Archiki Prasad
Electrical Engineering
Indian Institute of Technology Bombay
Specialization: CSP

UG Fourth Year (Dual Degree)
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Examination	University	Institute	Year	CGPA/%
Graduation	IIT Bombay	IIT Bombay	2019	9.59
Intermediate/+2	TSBIE	Sri Chaitanya Junior College, Hyderabad	2016	98.50
Matriculation	CBSE	Jubilee Hills Public School, Hyderabad	2014	10.00

Pursuing a **Minor** in **Computer Science and Engineering**

MAJOR ACADEMIC ACHIEVEMENTS

- Currently ranked **Third** in the Electrical Engineering Department (Dual Degree students) [Present]
- Awarded **Branch Change** to Electrical Engineering based on exceptional academic performance [2017]
- Secured **All India Rank 527** in IIT-JEE (Mains) out of about 1.4 million applicants [2016]
- Recieved **Advanced Performer's (AP)** grade in Linear Algebra & Economics (awarded to **top 1%**) [2017]

RESEARCH PROJECTS

Accent Analysis of End-to-End Automatic Speech Recognition (ASR) Models [July-Dec'19]
Guide: Prof. Preethi Jyothi *Computer Science and Engg., IIT Bombay*

- Analysed **hidden representations** of an end-to-end state of the art automatic speech recognition model: **DeepSpeech2** and proposed explanation techniques to understand confounding effect of accents
- Extended **gradient** and **information theoretic interpretation** techniques for NNs to speech modality
- Identified the hidden representations that exhibit maximum accent differentiation; useful in accent adaptation
- Authored a **long paper** accepted in the **Association of Computational Linguistics (ACL), 2020**

Cold Start Time Series Forecasting [May-July'19]
Research Internship *Adobe Research, Bangalore*

- Worked on time-series forecast of dynamic features, like sales of products, with little or no historical data by leveraging web-scraped **meta-information** and **similarity** among products and time series
- Extracted features from product descriptions through **topic modelling** techniques like LDA and TF-IDF
- Proposed a novel architecture: Continuous Dynamic Key Value Memory Networks an extension to **Memory Augmented Neural Networks**; achieved up to **55% improvement** over LSTM baseline on mean metrics
- Filed a **patent** in the USPTO and presented in the poster track of the **Web Conference (WWW), 2020**

Decentralized Users with Age-of-Information (AoI) Bandits [Jan'20-Present]
Guide: Prof. Sharayu Moharir *Electrical Engg., IIT Bombay*

- Developing **Multi-Arm Bandit** based policies to **schedule** M decentralised simulataneous users on N channels to minimize total time elapsed since destination received most recent update from each user (AoI)
- Implementing scheduling decisions based on **Upper Confidence Bound** and **Thompson Sampling**
- Designing **AoI-aware** scheduling policies and a **novel hybrid policy** with trade-off between UCB and TS
- Characterizing lower and upper **bounds** on AoI based regret for policies and validating them via simulations

KEY TECHNICAL PROJECTS

Dual-Degree Project , *Guide: Prof. Preethi Jyothi & Prof. V. Rajbabu* [Jun'20-Present]

- Exploring the effect of noise and accents on end-to-end ASR models, like DeepSpeech2, in conjunction
- Developing noise-robust models through front-end **Speech Enhancement**, Data Augmentation, **Multi-Task Learning** and **Adversarial Training**, and understanding their susceptibility to accented speech

Small Footprint Key Word Spotting, *Guide: Prof. Preethi Jyothi & Prof. V. Rajbabu* [Jan-Apr'120]

- Identified key words in continuous speech through **ResNet** and **Convolutional Neural Network** based models in PyTorch; used extensively for detecting wake-word(s) like 'Alexa', 'Siri' in personal assistants
- Analysed **robustness** to background noise and compared performances on Google Speech Commands
- **Reduced** number of **parameters** and number of **operations** of models; capable to run on ARM processors

Contextual Multi Arm Bandits, *Guide: Prof. Sharayu Mohrair (Course Project)* [Sep-Nov'18]

- Analysed a variant of MABs with underlying (user) context that influences rewards and actions (on items), and evolves over time based on them; specifically dealt with **positive externality** on user arrivals
- Explored existing bandit algorithms and conceptualized a new **Rejection Based Arm Elimination** policy

Evolutionary Model Selection using Machine Learning, *Research Internship* [May-July'18]
Guide: Prof. Arndt Von Haeseler *Universität Wien, Vienna, Austria*

- Contributed to developing a novel technique of selecting evolutionary models for genomic sequential data using machine learning; One of the **first applications** of artificial intelligence in the field of phylogenetics
- Designed an **LSTM** architecture on TensorFlow and achieved **94.37% accuracy**; on-par with statistical methods like Bayesian and Akaike Information Criteria and significantly **reduced computational power**

OTHER PROJECTS

- **Low-Resource Dialect Adaptation:** Adapted DeepSpeech2 model for two low-resource Spanish dialects via **transfer learning** and **adversarial training**; achieved up to **40% improvement** in word error rates
- **High Speed Polymer Optical Fibre Link:** Built a cost-efficient printed PCB prototype for a laser-based optical fibre communication link delivering data speeds of up to 70 Mbps over 100m long optical fibre cable
- **Audio Source Separation:** Designed a deep **Convolutional Neural Network** based model using PyTorch for separating professionally mixed songs into constituent vocals, drums, bass and other instruments.
- **Secure Voice Communication:** Low-resource voice communication system with 85% speech compression using LPC and encryption using FIR filters; Among the **top 5** projects in TI-DSP seminar, IIT Bombay
- **Pipelined RISC Processor:** Designed a 16-bit, 8-register, 6-stage pipelined processor with 15 possible instructions; used **VHDL** for coding, Quartus/Modelsim for simulation and **FPGA** for hardware testing
- **Artistic Style Transfer:** Designed an iterative algorithm to perform style transfer from famous paintings to real-life pictures on MATLAB and achieved results comparable to machine learning based algorithms
- **Summer of Science:** Explored the world of **derivatives and mathematical finance**, covering topics like the Black-Scholes model, common strategies like hedging, spreads, and options arbitrage.

KEY POSITIONS HELD

Institute Student Mentor, *Student Mentorship Programme* [July'19-Present]
2-tier organizational body enabling constructive interaction, guidance and mentorship of first year students

- Selected via rigorous procedure comprising of **SOP**, **peer reviews** and **interviews** from over **300** applicants
- Mentoring **12** first-year female students in the Electrical and Computer Science & Engg. Department

Teaching Assistant, *IIT Bombay*
MA-106, Linear Algebra [Jan-March'18 & 20] **MA-205, Complex Analysis** [July-Sept'18]
MA-207, Differential Equations – II [Sept-Nov'18]

- Engaged in weekly **problem-solving** sessions and in-depth discussion of concepts with about **45 students**
- Assisted the professor in conducting quizzes, deciding marking scheme and evaluating answer scripts

TECHNICAL SKILLS

Programming & Development	C/C++, Python, R, VHDL, MATLAB, Git, Docker, LaTeX, HTML
Machine Learning	TensorFlow, PyTorch, Keras, NumPy, OpenCV, Pandas

KEY COURSES UNDERTAKEN

- **Electrical Engg.:** Microprocessors, Digital Signal Procession, Information Theory and Coding, Communication Networks, Advanced Concentration Inequalities, Speech Processing, Applied Linear Algebra
- **Data Analysis:** Data Analysis and Interpretation, Proability and Random Processes, Linear Algebra
- **Computer Science:** Data Structures and Algorithms, Introduction to Machine Learning, Operating Sytems, Foundation to Digital Image Processing, Automatic Speech Recognition

EXTRA-CURRICULARS

- Participant in **Girls Take Dalal Street**, Bombay Stock Exchange; conducted by UBS & Bloomberg [2019]
- Worked for the flagship contest of **E-Summit Eureka!** as a co-ordinator for **E-Cell, IIT Bombay** [2017]
- **Semi-finalist** in ILS Pune Debate Tournament (Noive); **2nd** in Debate General Championship, IITB [2016]