

Ajinkya K. Mulay

MACHINE LEARNING ENGINEER · PRIVACY RESEARCHER

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Research Interests

Privacy, Federated Learning & AutoML: My primary focus is on learning, designing and building privacy-preserving federated systems and automated learning systems. My current research interests include privacy-preserving Machine Learning, Federated Learning and AutoML. Some of my past interests include Wireless Communications (3G and 4G) and IoT.

Education

Aug. 2018 - May 2023

PHD IN ELECTRICAL AND COMPUTER ENGINEERING

- Advised by *Prof. Xiaojun Lin*
- Major GPA: 3.6/4.0

W. Lafayette, IN

Aug. 2018 - May 2023

Aug. 2014 - May 2018

B.TECH (WITH HONORS) IN ELECTRICAL ENGINEERING

- Advised by *Prof. Bheemarjuna Reddy*
- Major GPA: 8.88/10

Hyderabad, India

Aug. 2014 - May 2018

Honors & Awards

2020	Invited Talk & Top 5% Paper , NeurIPS Pre-Registration Workshop	<i>USA</i>
2020	Graduate Research Assistantship , SuperPower Group, Psychological Sciences, Purdue	<i>Indiana, USA</i>
2017	Two-Year Graduate Teaching Assistantship , Electrical and Computer Engineering Department, Purdue	<i>Indiana, U.S.A</i>
2018	Winner and World Finalist for Emergensor Startup , Microsoft Imagine Cup, Japan National Final	<i>Tokyo, Japan</i>
2018	Winner , Third Business Plan Competition, University of Tokyo	<i>Tokyo, Japan</i>
2017	India-Japan Engineering Program Research Scholarship , University of Tokyo	<i>Tokyo, Japan</i>
2016	Undergraduate Teaching Assistantship , IIT Hyderabad	<i>India</i>
2016	Special Recognition & 8th Rank for Young Team , IEEE Signal Processing Cup	<i>India</i>
2014	Academic Excellence Award , IIT Hyderabad	<i>India</i>
2010	Recipient of the prestigious National Talent Search Examination (N.T.S.E) , Govt. of India	<i>India</i>

Publications

Rakshit Naidu, Harshita Diddee, Ajinkya Mulay, Aleti Vardhan, Krithika Ramesh, Ahmed Zamzam, "Towards Quantifying the Carbon Emissions of Differentially Private Machine Learning"	<i>OpenMined</i>
ICML 2021 SRML WORKSHOP	
Ajinkya Mulay, Tushar Semwal, Ayush Agrawal, "FedPerf: A Practitioners' Guide to Performance of Federated Learning Algorithms"	<i>OpenMined</i>
NEURIPS 2020 PRE-REGISTRATION EXPERIMENT WORKSHOP	
Ajinkya Mulay, Anand Basawade, Bheemarjuna Tamma, Anthony Franklin, "DFC: Dynamic UL-DL Frame Configuration for Improving Channel Access in eLAA"	<i>NeWS Lab, IIT Hyderabad</i>
IEEE NETWORKING LETTERS	
Ajinkya Mulay, Hideya Ochiai, Hiroshi Esaki, "IoT WebSocket Connection Management Algorithm for Early Warning Earthquake Alert Applications"	<i>Esaki Lab, University of Tokyo</i>
ACM/IEEE UCC, AUSTIN, TX, USA	
Konkimalla Chandra Prakash, et. al., "A Novel Electric Network Frequency Classification Algorithm and an Electrical Power Signal Measurement Circuit"	<i>LFOVIA Group, IIT Hyderabad</i>
IEEE SIGNAL PROCESSING CUP, 2016	

Pre-Prints

Skills

Focus Topics:	Differential Privacy, Federated Learning, Graph Algorithms, AutoML
Machine Learning	PyTorch, Tensorflow, Keras, Pytorch-Lightning, Scikit-Learn, PySyft
Data Analytics	Pandas, Numpy, Matplotlib
Programming	Python, Cpp, R, Go, MATLAB, \LaTeX
Mobile	Swift, Dart, Flutter, XCode
DevOps	AWS, Azure, Docker
Languages	English (Proficient), Japanese (Basic), Hindi, Marathi

Experience

May 2021 - Aug 2021

Menlo Park, CA

SOFTWARE ENGINEERING INTERN

May 2021 - Aug 2021

- Developed a fast and highly scalable differentially private machine learning algorithm which outperforms the state-of-the-art model's test performance by **15%**.
- Implemented additional visualizations to improve gradient flow and easily debug larger machine learning runs.
- Technology Stack:** Python, PyTorch

Aug. 2020 - Present

West Lafayette, IN, USA

MACHINE LEARNING TEAM LEAD

Aug. 2020 - Present

- Designed algorithms to examine effects of parameter uncertainty on statistical power and identify regions of robustness/reactivity in specified parameter values over a high-dimensional parameter space
- Reduced inference, training time and resource usage to under 10% of the baseline with feature engineering while maintaining majority of the predictive capabilities
- Technology Stack:** Python, PyTorch, Matplotlib, Pandas, Weights and Biases, R, Jupyter Notebooks, Git

Mar. 2020 - Present

Remote, USA

RESEARCH SCIENTIST

Mar. 2020 - Present

- Developing methods to characterize Private Federated Learning Systems and identify and track the performance of Federated Algorithms over varied environments with a single easy-to-use metric; proposal accepted at Pre-registration Workshop, NeurIPS 2020
- Demonstrated top 5 Federated Machine Learning algorithms on **100+** virtual mobile devices with an accuracy of over **99%** on LEAF datasets
- Technology Stack:** PyTorch, Weights and Biases, PySyft, Matplotlib

Aug. 2018 - Mar. 2020

West Lafayette, IN, USA

GRADUATE TEACHING ASSISTANT

Aug. 2018 - Mar. 2020

- Mentored 350+ undergraduate students and 15+ undergraduate teaching assistants to develop a strong fundamental understanding of electrical engineering concepts

Aug. 2017 - Apr. 2018

Hyderabad, India

UNDERGRADUATE STUDENT RESEARCHER

Aug. 2017 - Apr. 2018

- Designed and developed an algorithm to reduce interference between eLAA-WiFi networks by 40% using Game Theory techniques
- Technology Stack:** MATLAB, Python

Jul. 2017 - Dec. 2018

Tokyo, Japan

CHIEF SERVER ENGINEER

Jul. 2017 - Dec. 2018

- Built and maintained the back-end for a mobile application used to notify people of local emergencies
- Reduced the map's refresh time by **60%** to improve user experience
- Technology Stack:** Azure, Java, Google Maps API, Android Studio, Go, Python

May 2017 - Jul. 2017

Tokyo, Japan

RESEARCH INTERNSHIP

May 2017 - Jul. 2017

- Slashed the packet drop rate over a 3G IoT-Cloud network by **99%** by designing a dynamic ping-pong connection management algorithm
- Technology Stack:** Go, Arduino, C

May 2015 - Jul. 2016

Hyderabad, India

UNDERGRADUATE STUDENT RESEARCHER

May 2015 - Jul. 2016

- Developed a novel Neural Network-based classification algorithm to predict location of an audio recording using the Electrical Network Frequency (ENF) signature embedded in the audio file; achieved an accuracy of over **85%**
- Technology Stack:** MATLAB, Python

Teaching and Mentoring

MENTORING STUDENTS FOR ANVIL

Mentoring Undergraduate Students for the Anvil's Co-Founder AI Matching Platform Development

Jan 2022 - May 2022

GRADUATE TEACHING ASSISTANT FOR ECE 27000

Teaching assistant for *Introduction to Digital Design*

Aug 2019 - May 2020

GRADUATE TEACHING ASSISTANT FOR ECE 20002

Teaching assistant for *Electrical Engineering Fundamentals II*

Aug 2018 - May 2019

Other Services

2022 **Reviewer**, Conference on Health, Inference, and Learning (CHIL)

Extra-Curricular

2020-21 **Active Blogger**, Topics- Machine Learning, Differential Privacy, MS/PhD Applications

2018-21 **Active Member**, HKN (Eta Kappa Nau), Purdue University

2020-21 **Active Member**, Startup Purdue, Co-Founded Happyou, a mental health SaaS startup

2014-18 **Soccer Member, Varsity Team**, Inter & Intra-Collegiate Events, IIT Hyderabad

2015-17 **Head of Finance**, ELAN, IIT Hyderabad's Techno-Cultural Fest, managed budget in excess of \$40K

2015-17 **Events and Workshop Manager**, Entrepreneurship Cell, IIT Hyderabad