Shreyas Chaudhari | EE15B019

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Undergraduate Education

PROGRAM	INSTITUTION	CGPA	DURATION
Bachelor of Technology Electrical Engineering	Indian Institute of Technology Madras Chennai	8.90/10	2015 - 2019

Major Projects

Improvements in the Policy Gradient Algorithm

Prof. Prashanth L.A., CSE, IIT Madras — *January 2019 - Present*

- Ongoing **thesis** work with the aim of improving the **convergence rate and guarantees** of the policy gradient algorithm in RL
- Methods being considered are **second order** and **noise reduction methods** and **risk sensitive** measures derived from prospect theory

Multi-Hop Question Answering using Graph Convolutional Networks

Prof. Mitesh M. Khapra, CSE, IIT Madras — *July 2018 - January 2019*

- Ideated and implemented a deep learning framework for **Question-Answering** on the ***Wikihop*** and ***HotPotQA*** datasets
- Built a graphical model allowing **multi-hop reasoning**, wherein the context was taken across several documents to arrive at an answer
- Graph connected **coreference** mentions and nouns within documents and **named entities** and **co-occurrences** across documents
- Uniform edge weights with **hierarchical attention** gave an accuracy score of 60% on dev-set, with just 300 dimensional word vectors

Correlation in Finite-Armed Structured Bandits for Movie Recommender Systems

Prof. Gauri Joshi, ECE, CMU — *July 2018 - Present*

- The algorithm improves upon the UCB And Thompson Sampling algorithms by considering **correlation between arms**
- **Implemented** the new algorithm on the ***MovieLens dataset*** (U Minnesota), with genres as arms and meta-users as the latent variable
- Submitted **paper** is under review at **The Conference on Uncertainty in Artificial Intelligence 2019**, built upon the ***preprint***

Energy-Delay-Distortion Optimization over a Communication Channel

Prof. Rahul Vaze, STCS, TIFR, Mumbai — *May 2017 - July 2017*

- Worked on the **information versus transmission time trade-off under energy constraints** over a communication channel
- Formulated a **convex optimization set-up** for the continuous problem, a setting which was unexplored till then to our knowledge
- Solved the discrete version as a **multi-partitioning problem**, the proposed greedy algorithm incurring at most **2-times** optimal cost
- Authored the paper ***Energy-Delay-Distortion***[arXiv:1711.05032v1] accepted at the **National Conference on Communications 2018**

Pseudo-Random Number Generator using Generative Adversarial Networks

Prof. Gauri Joshi, ECE, CMU — *January 2018 - May 2018*

- Built a **Pseudo-Random Number Generator** using Generative Adversarial Networks, to pass statistical tests by NIST
- Experimented with **deep neural architectures** like GANs supported by **information theoretic analysis** to evaluate performance
- Stability in convergence was attained by employing **Wasserstein GANs** with **gradient clipping** to handle exploding gradients

IITMSAT - Payload Team

Prof. David Kolipillai and Prof. Harishankar Ramachandran, EE, IIT Madras — *January 2016 - December 2016*

- **Student satellite project** with the scientific goal of studying the **energy spectrum of charged particles** in the upper ionosphere
- The energy spectrum is theorized to have a correlation with seismic activity: possible **model for earthquake prediction**
- **Modified and ideated** on the final PCB layout, debugging possible exceptions in the payload code; experiments conducted at **BARC**

Professional Experience

SUMMER ANALYST, GOLDMAN SACHS — Bangalore

Mentor: Felix Breuer, Vice-President, Securities FAST Team — *January 2019 - Present*

- Analysed the trade data for European markets post MiFID II regulations; helped gauge the **monetary value of acquired data**
- **Trade volume** and **market share** driven analysis compared against existing datasets, indicating ~40% increase in market coverage
- **Probabilistic modelling** of **quoting patterns of dealers** using pre-trade data feed, drew correlations across aggressiveness of quoting
- Received a **full-time offer** to join the Securities FAST (Franchise Analytics Strategy & Technology) team

MACHINE LEARNING SD TEAM, DETECT TECHNOLOGIES **Chennai**
Funded by Reliance Industries *May 2016 - July 2016*

- **Developed heuristic code** for the flagship product **GUMPS**, which detects defects and their growth in oil refinery pipelines
- Code detected anomalies in the reflected waveform of the ultrasound sensors, determining the **position of defect** and its **rate of decay**
- Implemented idea is projected to impact **5,000 human lives** annually in oil refineries across the country

Relevant Course Projects

Equivalence of GANs and Zero Sum Games
Prof. P.V. Reddy; Course - Dynamic Game Theory *January 2018 - May 2018*

- A game theoretic analysis of **Generative Adversarial Networks**, exploiting the **two-player minimax game modelling**
- Collated research papers to show that the **training process** is a **two-player zero sum game**, under certain constraints, satisfying the conditions of MiniMax theorem; allows for Nash equilibrium to be minmax/maxmin value, addressing the issue of instability in GANs

Risk-Sensitive Reinforcement Learning: A Comparative Analysis
Prof. L.A. Prashanth; Course - Reinforcement Learning *August 2018 - Present*

- Empirically analysed the existing methods for risk sensitive RL various spanning **risk measures** like variance bounds and probabilty of risk bounds; incorporating them in **algorithms** like Q learning, SARSA and their risk-sensitive variants
- Bench-marking on a Gridworld with error states, introduced a **new risk measure** that maximizes distance from error states per step

Scholastic Achievements

- Selected for the **Danaher Scholarship Program, 2018** by **Scholarship America** to fund undergraduate education
- **AIR 18** in IIT-JEE Mains, 2015; **AIR 356** in IIT-JEE Advanced, 2015 - In **top 0.02%** of 0.15 million students
- Awarded **KVPY scholarship** (2014) - **AIR 118** - by Department of Science and Technology, Government of India
- Qualified for national level of **Indian National Astronomy Olympiad (2015 and 2013)** - In **top 400** across the country
- Qualified for national level of **Indian National Junior Science Olympiad (2013)** - In **top 400** across the country

Relevant Courses

- Principles of Machine Learning
- Data Structures & Algorithms
- Information Theory & Coding
- Reinforcement Learning
- Game Theory
- Control Systems
- Deep Learning
- Linear Algebra
- Probability Theory

Talks and Presentations

National Conference of Communications, 2018 *Slides*
Presented the paper Energy-Delay-Distortion in the Communication Networks track at NCC 2018 at IIT Hyderabad

GANs: A Game Theoretic Approach *Slides*
Presented the equivalence between GANs and zero sum two player games, and the convergence properties that follow

Risk-Sensitive Reinforcement Learning *Slides*
Presented an empirical comparative analysis on existing risk measures in RL while introducing a new risk measure

Goldman Sachs: FAST Team Summer Analysts Presentation
Globally presented the work under the two internship projects to team members in Bangalore, London and New York

Leadership Experience

Core, Sponsorship & PR, 52nd Inter IIT Sports Meet	○ **Headed** a team of **16** that handled sponsorship and publicity for the Meet; which involved participation of **23 IITs** ○ **Generated funds of ~INR 3 million** to realize the recreational events planned under the **"Games Village"** ○ Handled a budget of **INR 35 million** for end-to-end organization: hospitality, transportation and event-conduction ○ Conducted the **social campaign** of the Inter IIT Sports Meet for the **routing of CSR funds to NGOs**
Coordinator, SOC, 2016	○ **Oversaw all sponsorship** for the SOC, which handles the entirety of sporting activities within the institute ○ Helped acquire funds for a total expenditure of ~**INR 50L**, while simultaneously carrying out **publicity events**
Acad-Mentor, Saathi, 2018	○ **Mentored** a group of 3 freshmen to provide supervision and assistance on an academic front

Extra-Curricular Activities

Sports	◦ Member of the **IIT Madras Athletics team**: won a **bronze medal** at the Inter IIT Sports Meet at Kanpur (2016) ◦ **13 medals** in two years in inter-hostel Athletics competitions; team **captain** for two years ◦ Member of the hostel football, hockey and athletics teams
Co-curricular Activities	◦ Member of the IIT-Madras team that finished **third** in the regionals of **NASA Space Apps Hackathon challenge** ◦ First runner up in the **Deep Learning Hackathon** conducted by **Amazon Web Services**, Shaastra 2018 ◦ First runner up in the **Big Data Challenge** conducted by **American Express**, Shaastra 2018