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

Purdue University — *W. Lafayette, IN*

PhD in Electrical and Computer Engineering — *Aug. 2018 - May 2023*

- Advised by *Prof. Xiaojun Lin*
- Major GPA: 3.61/4.0

Indian Institute of Technology, Hyderabad — *Hyderabad, India*

B.Tech (with Honors) in Electrical Engineering — *Aug. 2014 - May 2018*

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

Honors & Awards

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

Publications

Ajinkya Mulay, Tushar Semwal, Ayush Agrawal, "FedPerf: A Practitioners' Guide to Performance of Federated Learning Algorithms" — *OpenMined*

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" — *NeWS Lab, IIT Hyderabad*

IEEE Networking Letters

Ajinkya Mulay, Hideya Ochiai, Hiroshi Esaki, "IoT WebSocket Connection Management Algorithm for Early Warning Earthquake Alert Applications" — *Esaki Lab, University of Tokyo*

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" — *LFOVIA Group, IIT Hyderabad*

IEEE Signal Processing Cup, 2016

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, LaTeX
Mobile	Swift, Dart, Flutter, XCode
DevOps	AWS, Azure, Docker
Languages	English (Proficient), Japanese (Basic), Hindi, Marathi

Experience

SuperPower Group, Purdue University
West Lafayette, IN, USA

Machine Learning Team Lead — *Aug. 2020 - Present*

- Designing 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
- Designing a novel graph algorithm to identify robust parameter regions under constrained resources
- Built a Neural Network to reduce run-time and resource usage to less than 10% of the original
- **Technology Stack:** Python, PyTorch, Matplotlib, Pandas, Weights and Biases, R, Jupyter Notebooks, Git

OpenMined
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

NeWS Lab at IIT Hyderabad
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

Emergensor (Startup), University of Tokyo
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

Esaki Lab, University of Tokyo
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

LFOVIA Group, IIT Hyderabad
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

Research Experience

B.Tech Project at NeWS Lab, IIT Hyderabad
Hyderabad, India

Design of protocols to reduce interference in unlicensed wireless communications- Wi-Fi and 3G (LTE) — *2017-2018*

Research Internship at Esaki Lab, University of Tokyo
Tokyo, Japan

Developed efficient IoT-Cloud 3G communication algorithms — *Summer 2017*

Research Internship at WiCoN Lab, IIT Hyderabad
Hyderabad, India

Implementation and survey of Wi-Fi security flaws and hacks — *Summer 2016*

Research Internship at LFOVIA Group, IIT Hyderabad
Hyderabad, India

Developed novel machine learning classifiers for audio and speech data — *2015-2016*

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