Anshuman Barnwal

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Education

ETH Zürich, Switzerland: **M.Sc.** in Electrical Engineering and Information Technology — *Sep'24 - Sep'26*

Specialization: Systems and Controls, Computers and Networks — *GPA: 5.6/6.0*

IIT Kanpur, India: **B.Tech.** in Department of Electrical Engineering — *Sep'20 - Jun'24*

Minors: Computer Systems; Machine Learning and Applications — *CPI: 9.13/10.0*

Achievements

Mar 2023 **Bronze Medal**, Inter IIT Tech Meet 11.0 - *Drone Swarm Control* Challenge — *IIT Kanpur*

Mar 2022 **Bronze Medal**, Inter IIT Tech Meet 10.0 - ISRO *Signal Processing of Solar Bursts* — *IIT Kharagpur*

Apr 2021 **Academic Excellence Award**, for exceptional performance in the academic year 2020-21 — *IIT Kanpur*

Sep 2020 **All India Rank 651**, Joint Entrance Examination - Advanced, among 130,000 candidates — *India*

Jan 2020 **All India Rank 1638**, Joint Entrance Examination - Mains, among 1.1 million candidates — *India*

Mar 2020 **All India Rank 1253**, Kishore Vaigyanik Protsahan Yojana (KVPY) - SX — *Govt. of India*

Mar 2019 **All India Rank 938**, Kishore Vaigyanik Protsahan Yojana (KVPY) - SA — *Govt. of India*

Mar 2018 **Top 1000**, National Talent Search Scholar (NTSE), out of 0.9 million participants — *Govt. of India*

Experiences

Building a Solar Car

Team Link

Low Voltage and Embedded Developer — *aCentauri Solar Racing* — *Nov 2024-Ongoing*

- Designed PCB to control the steering of the solar car in Altium Designer and assembled it manually
- Implemented the codebase for the MCU STM32L476 in the steering using FreeRTOS and STM32 HAL
- Built telemetry using sub-GHz RF module with upto 300 meters range and $55KB/s$ bandwidth
- Implemented the device drivers that handles wireless protocol over SPI communication integrated in FreeRTOS

Fair Value Beta Automation

completion certificate

Software Development Internship — *Goldman Sachs* — *May-Jul 2023*

- Developed end-to-end **ML pipeline** to generate correlation coefficients between stocks and their proxies returns
- Created dynamic **ETL** pipeline on **Apache-Airflow** scheduler from four data sources to **Apache-Hive** warehouse
- Developed schema for three databases handling **36000** additions and **12 million** queries per day
- Implemented model agnostic **rolling regression** over time series of returns, increasing F1-score by **12%**
- Created GitLab **CI/CD** pipelines with **92%** coverage of automated testing for package deployment over PyPi

Drona Aviation Swarm Control Challenge

AerialRobotics-IITK/interiit_11.0

Inter IIT Techmeet 11.0 — *IIT Kanpur* — *Feb-Apr 2023*

- Led a **team of 10** to control a swarm of Mini Aerial Vehicles with no external dependencies and position feedback
- Created handler for MultiWii Serial Protocol **MSP** packets for low level communication with drone stack
- Developed **geometric controller** for UAV maneuver and used **Zeigler Nichols** parameter tuning
- Used a **single** monocular RGB camera for pose estimation of MAVs using custom built thread-safe camera driver

RISC Single-Cycle Processor

ba-13/RISC

Computer Organisation — *Prof. Urbi Chatterjee* — *Mar-Apr 2023*

- Developed a modular single-cycle 32-bit processor in **IVerilog** supporting MIPS-I Instruction Set Architecture
- Built an **assembler** in Python for MIPS-I ISA to 32-bit binaries, benchmarked 27 algorithms for performance analysis

Balanced DCCA for Bird Vocalization Detection

madhavlab/2022_icassp_krsumit

MadhavLabs IITK — *Prof. Vipul Arora* *Jul-Nov 2022*

- Developed a novel self-supervised architecture for **skewed bi-modal time-series** dataset for event classification
- Implemented Deep CRNN cascaded to Deep Canonical Correlation Network in **Tensorflow** with customized loss
- Included binning using **projected histogram** of labels to increase entropy, handling skewness and null outputs
- Improved F1 score from 76% to **83%**, surpassing previous SOTA performance, paper accepted in **IEEE ICASSP'23**

WFSM Logic Locking Scheme

ba-13/EE392

NeuroCHaSe Group — *Prof. Shubham Sahay* *Jan-Apr 2023*

- Developed a **novel** defense and attack **logic-locking** strategy for logic-in-memory 3D NAND Flash architecture
- Simulated Flash Memory architecture and Flash Translation Layer with this scheme in Python
- Theoretically proved potentially **boundless key space**, demonstrated inclusion **without hardware overhead**

MPC-based landing on Moving Platform

rrustagi20/MPC_AutoLanding/

Cyberphysical Systems — *Prof. Indranil Saha* *Aug-Nov 2022*

- Created **Robot Operating System** packages for drone control and landing on a path-agnostic moving platform
- Demonstrated three types of path planning algorithms optimizing for **least time** taken, given position history of the platform perceived by the drone

MCMC Methods in JuliaLang

ba-13/mcmc-methods-in-julia

Stamatics — *IIT Kanpur* *Apr-Jun 2022*

- Implemented **accept-reject proposal**, **importance sampling** in **Julia** for complicated distribution sampling
- Analysed the importance of the proposal distributions through bias and variance theoretically and in-simulation
- Implemented MCMC method **Metropolis Hastings** algorithm to perform **Bayesian regression**

Solar Bursts Identification Challenge

astroclubiitk/Inter-IIT-Tech-Meet-2022

InterIIT Techmeet 10.0 — *Indian Space Research Organisation* *Mar-Apr 2022*

- Automated demarcation of solar bursts and their classification on an open-source X-ray light curve dataset
- Created a hierarchical-filtering algorithm using FFT and band-pass filters, followed by Hanning windowed temporal filters with **outlier detection** using random forests to improve performance
- Secured the **Second position** out of 22 participating IITs, on the basis of performance and the presentation

Skills

Programming Languages	C/C++, Python, MATLAB, Icarus Verilog, Javascript
Libraries and Frameworks	Robot Operating System, Gazebo, Simulink, Pytorch
Utilities	LaTeX, Docker, Git, Blender, Adobe Illustrator

Relevant Coursework

Computer Science	Data Structures and Algorithms, Computer Organization, Operating Systems Introduction to Machine Learning, Probabilistic Machine Learning, Computer Graphics Computer Architecture, Network Analysis, Embedded Systems
Electrical Engineering	Signals, Systems and Networks, Digital Signal Processing, Control Systems Analysis Digital Electronics and Microprocessor Technology, Principles of Communication Radio Frequency Electronics
Robotics	Planning and Decision Making in Autonomous Robots, Robot Dynamics Dynamic Programming and Optimal Control, Model Predictive Control