**Prathu Baronia** | **14D070046**
**Electrical Engineering** | **Dual Degree (B.Tech+M.Tech.)**
**Indian Institute of Technology Bombay** | **Male**
**Specialization: Microelectronics** | **DOB: 28-5-96**

| Examination | University | Institute | Year | CPI / % |
|---|---|---|---|---|
| Graduation | IIT Bombay | IIT Bombay | 2019 | 8.26 |
| Intermediate/+2 | CBSE | S.R Senior Secondary School | 2014 | 90.40 |
| Matriculation | CBSE | Deep Memorial Public School | 2012 | 9.40 |

## SCHOLASTIC ACHIEVEMENTS

- Secured **All India Rank 241** in **JEE-Advanced-2014** with a percentile of **99.8** among **1.2 lakh** candidates
- Scored **342/360** in **JEE-MAIN-2014** with a percentile of **99.92** among **12.7 lakh** candidates
- Achieved **All India Rank 163** in prestigious **KVPY fellowship, 2014** conducted by **DST, Govt. of India**
- Awarded **Merit Certificate** with a percentile of **98.1** in **National Standard Examination in Astronomy-2014**
- Awarded **Merit Certificate** with a percentile of **99** in **National Standard Examination in Chemistry-2014**

## PROFESSIONAL EXPERIENCE

**Embedded System Engineer** (May'17 - Jul'17)
*Greetude Energy Pvt. Ltd, Bangalore*
- Designed a **Remote Billboard Surveillance System**, providing periodic images on **AWS bucket** & **Google Drive**
- **Saved** the cost of an external **Intellectual Property** by building and administering an **in-house** surveillance design
- Developed a **control and debug interface** for the site and **circular logs** for **energy consumption and crashes**
- Devised a **Smart Metering System** for transmitting and logging standard power parameters onto the main server
- System included **synchronously reading internal registers** and **space efficient circular logging** of the parameters

## RESEARCH EXPERIENCE

**Linux Port to Indigenous AJIT Processor** (Jul'18 - Present)
*Guide: Prof. Madhav P. Desai, IIT-Bombay*
- Member of **Embedded Software Design** team of **India's first** in-house **designed and fabricated processor**
- Designed an **exclusive AXI-Lite interface DDR Memory controller** for a **32 bit Sparc V8 processor**
- Conducted memory tests on the Xilinx Virtex-7 Series **FPGA** board with a prototype Microblaze processor
- Developed a **PCI express to AXI interface** for processor and host CPU connection using Xilinx IP blocks
- Verified the above design on the FPGA board with a **custom developed C driver for PCI express peripherals**
- Generated **exclusive Memory mapped AXI Stream FIFOs** through **High Level Synthesis** tools

## KEY COURSE PROJECTS

**Android 5 Port to ZedBoard** (Jan'18 - May'18)
*Guide: Prof. Sachin Patkar, IIT-Bombay*
- **Ported Android 5**(Lollipop) to **ARM Cortex A9** to build a **bare bone IoT infrastructure** on Zedboard
- Developed a custom **First Stage bootloader** compatible with **U-boot** in Vivado Design Suite from ground up
- Developed custom **Second Stage bootloader(U-boot)** for a modified **Linux Kernel with Android patches**
- Designed an **exclusive HDMI hardware block** to provide an interface between FPGA and on-board HDMI chip
- Implemented a **hardware GPIO core** for peripheral interfacing using programmable logic segments

**Hexapod Navigation using WiFi Localization** (Feb'18 - Apr'18)
*Guide: Prof. Kavi Arya, IIT-Bombay*
- Designed a **1.5m** $\times$ **1.5m indoor localization** network using **Xbee radios** for closed space settings
- Achieved an **average location accuracy of 90%** for indoor setting with an **error bound of** $\pm$**10cm**
- Calculated location by taking a **moving average** of **Trilateration algorithm** results on target to node distances
- Fabricated and assembled a **Hexapod** with 18 degrees of freedom from ground up as a target object
- Demonstrated a scenario where Hexapod was guided using the **coordinates obtained by the localization system**

**Walk Smart Vision** (Jan'17 - Apr'17)
*Guide: Prof. Kushal R.Tuckley, IIT-Bombay*
- Designed a **3-level navigation** system for the visually impaired people using a **Star network of Xbee radios**
- Provided **precise proximity control** using **Ultrasonic** modules at **head, waist and foot** level for all round security
- Conveyed **critical obstacle** information to the user through **surficial vibrations proportional** to the **proximity**
- Demonstrated the performance in a **populous setting** with successful navigation by **blindfolded novice** users

**Real Time Audio Compression using MDCT** (Mar'17 - Apr'17)
*Guide: Prof. V.M Gadre, IIT-Bombay*
- Achieved **5x** compression by **redundant data removal** using **Modified Discrete Cosine Transform**
- Improved **80% efficiency** for storage and transmission of audio signals while conserving **95% signal information**
- Developed a compression block and a **wireless socket block** to compress & transmit the audio in **real time**

**Data Abstraction Layer** (Mar'15 - Apr'15)
*Guide: Prof. Saurabh Lodha, IIT-Bombay*
- Interfaced **MAX V CPLD** board with **SRAM, ADC, and DAC** to sample, store, and display mixed signals
- Developed **SRAM, ADC, and DAC drivers** from ground up in **VHDL** and simulated them on **GTKWave**

**Processor Designing & Testing** (Sep'16 - Nov'16)
*Guide: Prof. Virendra Singh, IIT-Bombay*
- Designed a **16-bit pipelined RISC processor** in VHDL and verified it through simulations in **Quartus ModelSim**
- Validated the design at **50MHz** for a **Turing complete ISA** on **DE0 Nano FPGA** using the **Signal-Tap Analyzer**

**Drive Parameter Extraction** (Apr'17 - Nov'17)
*Guide: Prof. Siddarth Tallur, IIT-Bombay*
- Extracted **critical parameters** such as **Angular velocity** and **acceleration** of a bat during cricket shots
- System included an **Accelerometer** and a **Gyroscope** for measurements, and a **Xbee radio** for transmission
- Attained **close measures** for parameters like **delay in the shot, angular position of the bat** at impact

**Book Genre Classifier** (Mar'18 - May'18)
*Guide: Prof. Amit Sethi, IIT-Bombay*
- Achieved **72.3% test accuracy** in classifying the genre of a book on test dataset comprising **6000+ images**
- Attained **78.6% accuracy** using **Bag-of-Words** model to extract **feature vectors** from titles on **Random Forest**
- Implemented **Transfer Learning with VGGNet CNN** pretrained on ImageNet dataset in Python using Keras

**Pen-Plotter** (May'15 - Jun'15)
*Guide: STAB, IIT-Bombay*
- Designed an **auto-sketcher** bot for **sketching and mimicking handwriting** through finely manoeuvred steps
- **Generated** instructions by a **fine grid image division** and an **edge extraction** process conducted in MATLAB
- **Interpolated high curvature** elements with **concise straight lines** and **fine axial movements** by lead screws
- Provided a **pipelined serial interface** for communicating instructions prepared post image processing to the sketcher

## TECHNICAL STRENGTHS

| | |
|---|---|
| **Programming Languages & HDL** | Embedded C, ARM Assembly, VHDL, C, C++, Shell Scripting, Python |
| **Hardware Platforms** | FPGA, STM, ARM, AVR, BeagleBone, Raspberry Pi |
| **Design Tools** | Vivado HLS, Xilinx SDK, TI CCS, Quartus |

## KEY COURSES TAKEN

| | |
|---|---|
| **Embedded** | Embedded System Design(*EE*), Embedded System Design(*CSE*) |
| **Digital Design** | VLSI Design, System Design, Microprocessors, Sensors in Instrumentation |
| **Math & Statistics** | Data Analysis and Interpretation, Probability & Random Processes, Complex Analysis |
| **Miscellaneous** | Digital Signal Processing, Communication Systems, EM waves, Control Systems |

## POSITIONS OF RESPONSIBILITY

**Teaching Assistant** | Electromagnetic Waves (Jul'18 - Present)
- **Managed logistics** and assisted the professor in **ensuring smooth functioning** of the course and exams
- Evaluated answer scripts and **conducted practice sessions** for a batch of **120+ undergraduate students**

**Overall Music Coordinator** | Performance Arts Festival'18 (Feb'18 - Apr'18)
- Secured the **First Prize** in **Performance Arts Festival'18** while **leading** a team of **15 people**
- Received the **Best Music** award and a **Special mention for Organizational skills** out of **100+ students**
- Was the **principal composer** of the **background score** and an **original composition**

## EXTRA-CURRICULAR
- Secured the **First position** in **Inter-Hostel Music Championship, 2017** as a part of an **8 piece band**
- Received the **Best Original Composition** award in **Inter-Hostel Music Championship, 2017**
- **4 years** experience of **Spanish** and **Electric Guitar** playing, and **composing music pieces**
- **Core member** of the **Hostel band**, **Hostel Cricket team**, and **Performance Arts Festival Team**
- Completed a year long training in **Cricket** under **National Sport Organization, IIT-Bombay**