*
International Conference on Machine Learning 2020 `[ICML 2020]`.

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

Reinforcement Learning as Representation Learning
UC Berkeley   *May 2024*

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 Internals

| PyTorch Developer Conference, San Francisco, CA, USA | *October 2019* |
| Global Mobile Internet Conference, Beijing, China | *April 2018* |

MENTORING

Massachusetts Institute of Technology

Adrian Rodriguez Munoz (Ph.D. student)	*Spring 2024 - PRESENT*
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 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 2020-2024, NeurIPS 2020-2023, ICLR 2022, RLC 2024, CVPR 2021, TMLR, TPAMI, GCRL Workshop 2023. |
| **Workshop Organizer** | Goal-Conditioned Reinforcement Learning (GCRL) Workshop at NeurIPS 2023. The First Dataset Distillation Challenge at ECCV 2024. |

OPEN-SOURCE PROJECTS ————— (104k stars on GitHub combined over projects that I made significant contributions to)

`PyTorch` Framework for Hardware-Accelerated Machine Learning and Scientific Computing — *2017-2020*
Data loading pipelines, CUDA/CPU kernels, ML ops, API design, autograd optimization, Python bindings, etc.

CycleGAN and pix2pix in PyTorch — *2018-PRESENT*
Popular repository for image-to-image translation

`torchreparam` — *2019-2020*
One of the first toolkits to reparametrize neural nets; now a core part of the large-scale training framework `fairscale`

`torchqmet` — *2022-PRESENT*
The first toolkit for parametrizing quasimetric functions in 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

Airbnb, Inc. *2016*
Machine Learning Infrastructure

Facebook, Inc. *2015*
Ads API Platform

Grue, Inc. *2015*
Co-Founder

PUBLICATIONS (COMPLETE LIST)   (* indicates equal contribution)

The Platonic Representation Hypothesis
Minyoung Huh*, Brian Cheung*, <u>Tongzhou Wang</u>*, Phillip Isola*   *2024*
- International Conference on Machine Learning 2024 [`ICML 2024 (Position Paper)`]
- ⧉ <u>Code</u> <u>Webpage</u> <u>arXiv</u>

Optimal Goal-Reaching Reinforcement Learning via Quasimetric Learning
<u>Tongzhou Wang</u>, Antonio Torralba, Phillip Isola, Amy Zhang   *2023*
- International Conference on Machine Learning 2023 [`ICML 2023`].
- ⧉ <u>Code</u> <u>Webpage</u> <u>arXiv</u>

Generalizing Dataset Distillation via Deep Generative Prior
George Cazenavette, <u>Tongzhou Wang</u>, Antonio Torralba, Alexei A. Efros, Jun-Yan Zhu   *2023*
- Conference on Computer Vision and Pattern Recognition 2023 [`CVPR 2023`].
- ⧉ <u>Code</u> <u>Webpage</u> <u>arXiv</u>

Deep Augmentation: Enhancing Self-Supervised Learning through Transformations in Higher Activation Space
Rickard Brüel-Gabrielsson, <u>Tongzhou Wang</u>, Manel Baradad, Justin Solomon   *2023*
- ⧉ <u>arXiv</u>

Steerable Equivariant Representation Learning
Sangnie Bhardwaj, Willie McClinton, <u>Tongzhou Wang</u>, Guillaume Lajoie, Chen Sun, Phillip Isola, Dilip Krishnan   *2023*
- ⧉ <u>arXiv</u>

Improved Representation of Asymmetrical Distances with Interval Quasimetric Embeddings
<u>Tongzhou Wang</u>, Phillip Isola   *2022*
- Workshop on Symmetry and Geometry in Neural Representations at NeurIPS 2022 [`NeurReps Workshop at NeurIPS 2022`].
- ⧉ <u>PyTorch Package for Quasimetric Learning</u> <u>Webpage</u> <u>OpenReview</u> <u>arXiv</u>

Procedural Image Programs for Representation Learning
Manel Baradad, Chun-Fu Chen, Jonas Wulff, <u>Tongzhou Wang</u>, Rogerio Feris, Antonio Torralba, Phillip Isola   *2022*
- Advances in Neural Information Processing Systems 2022 [`NeurIPS 2022`].
- ⧉ <u>Code & Datasets</u> <u>Webpage</u> <u>OpenReview</u> <u>arXiv</u>

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   *2022*
- International Conference on Machine Learning 2022 [`ICML 2022`].
- ⧉ <u>Code</u> <u>Webpage</u> <u>arXiv</u>

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*

- 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`].
- 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