Pursuing a Minor in the **Computer Science Engineering** Department

SCHOLASTIC ACHIEVEMENTS

- Currently ranked **2nd** in the Dual Degree batch of Engineering Physics Department, IIT Bombay ['20]
- Selected twice for the Kishore Vaigyanik Protsahan Yojana (KVPY) fellowship awarded by DST ['15, 16]

PUBLICATIONS

- A baseline correction model for humidity and temperature compensation **IEEE Sensors 2019, Canada** ['19]
  - *Ghosh Sujoy, Anujay Ghosh,* ***Nived Kodavali****, Chandra Shekhar Prajapati, and Navakanta Bhat*
- Unsupervised Generative Networks for Single Image Raindrop Removal **Submitted to AAAI 2021** ['20]
  - ***Nived Kodavali****, Pradumn Kumar and Saqib N Shamshi*

INTERNSHIPS & RESEARCH PROJECTS

Deep Learning enabled Inverse Design for nanophotonic waveguide couplers April'20 - Present

Guide: Prof. Anshuman Kumar *Master's Thesis*

- Built models of the waveguide coupler in **COMSOL** and **Lumerical FDTD**, optimizing parameters like meshing, dimensions, reducing the **simulation time from 5 min to 15s** (in order to speed up Dataset Generation)
- **Generated** 4-5 Datasets of ∼**5000** points each, to train models (**SNN, CNN, VAE**, **Dual-encoder**) in **PyTorch**
- Developed a **Genetic Algorithm** to optimize data generation, improving the dataset quality for training DL Models

Upcoming Work:

- Improve the forward model and build a **Tandem NN Architecture** for inverse design to deal with **non-uniqueness**
- Build a **Reinforcement Learning** based **DDQN Model** using a robust forward model to generate necessary data

Single Image De-Raining with Generative Adversarial Neural Networks Mar'20 - Present

Guides: Mr. Saqib Shamsi (Whirpool Co.), Prof. Amit Sethi (EE IITB) *Industry Mentored Research Project*

- Developed a **Generative model** for Single Image Deraining, matching **state of the art methods**, in **Tensorflow**
- **Perceptual Loss** was added, using representations from a pre-trained **VGG16 Network**, greatly improving **SSIM**
- Performed **Ablation studies** on **nine** different models, including **transfer learning, CoordConv**, and **Spectral Norm**, the most optimized network yielding an **SSIM score of 0.88**. (Results to be submitted to **AAAI 2021**)

Characterization of advanced SEM microscopes for Semiconductor Wafer metrology May'19 - Jul'19

KLA Tencor (Chennai) *Summer Internship*

- Studied the different subsystems in a high-resolution SEM theoretically, and by **remotely operating** the device
- Simulated impact of beam size on CD measurement accuracy for **beam dias** $<$ **10 nm**, **optimizing** it on **MATLAB**
- Worked on the development of **edge roughness measurement** capability including design of experiments, **image processing algorithms**, and analysis for the next generation **eSL-10** tool
- Collaborated with the algorithms team to evaluate edge roughness in patterns of sub-micron dimensions, using metrics like **PSD, HHCF, and 3σ** and studied the relation between roughness patterns and characterization metrics

Diamond Nanocavities for NV Quantum Computing and Metrology Feb'19 - Nov'19

Guide: Prof. Kasturi Saha *Bachelor's Thesis Phase I*

- Simulated and studied Photonic crystal cavities on **COMSOL** and **Lumerical FDTD**, and wrote automated Lumerical scripts to sweep parameters to maximize **Quality Factor**, achieving Q values higher than **600000**
- Worked in coordination with the **fabrication** team to determine optimal parameters and make the test setup.

Optical Oscillatory Neural Networks July'18 - April'19

Guide: Prof. Kasturi Saha *Supervised Learning Project*

- Studied the time evolution and parametric dependence of a **Kerr Frequency Comb** in an optical microresonator
- Wrote **MATLAB** code to simulate synchronization of two Kerr Frequency Combs, to study the possibility of anti-synchronization in **Optical Oscillatory Neural Networks**, exploiting it to solve **NP-Hard Problems**

Characterization of advanced SEM microscopes for Semiconductor Wafer metrology May'18 - Jul'18

Guide: Prof. Navakant Bhat *Visiting Researcher, CeNSE, IISc Bengaluru*

- Worked on characterization of SMO nano-sensors with **AFM, SEM** microscopy, **XPS, FTIR** spectroscopy, **FLIR**
- **Calibrated** and **optimized NO2** sensors and developed **self-adaptive algorithms** to predict accurate gas concentrations irrespective of **environmental conditions** by taking into account various parameters of the system
- Made a **python** program (with GUI) to interface with **SMU devices** and simultaneously acquire and plot data

Classical Control Theory May'17 - Jun'17

Guide: Prof. Laxmidhar Behera *Visiting Researcher, EE, IIT Kanpur*

- Designed and implemented **MATLAB** simulations for a **PID Controller** for a **quadrotor**
- Studied the mechanism and safety precautions used for testing new control laws on quadrotors

KEY PROJECTS

Engineer, Electrical Subsystem, Satellite Project | *ADVITIY, 2nd Student Satellite, IITB* Jan '17 - July '19

- Implemented **USART, SPI and TWI (I2C)** communication protocols between **Atmega32A microcontrollers**
- Performed a **system engineering study** of the electrical subsystem, analyzing the requirements on and by the electrical subsystem on other subsystems for the **lunar impacts payload**, following the **ISRO prescribed guidelines**
- Performed a timing analysis of **Matrix operations (including Inverse)** of multiple orders on an **Atmega32A**
- Lead the design of solar panel interface and power circuit on **Eagle**, performing **MATLAB** simulations for panel/ battery configurations with **MPPT Algorithms**, along with **SPICE simulations**, and experimental verification

Attrition Classification | **Kaggle Competition** | *ML Course Project* | *Prof. Amit Sethi* Mar '20 - Jun '20

- Performed a **comparative study** of various **ML models** including MLP, Logistic Regression, Naive Bayes, Decision Trees, Random Forest, Support Vector Machines, Neural networks, to predict Attrition based on 37 input categories
- Data pre-processing including **one-hot encoding** and **Feature normalization** were implemented, with the final model achieving an accuracy of **88.1%** on the private leaderboard, the **10th best** score among 195 participants

IITB-RISC Processor | *Microprocessors Course Project* | *Prof Virendra Singh* Aug '18 - Nov '18

- Designed 16-Bit, 6-Stage **Pipeline processor** based on Turing-Complete Instruction Set in **VHDL** from scratch
- Programmed 14 Instructions including branch, arithmetic, memory interface; tested it on Altera **DE0 Nano FPGA**
- Implemented a **6 stage pipelined** processor with Branch Predictors, Priority Encoders and Hazard Detection

Panorama Cam Scanner | *Generating High Res. Scan quality stitched images* | *WnCC IITB* May '17 - July '17

- Studied feature extraction algorithms, and implemented **ORB feature matching** with **OpenCV** and **Python**
- Computed **homography** matrices using **RANSAC**, stitched images with **multiband blending** creating a panorama
- Built a **Kivy (python) android app**, for creating a high res panorama image from 4 camera clicked pictures

Autonomous Target Shooting Bot | *Technical Summer Project* May '17 - July '17

- Developed an automatic **spring latch mechanism** with **vertical servo actuation** to shoot a **moving target**
- Made a **2-Degrees Of Freedom** rotating platform using **Stepper Motors** for orienting the launcher
- Developed a **C++** algorithm for tracking the trajectory of a **moving object** using **OpenCV** and **Haar Cascades**
- Designed and implemented **real-time two way communication** between CPU and **Arduino UNO** using **pySerial**

Remote Controlled and Autonomous Bots | *Technical Competitions* 2016, 2017

- Made a bluetooth controlled (by Android App) bot by using **ATTINY2313A** microcontroller **L293D** motor driver
- Designed, built from scratch and piloted an **RF controlled** plane propelled by **brush-less DC motor**
- Designed and built an autonomous line follower bot using an **Arduino** and **Infrared and Ultra-Sonic sensors**

POSITION OF RESPONSIBILITY

Leader, Electrical Subsystem | *Advitiy, Student Satellite Project IIT Bombay* Feb '18 - July '19

- Part of the recruitment team which executed a **3-step recruitment process** to select **7 students** for the subsystem from **150+ applicants**, evaluating their technical ability, practical approach, and teamwork
- Contributed to Satellite 101 wiki, achieving outreach of **102k pageviews** and **38.5k global users** in a month
- Coordinated training program for recruits, by conducting sessions on topics like **GIT** and **basic electronics**

Teaching assistant | *PH 107 - Quantum Physics and Applications* Autumn 2017

- **Mentored 48 Freshmen**, responsible for teaching and evaluating them under the guidance of instructor-in-charge
- Took the initiative to help academically weak students, by explaining concepts in **vernacular languages**

Volunteer at Web and Coding Club | *One of the largest technical clubs in IIT Bombay* April '17 - April '18

- Managed the seasons of code initiative taken by WnCC, helping students work on comprehensive mentored projects
- Conducted **git** and **python** workshops attended by **200+** students and freshmen events like **Scratch** weekend

TECHNICAL SKILLS & EXTRACURRICULAR ACTIVITIES

Technical Skills	**Programming** : Python, R, SQL, C++, Java, MATLAB, , Git, Verilog/VHDL, HTML, CSS, JavaScript **Software** : Eagle, Spice, LabView, Tableau, Adobe Creative, LaTeX, Origin, COMSOL, SolidWorks **Fabrication** : EBL, Thermal Evaporation, SEM, AFM, XPS, FTIR, FLIR, XRD, PL, UV-Vis
MOOCs	Completed the *Deep Learning* **5-Course Specialization** on Coursera
Volunteer	• Spearheaded the Youth Empowerment Program in collaboration with Abhyuday, reaching **300+** students • Developed a simple **transcoder**, providing **stereo auditory** feedback to avoid obstacles for blind people
Cultural	• Learned Hindustani Classical music for 4 years (**3/8 Visaradh Exams given**), and Carnatic for 3 years • Anchored at **Hysteria - India's largest semi-professional DJ hunt** during Mood Indigo 2016
Tech	• Presented **Pratham**, the first student satellite at **Tech & Rnd Expo** organized by ITC and Techfest • Built bots like **line follower** and **RF Plane** (**best design** commendation), for student competitions
Sports	• Successfully completed **NSO Basketball**; participated in an Inter-College basketball tournament • Green Belt in Karate, participated in district level swimming competition (professional coaching for 3 yrs)