

# Tongzhou Wang

✉ tongzhou@mit.edu | 🏠 tongzhouwang.info | 📄 Google Scholar | 📺 ssnl

## 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

|   |                       |
|---|-----------------------|
| 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, 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

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

## PUBLICATIONS (COMPLETE LIST)

(\* indicates equal contribution)

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