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 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*

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

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 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.

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

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*

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*
- IEEE/CVF 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*
- Conference on 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
<u>Tongzhou Wang</u>, Phillip Isola *2022*
- International Conference on Learning Representations 2022 [`ICLR 2022`].
- ⬀ <u>Code</u> <u>Webpage</u> <u>OpenReview</u> <u>arXiv</u>

Dataset Distillation by Matching Training Trajectories
George Cazenavette, <u>Tongzhou Wang</u>, Antonio Torralba, Alexei A. Efros, Jun-Yan Zhu *2022*
- IEEE/CVF Conference on Computer Vision and Pattern Recognition 2022 [`CVPR 2022`].
- ⬀ <u>Code</u> <u>Webpage</u> <u>arXiv</u>

Wearable ImageNet: Synthesizing Tileable Textures via Dataset Distillation

George Cazenavette, <u>**Tongzhou Wang**</u>, 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`].
- ⬀ <u>Code</u> <u>Webpage</u> <u>Paper</u>

Totems: Physical Objects for Verifying Visual Integrity

Jingwei Ma, Lucy Chai, Minyoung Huh, <u>**Tongzhou Wang**</u>, Ser-Nam Lim, Phillip Isola, Antonio Torralba *2022*

- European Conference on Computer Vision 2022 [`ECCV 2022`].
- ⬀ <u>Code</u> <u>Webpage</u> <u>arXiv</u>

Learning to See by Looking at Noise

Manel Baradad*, Jonas Wulff*, <u>**Tongzhou Wang**</u>, Phillip Isola, Antonio Torralba *2021*

- Advances in Neural Information Processing Systems 2021 [`NeurIPS 2021`].
- ⬀ <u>Code & Datasets</u> <u>Webpage</u> <u>arXiv</u>

Understanding Contrastive Representation Learning through Alignment and Uniformity on the Hypersphere

<u>**Tongzhou Wang**</u>, Phillip Isola *2020*

- International Conference on Machine Learning 2020 [`ICML 2020`].
- ⬀ <u>Code</u> <u>Webpage</u> <u>arXiv</u>

Rewriting a Deep Generative Model

David Bau, Steven Liu, <u>**Tongzhou Wang**</u>, Jun-Yan Zhu, Antonio Torralba *2020*

- European Conference on Computer Vision 2020 [`ECCV 2020`].
- ⬀ <u>Code</u> <u>Webpage</u> <u>arXiv</u>

Diverse Image Generation via Self-Conditioned GANs

Steven Liu, <u>**Tongzhou Wang**</u>, David Bau, Jun-Yan Zhu, Antonio Torralba *2020*

- Conference on Computer Vision and Pattern Recognition 2020 [`CVPR 2020`].
- ⬀ <u>Code</u> <u>Webpage</u> <u>arXiv</u>

Dataset Distillation

<u>**Tongzhou Wang**</u>, Jun-Yan Zhu, Antonio Torralba, Alexei A. Efros *2018*

- ⬀ <u>Code</u> <u>Webpage</u> <u>arXiv</u>

Meta-Learning MCMC Proposals

<u>**Tongzhou Wang**</u>, 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)`].
- ⬀ <u>arXiv</u>

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

Pratul Srinivasan, <u>**Tongzhou Wang**</u>, Ashwin Sreelal, Ravi Ramamoorthi, Ren Ng *2017*

- International Conference on Computer Vision 2017 [`ICCV 2017`].
- ⬀ <u>Code</u> <u>arXiv</u>