# Atharva Anand Joshi

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## RESEARCH INTERESTS
Speech Processing: Enhancement and Separation, Deep Learning, Representation Learning

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## EDUCATION

**Carnegie Mellon University**                                                                     Pittsburgh, PA
Master of Science in Electrical and Computer Engineering - Applied Advanced Study (AI/ML Systems)      December 2024
GPA: 4.0/4.0

**Birla Institute of Technology and Science, Pilani**                                                Pilani, India
Bachelor of Engineering in Electrical and Electronics Engineering                                      July 2022
GPA: 9.49/10
GRE: 331/340 (AWA: 4/6), TOEFL: 109/120

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## SKILLS

**Programming:** Java, Python3, C, CUDA, MATLAB
**Deep Learning:** PyTorch, TensorFlow, Keras, AWS and GCP for ML
**Frameworks:** Kalimba Toolkit, PySpark, WandB, OpenMP, LaTeX, Git

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## EXPERIENCE

**Hewlett-Packard Inc., Poly**                                                                       Austin, TX
Machine Learning Intern                                                                          May – August 2024
- Introduced a novel ML pipeline that enhances speech through a combination of spatial and speaker representations
- Enabled a journey wherein the headset adapts to users' voices and improves over time at isolating only their speech
- Condensed the model such that the entire pipeline can be reliably hosted on the Tensilica HiFi DSP
- Automated the complete development process to make it scalable to upcoming products with diverse form factors
Research and Development Intern                                                                   May – August 2023
- Developed a deep learning model that can suppress stationary and impulsive background noises directly on headsets
- Optimized the inference pipeline on memory, compute and latency for real-time execution on the QCC5171 DSP
- Introduced an efficient approach to Audio ML Development that would make integration into products 6-8 times faster

**American Express, Artificial Intelligence Labs**                                                Gurgaon, India
Analyst - Product Development                                                                July - December 2022
- Researched a blend of Tabular models with Tree-based algorithms for the Credit Default Prediction problem
- Enhanced model performance by leveraging extensively hand-engineered features, along with meta features
- Generated valuable business insights pertaining to features selection and effective aggregation of temporal features
Analyst Intern                                                                              January - June 2022
- Proposed a template-based journey that allows users to seamlessly create and deploy their machine learning pipelines
- Developed a framework that facilitates deployment of end-to-end Self Learning pipelines for Sequence Models

**Adobe Research, India**                                                                          Bangalore, India
Research Intern                                                                               May - August 2021
- Created rich user representations that can be projected onto edge servers, hence powering faster marketing services
- Performed various experiments around the extent of compression and updatability of the representations generated
- Contributed towards a **patent** as a co-inventor - "Generating Concise and Common User Representations for Edge Systems from Event Sequence Data Stored on Hub Systems" (US20230419339A1 - Filed June 24, 2022)

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## PUBLICATIONS

- **A. A. Joshi**, H. Settibhaktini, and A. Chintanpalli. Modeling concurrent vowel scores using the time delay neural network and multitask learning. IEEE/ACM Transactions on Audio, Speech, and Language Processing, 30:2452-2459, 2022

- **A. A. Joshi**, P. Bhardwaj, and S. M. Zafaruddin. Terahertz wireless transmissions with maximal ratio combining over fluctuating two-ray fading. IEEE Wireless Communications and Networking Conference (WCNC), pages 1575-1580, 2022

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## PROJECTS

### Machine Learning for Speech Processing Applications
- Contributed an end-to-end reproducible deep learning pipeline for the Kinect-WSJ dataset – a multichannel, reverberated and noisy version of the WSJ0-2mix dataset to the ESPnet Speech Processing Toolkit
- Performed benchmark analysis on this speech separation dataset using the current state-of-the-art models
- Currently investigating the data and model scalability aspects for large speech enhancement and separation models

### Proactive Servicing: American Express ML Challenge
- Utilized event sequences and demographic data to predict customer intent at the start of the Ask AmEx chat session
- Employed joint training of Bidirectional GRU with Feedforward Networks
- Attained a validation top-5 accuracy score of 0.768 and hence made it to the top 10 leaderboard out of ~80 teams

### High Performance Parallel Implementations for Convolutional Neural Networks
- Provided fast OpenMP and CUDA implementations for various subroutines corresponding to the convolution layer
- Investigated several design choices in detail aiming to optimize speedup over a simple sequential C++ implementation
- Achieved maximum speedup of 4.23x on the Intel(R) Xeon(R) Silver 4208 CPU and 73.87x on the Nvidia Tesla T4 GPU

### Concurrent Vowel Identification Using DNN
- Developed a novel computational model to predict the effect of fundamental frequency difference on the identification scores in a Concurrent Vowel Identification Experiment
- Trained a TDNN augmented with a Multi-task Learning setup on the neuron responses from the Auditory Nerve Model

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## AWARDS AND RECOGNITION

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| HP InternStellar Awards: Technical Impact – 2nd Runner up among all US interns | 2024 |
| HP Intern Award – 4th position among ~90 engineering interns | 2023 |
| American Express Modeling Super Bowl – Top 10 Leaderboard | 2022 |
| OP Jindal Engineering and Management Scholarship | 2020-2021 |
| Institute Merit-Based Scholarship, Birla Institute of Technology and Science, Pilani – Top 2% | 2019-2022 |
| Regional Runner-up at TCS IT Wiz, a nationwide inter-school quiz competition | 2015 |

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## MENTORSHIP AND TEACHING

- **Graduate Teaching Assistant** for 10-605: ML with Large Datasets     Spring 2024 - Fall 2024
  Instructors: Prof. Virginia Smith, Prof. Ameet Talwalkar and Prof. Geoff Gordon
- **Graduate Teaching Assistant** for 18-661: Introduction to ML for Engineers     Fall 2023
  Instructors Prof. Yuejie Chi and Prof. Beidi Chen
- **Undergraduate Teaching Assistant** for BITS F312: Neural Networks and Fuzzy Logic     Fall 2021
  Instructors: Prof. Surekha Bhanot and Prof. Bijoy Krishna Mukherjee

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## RELEVANT COURSEWORK

**Graduate:** Introduction to Deep Learning, Machine Learning for Signal Processing, Deep Generative Modeling, Machine Learning with Large Datasets, Natural Language Processing, Introduction to Machine Learning for Engineers, CUDA Programming, Convex Optimization

**Undergraduate:** Neural Networks and Fuzzy Logic, Artificial Intelligence, Object Oriented Programming (Java), Digital Signal Processing, Digital Image Processing, Communication Systems, Operating Systems

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## POSITIONS OF RESPONSIBILITY

**Joint Coordinator** at Ragamalika, the Classical Music and Dance Club of BITS Pilani, Pilani Campus (2020-2021)
- Actively involved in composing music for semester productions and managing professional concerts
- Avid practitioner and performer of Hindustani Classical Vocal Music for the past fourteen years