

# 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.

## 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

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### 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
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### 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

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**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

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**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)

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**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

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**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

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

## SOFTWARE ENGINEERING EXPERIENCES

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

## PUBLICATIONS (COMPLETE LIST)

 (\* indicates equal contribution)

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