KUNJAL PANCHAL

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SKILLS

Programming Languages – Python, Java, C/C++, Matlab
Tools/Frameworks – PyTorch, TensorFlow, TF-Federated, NumPy, pandas, scikit-learn, Github

EDUCATION

University of Massachusetts – Amherst, Massachusetts Sep 2021 – Expected May 2026

- **Doctor of Philosophy in Computer Science** – Advised by Dr. Hui Guan and Dr. Adam O'Neill
- Research Area: Federated Learning, Privacy-preserving Machine Learning, Relaxed Cryptography

University of Massachusetts – Amherst, Massachusetts Sep 2019 – May 2021

- **Master of Science in Computer Science** – Research Track – 3.6/4.0 GPA
- Relevant Coursework – Machine Learning, Computer Vision, Natural Language Processing, Robotics, Optimization in Computer Science, Reinforcement Learning, Advanced Algorithms

The Maharaja Sayajirao University of Baroda, Gujarat, India Aug 2015 – May 2019

- **Bachelor of Engineering in Computer Science** – 4.0/4.0 GPA
- Relevant Coursework – Artificial Intelligence, Data Structures, Databases, Object Oriented Programming, Software Engineering, Design and Analysis of Algorithms, Network Security

RESEARCH

Flow: Fine-grained Personalized Federated Learning through Dynamic Routing
Kunjal Panchal and Hui Guan
CrossFL Workshop @ MLSys, 2022 Sept 2022

WORK EXPERIENCE

Research PhD Intern May 2022 - Aug 2022
Adobe Research, Bangalore, India

- Worked on solving personalization in federated learning problems specific to streaming setting
- Currently improving on the generalization bounds of Scaffold and FedDyn, and working on proving the relation between global generalization and personalized performances of clients

Research Fellow / Teaching Assistant Sep 2021 - Current
Manning College of Information and Computer Sciences, UMass - Amherst
Currently working on solving open issues of Federated Learning, with focus on Personalized Federated Learning and Poisoning Attacks resilient Federated Learning

AI and Machine Learning Head Mentor - MIT FutureMakers 2022 July 2022 - Aug 2022
AI and Machine Learning Head Mentor - MIT FutureMakers 2021 Jun 2021 - Aug 2021
Machine Learning Mentor - Virtual AI Learning Program Feb 2021 - Mar 2021

SureStart, New York City, NY (Remote)

- Conducted lectures as a head mentor and taught students applied deep learning concepts like optimization, generative networks, algorithmic biases, regularization
- Helped students to use the taught skills to build a final deep learning based project

Graduate Student Researcher - UMass CyberSecurity / ML Group Apr 2020 – Aug 2021

College of Information and Computer Sciences, UMass – Amherst

Areas – Machine Learning, Cryptography

- Employed evolutional network architecture search to identify the best model configuration for a late fusion multimodal deep learning strategy
- Improved the latency of multimodal fusion by ~80%, while achieving near state of the art accuracy performance
- Parallelly also worked on a novel cryptographic notion of relaxed authentication with digital signatures to create a "fine grained knob" for trade-offs between unforgeability and speed
- Besides formally introducing the concept, sketched and implemented a practical hash-based digital signature scheme, which fit the notion of relaxed authentication

Teaching Assistant and Grader Sep 2020 – May 2021

College of Information and Computer Sciences, UMass – Amherst

- Held office hours, resolved student queries, walked through homework problems for the graduate class CS 690C Foundations of Applied Cryptography and CS 466 Applied Cryptography
- Graded homeworks, quizzes, assignments, exams for the graduate class CS 690C, CS 466

Emotion AI Program Mentor Jul 2020 – Aug 2020

Affectiva, Boston, MA (Remote)

- Mentored 3 undergrad students in the field of Machine Learning and Affective Computing
- Developed a prototype for an "Emotion-enabled" smart fridge
- Trained the VGG-16 food classifier on Freiburg Grocery dataset with the accuracy of 76.16%
- Became familiar with market analysis, idea pitching, patent creation and honed the technical aspects of data acquisition, data synthesis, and affect analysis

Software Developer Intern Jun 2018 – Jun 2019

The Maharaja Sayajirao University of Baroda, India

- Created simulations, visualizations of inner workings of operating systems in Java
- Utilized JNLP [Java Network Launch Protocol] to make the Java simulations render on client-side while using server resources with ~1000 simultaneous connections capacity
- Refactored the database of the learning platform site, on which these simulations were embedded, with 60% increase in speed-up efficiency
- Provided a mobile interface for the site which had inherently no support for servlet rendering

PROJECTS

SoundCluch – *https://github.com/Astuary/BoseSoundTouchAPI* Feb 2020

- Winner of "Best use of Bose SoundTouch API" and "Best Hack for Home Accessibility sponsored by Wayfair" at Hack(h)er413 2020 at UMass Amherst

- Enhanced the SoundTouch API in Python to get the motion sensor inputs within 150 cm with a Raspberry Pi, to sound off a custom audio notification through the Bose speakers

LSTM Variants for Time-Series Data Prediction Dec 2019

- Used the human activity recognition data set - ExtraSensory dataset, containing data from 60 individuals, for the task of probabilistic activity forecasting.
- Built LSTM variants to predict the probability that each of the five labels (LYING_DOWN, SITTING, FIX_walking, TALKING, OR_standing) at the future specified time, t.
- Experimented with GRU baseline model, LSTM baseline, CNN LSTM, Separable CNN LSTM

Optimization-based supervised and unsupervised learning models Sep 2019 – Sep 2020

Developed from scratch, the augmented versions of outlier minimizing linear regression with Huber and Approximate Absolute losses, logistic regression with Z-score transform, heteroscedastic regression, geometric regression, support vector classifiers with regularization, a custom neural network with regression and multi-class classification, laplacian mixture models with missing data imputations

Deep Image Prior - *https://github.com/Astuary/DeepImagePrior* Sep 2019 – Dec 2020

Denoising images with an auto-encoder with batch normalization and bilinear upsampling and also with deeper architectures, those with skip connections, averaging the results across iterations to scale up the resolution

LEADERSHIP

Coding Gym Leader – SureStart winter bootcamp to teach coding interview strategies Jan 2022

Campus Leader – Google Developer Students Club India Dec 2018 – Dec 2019

ACHIEVEMENTS

CICS Jumpstart Fellowship (2021) - College of Info and Comp Sci, UMass - Amherst

Gold Medalist (2019) – The Maharaja Sayajirao University of Baroda, B.Engg. in Computer Science

Student of the Year (2019) – The Maharaja Sayajirao University of Baroda, B.Engg. in CS

National Talent Search Examination [High-school] – Top 100 in Science and Mathematics

All India Essay Writing Event – Honorable Mention

Community Science Center – Winner of Conmat Cosmopolitan Tree Garden Award