

# Fahim Tajwar

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## EDUCATION

### Carnegie Mellon University

Doctor of Philosophy (PhD), Machine Learning

Pittsburgh, PA

2023 -- Current

### Stanford University

Master of Science (MS), Computer Science (AI/ML)

Bachelor of Science (BS) with Distinction, Mathematics

Stanford, CA

2022 -- 2023

2017 -- 2022

## PUBLICATIONS (\* Equal Contribution)

### Conservative Prediction via Data-Driven Confidence Minimization

2023

Caroline Choi\*, [Fahim Tajwar\\*](#), Yoonho Lee\*, Huaxiu Yao, Ananya Kumar, Chelsea Finn

Preprint, 2023

### Surgical Fine-Tuning Improves Adaptation to Distribution Shifts

2023

Yoonho Lee\*, Annie S Chen\*, [Fahim Tajwar](#), Ananya Kumar, Huaxiu Yao, Percy Liang, Chelsea Finn

International Conference on Learning Representations (ICLR), 2023

### When to Ask for Help: Proactive Interventions in Autonomous Reinforcement Learning

2022

Annie Xie\*, [Fahim Tajwar\\*](#), Archit Sharma\*, Chelsea Finn

Neural Information Processing Systems (NeurIPS), 2022

### Do Deep Networks Transfer Invariances Across Classes?

2022

Allan Zhou\*, [Fahim Tajwar\\*](#), Alexander Robey, Tom Knowles, George J. Pappas, Hamed Hassani, Chelsea Finn

International Conference on Learning Representations (ICLR), 2022

### No True State-of-the-Art? OOD Detection Methods are Inconsistent across Datasets

2021

[Fahim Tajwar](#), Ananya Kumar\*, Sang Michael Xie\*, Percy Liang

ICML Workshop on Uncertainty & Robustness in Deep Learning (UDL), 2021

### Scalable deep learning to identify brick kilns and aid regulatory capacity

2021

Jihyeon Lee\*, Nina R. Brooks\*, [Fahim Tajwar](#), Marshall Burke, Stefano Ermon, David B. Lobell, Debashish Biswas, Stephen P. Luby

Proceedings of the National Academy of Sciences, Apr 2021, 118 (17)

## RESEARCH EXPERIENCE

### Research Intern, Stanford Artificial Intelligence Laboratory

March 2020 – Current

- (Prof. Chelsea Finn and Percy Liang) Relationship between distribution shifts and the layer of a neural network that should be fine-tuned (surgical fine-tuning) on the unsupervised (test-time) adaptation setting, specifically adapting earlier layers outperform adapting later/all layers for corruption datasets like CIFAR-10-C and ImageNet-C (*Under review in ICLR, 2023*)
- (Prof. Chelsea Finn) Deep reinforcement learning for irreversible environments with applications to episodic, autonomous, and continuous learning setups (*NeurIPS, 2022*)
- (Prof. Chelsea Finn) Generative model-based algorithm that produces performance boost of 1-2% when combined with other state-of-the-art methods on long-tailed versions of datasets like CIFAR, GTSRB, etc. (*ICLR, 2022*)
- (Prof. Percy Liang) Demonstration of out-of-distribution (OOD) detection problem being too broad by showing that many well-known methods don't perform consistently on a comprehensive suite of benchmark datasets (*ICML UDL Workshop, 2021*)

### Computer Vision Research Intern, Stanford University

March 2019 – June 2020

- (Prof. Steve Luby and Stefano Ermon) Built a system using convolutional neural networks (CNNs), that detects environmental regulation violations in the form of brick kilns and produces their co-ordinates from satellite imagery in South Asia (*PNAS, 2021*)
- Detected nearly 10,000 brick kilns in Bangladesh which directly affect the lives of at least 1 million people using the trained CNN in *TensorFlow*, with the possibility of extending the project over to India (with 100,000 kilns) and other developing countries
- Created a classifier to distinguish between environment-friendly (Zigzag) and unfriendly (FCK) type of brick kilns

## Research Intern, SLAC National Accelerator Laboratory

June 2018 – September 2018

- (Johanna Nelson Weker and Prof. Piero Pianetta) Using *Python* (“*Tomopy*”), generated 3D X-ray images of Lithium-Ion batteries from 2D projections and used the *Dragonfly* software to segment them
- Quantified the relationship between the morphological change near Anode (e.g., Lithium plating) and various accelerated ageing conditions --- recorded a 40% increase in Lithium plating in batteries cycled at 55° C compared to those cycled at 25° C.

## TEACHING EXPERIENCE

Teaching Assistant, CS 330 (Deep Multi-Task and Meta Learning), Stanford University

Sept 2022 – Dec 2022

Academic Tutor, Athletic Academic Resource Center (AARC), Stanford University

Sept 2021 – June 2022

Academic Tutor, Stanford University Mathematical Organization (SUMO)

Sept 2019 – June 2020

Trainer, National Physics Olympiad Team, Bangladesh (BdPhO)

Feb 2017 – June 2018

## INDUSTRY EXPERIENCE

### Software Engineer Intern, Meta Platforms (formerly Facebook)

June 2022 – September 2022

- As part of the Ads Core ML Eng team, designed and implemented components for state-of-the-art ML recommendation systems in *Python*
- Experimented with various knowledge distillation techniques to improve performance of computationally cheaper ML networks
- Designed new modules with scalability in mind to make sure they work well with extremely large datasets and can also be trained efficiently

### Software Engineering Intern, Cadence Design Systems

June 2020 – September 2020

- Using *C++*, designed efficient data storage systems for graph neural networks (GNN), which reduced memory usage by 86%
- Using *Python* (*NumPy*), designed and implemented efficient data pre-processing modules
- Designed time and memory efficient data-loader classes in *Keras* and *TensorFlow*; researched memory-time tradeoff to find the optimal design

## SKILLS

Programming Languages: C, C++, Python, Java, Matlab

Frameworks: Unix, PyTorch, Caffe2, TensorFlow

## TALKS & PRESENTATION

- Neural Information Processing Systems (NeurIPS) November 2022
- International Conference on Learning Representations (ICLR) April 2022
- ICML Workshop on Uncertainty & Robustness in Deep Learning (UDL) July 2021
- Stanford Earth Summer Undergraduate Research (SESUR) August 2019
- Stanford EE Research Experience for Undergraduates (REU) August 2018

## AWARDS

University Distinction, top 15% of the graduating class, Stanford University

June 2022

Tau Beta Pi Engineering Honor Society

May 2020

Bronze Medal, 48<sup>th</sup> International Physics Olympiad, Indonesia

July 2017

Bronze Medal, 47<sup>th</sup> International Physics Olympiad, Switzerland Liechtenstein

July 2016

## SERVICE

- Reviewer, Neural Information Processing Systems (NeurIPS) 2023
- Reviewer, NeurIPS Workshop on Distribution Shifts (DistShift) 2023
- Reviewer, International Conference on Learning Representations (ICLR) 2024

## SELECTED COURSEWORK

**Mathematics:** Real Analysis, Functional Analysis, Differential Topology, Measure Theory, Probability Theory, Graph Theory, Abstract Algebra, Linear Algebra & Matrix Theory, Statistical Inference, Numerical Computing

**Computer Science:** Machine Learning, Reinforcement Learning, Convex Optimization, Deep Learning for Computer Vision, Artificial Intelligence: Principles and Techniques