Sayeedul Islam Sheikh

4th-year Undergraduate Student

Indian Institute of Technology Kanpur, U.P, India.

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RESEARCH INTERESTS

I am interested in learning and developing algorithms that make machine learning models more reliable compared to existing methods. Apart from this I am also interested in exploring techniques that can make machine learning models more flexible and deployable under resource constraint settings. I also would like to explore interdisciplinary research, which I want to apply to develop more biologically/physically accurate models.

EDUCATION

Indian Institute of Technology Kanpur — Dec'21–present

Bachelor of Technology

Majors: **Chemical Engineering, Electrical Engineering**

GPA: **8.6/10.0**

RESEARCH EXPERIENCE

Leveraging Training Dynamics for Event Detection in Unlabelled Audio Files — May'23-Jul'23, IIT Kanpur

Advisor: Dr. Vipul Arora, Dept. of Electrical Engineering

* Supported by a **SURGE** fellowship.
* Developed a model to distinguish events within raw audio files by analyzing their training loss trajectories.
* Achieved multi-label classification of weak events in unlabelled audio samples by drawing on the training dynamics and comparing them to labeled examples from extensive datasets.

Learning Ontology Informed Representations by Injecting Constraints for Acoustic Event Detection — Aug'23-Sep'23, IIT Kanpur

Advisor: Dr. Vipul Arora, Dept. of Electrical Engineering

* Worked on developing a robust model for learning ontology-based representations.
* Added a constraint-based loss to the loss function in order to enforce the mathematical constraint that probability of any "parent" event occurring in an audio file must be $\geq$ sum of probabilities of all events present at its "child nodes."
* Experiments for acoustic event detection in ontology-based datasets like UrbanSound8K and FSD50K achieved higher F1 scores than the baseline and other methods aimed at learning ontology.
* A paper regarding the same has been accepted as poster at IEEE ICASSP-2024.

Development of IITK-PB Dataset — Oct'23-Jul'24, IIT Kanpur

Advisor: Dr. Vipul Arora, Dept. of Electrical Engineering

* Performed literature survey on existing label propagation works
* Implemented Iscen et al. successfully for the purpose of identifying musical istruments playing in a audio piece with the help of other instrument based datasets.
* Used a pre-trained speaker diarization model for inference on a subset of the dataset.
* Trained existing speaker identification SOTA models on a labeled subset of the dataset for benchmarking purposes.

PUBLICATIONS AND POSTERS

2023 Poster — **Learning Ontology Informed Representations with Constraints for Acoustic Event Detection**
Akshay Raina, Sayeedul Islam Sheikh, Vipul Arora
Presented at the Winter School on Speech and Audio Processing-2023 poster session, held at IIT Kanpur

2023 **Paper** — **Learning Ontology Informed Representations with Constraints for Acoustic Event Detection**
Akshay Raina, Sayeedul Islam Sheikh, Vipul Arora
Accepted at the 2024 IEEE International Conference On Acoustics Speech and Signal Processing (Paper)

2023 Poster — **Acoustic Event Mining using Training Dynamics of Deep Neural Networks**
Sayeedul Islam Sheikh, Akshay Raina, Vipul Arora
Presented at the SURGE-2023 poster session, held at IIT Kanpur.

Projects

Finger Print enabled Door Lock using Microcontrollers
Jan'23–Feb'23

Electronics Club, Science and Technology Council
IIT Kanpur

* Developed a finger print based door lock system, using Arduino UNO and AS608 Optical Fingerprint Sensor Module.
* Included features for adding and deleting fingerprints and integrated the system with a 12-key Keyboard module.

Technical Skills

General

Python | MATLAB | Simulink | Aspen Plus | C | R | Arduino | Java | LaTeX

Libraries/Frameworks

PyTorch | Tensorflow | Tensorflow lite | Librosa | torchaudio | torchvision | PyStan | brms

Selected Coursework

Fundamentals of Computing | Real Analysis | Linear Algebra | Introduction to Electronics | Signals and Systems | Complex Variables | Partial Differential Equations | Computational Methods for Engineers | Transport Phenomena | Chemical Process Simulation | Advanced Topics In Machine Learning(on Generative AI) | Bayesian Models & Data Analysis | Process Dynamics and Control Theory

Mentorship Experience

Smartwatch with Fall Detection
May'23–Jul'23

Electronics Club, Science and Technology Council
IIT Kanpur

* Mentored 15 first-year students who developed a TinyML-based real-time Fall Detection Model, trained on the publicly available SmartFall dataset.
* Deployed the Tensorflow Lite model on an Arduino Nano 33 BLE.
* Helped in incorporating other features like TFT display and clock module to the Arudino to develop a prototype smartwatch.

Controlling Servo Motor Using EEG signals
May'23–Jul'23

Electronics Club, SnT Council
IIT Kanpur

* Mentored 13 first-year students on a project to create an EEG signal recording system that detects eye blinks, using a 2-channel EEG headset through amplifiers.
* Helped create a dataset to train a CNN model that analyzes EEG signals to detect eye blinks in real-time.

Awards and Achievements

Summer Undergraduate Research & Graduate Excellence (SURGE) fellowship, IIT Kanpur — 2023
Awarded a SURGE fellowship to conduct an 8-week long summer research project.

Academic Excellence Award, IIT Kanpur — 2023
Awarded to **top 10%** of students in the department for the academic year 2022-'23

National Entrance Examinations for admissions into Indian undergraduate STEM programs — 2021
99.85 percentile (among 1.1 million candidates) in JEE Main 2021
All India Rank 2292 in JEE Advanced 2021
State Rank 91 in WBJEE 2021

Mentorship and Service

Coordinator at Electronics Club, IIT Kanpur
Mar'23–present
Mentored a group of 25+ students for Electronics summer projects. Leading a group of 25 sophomore Secretaries for management and outreach of the club.

Student Guide, Counselling Service, IIT Kanpur
Jun'22–Mar'23
Selected as an official Student Guide; received training on how to assist students in various situations; mentored a group of freshmen as they adjusted to university life