SHRUTI HIRAY

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EDUCATION

Indian Institute of Technology Bombay, India　　　　*July 2014 - Present*
Dual Degree (Bachelor +Master of Technology), Department of Electrical Engineering
Masters Specialization: Communications & Signal Processing
Minor degree in Computer Science
CGPA: 8.51/10

RESEARCH PROJECTS & INTERNSHIPS

Lightning Network Simulator - Dual Degree Thesis
Guide: Prof. Saravanan Vijayakumaran　　　　*Spring 2017 - Present*

- Studied scalability of **Bitcoin blockchain** with Lightning Network.
- Implemented a simulator for multihop payment routing in Lightning Network in **Haskell** and **Python**.
- Analyzed Flare routing protocol - achieves **98%** reachability to any node in the 2000 node network with only 4 beacons.

Multisource and Multipath Content Transfer
Guides: Prof. D. Manjunath & Prof. Nikhil Karamchandani　　　　*Autumn 2018*

- **Parallel download** through Cellular and WiFi from multiple sources.
- Implemented browser plugin using **Javascript & Google Native Client**.
- Implemented **Java Cloud Server** on **AWS with Apache** and **C++ Server** on **OpenWrt** Operating system installed on WiFi access points.
- Parts of file downloaded from cache in WiFi access points reduces network congestion considerably and increases throughput.

Summer Risk Analyst at *American Express*　　　　*Summer 2017*

- Built **dynamic pricing engine** for Membership Rewards using **Gradient Boost** in **SQL & Hadoop**.
- Used customer analytics data to personalize the offers to customers.
- Achieved **80%** accuracy of prediction of expected points redeemed by customer.
- Received **pre-placement offer** for remarkable work in the internship.

Android Application Developer at *Carsense*　　　　*Summer 2016*

- Developed APIs for data sync with hardware device via **BLE communication**.
- Analyzed user activity with **CleverTap** and crashes with **Crashlytics**.
- Developed **JUnit** Test Cases using **Espresso Test Framework** to test the app features on various mobile devices present in **Google Cloud Testing Lab**.

TEACHING ASSISTANTSHIP	EE720: Number Theory & Cryptography	Prof. Saravanan Vijayakumaran
	EE308: Communication Systems	Prof. S. N. Merchant

RESEARCH INTERESTS

My research interest lies in **Blockchain & Cryptocurrency Technologies, Cryptography, Distributed Systems**.

KEY ACADEMIC PROJECTS	**Algorand Simulator** *Spring 2019*
• Discrete event simulator of Algorand using **Gossip, Cryptographic sortition**.
• Tested for **Fail-Stop** adversary, **Byzantine** adversary.

Optimal Relay Node Placement *Spring 2018*
• Implemented relay node placement in **LTE-A Cellular Systems**
• Jointly optimized for downlink and uplink for **coverage extension**.

Speech Watermarking *Autumn 2017*
• Developed watermark extraction algorithm for proving ownership and tampering.
• Implemented using **Autoregressive model** & **Psychoacoustic model**.

Automatic Speech Recognition system *Autumn 2017*
• Classified speech signals of spoken numerical digits using labelled data.
• Used **Cepstrum, K-means clustering, Dynamic time warping**.

Voice Morphing using Linear Prediction *Spring 2017*
• The information in speech of one speaker is morphed in the voice of another.
• Used **source-filter** model of speech, linear prediction and pre-emphasis in **phonemes**.
• Selected in the **top 4** projects among 30 projects.

Microprocessor Design *Autumn 2016*
• Designed a 16 bit - 8 register **RISC** computer system of 14 instructions.
• A 6 staged pipeline processor with **hazard mitigation** using data-forwarding. |
| RELATED COURSEWORK | **Computer Science**: Blockchain Technology, Number Theory & Cryptography, Network Security, Data Structures & Algorithm, Computer Networks, Discrete Structures, Operating Systems, Machine Learning, Computer Graphics

Electrical: Error Correcting Codes, Speech Processing, Wireless Communications, Advanced Communication Networks, Advanced Signal Processing, Microprocessors

Others: Probability, Data Analysis, Economics. |
| TECHNICAL SKILLS | **Programming Languages:** Python, Solidity, C/C++, Java, Haskell, Django, Assembly Language, VHDL, SQL

Development Tools: Truffle, Ganache, PRAAT, MATLAB, Scilab, LaTeX 2_ε, ngSpice, Arduino, GitHub, Android Studio, AutoCAD, SolidWorks |
| POSTIONS OF RESPONSIBILITY | **Technical Councilor** of *Hostel 10, IIT Bombay* *2016-2017*
Organized **telescope, microscope** handling workshops, virtual reality session.
Spread awareness of **Women In Tech**, managed technical general championships.

Institute Convener of *Robotics Club, IIT Bombay* *2015-2016*
Conducted inter-hostel robotics events, organized industrial visits and guest lectures.
Mentored technical activities, played a key role in creating **robotics community**. |
| EXTRA CURRICULAR ACTIVITIES | • Performed Maharashtra Folk dance in **Institute Classical & Folk Arts Night.**
• Secured 2nd position in **Freshiezza Group Dance** Competition.
• Completed a basic certified course in **Spanish** language.
• Completed a course in **Lawn Tennis** under **National Sports Organization**.
• Secured **Bronze** medal in Institute **Carom** General Championship. |