AYUSH SHRIVASTAVA

PhD, Computer Science, IIT Gandhinagar
shrivastavaayush@iitgn.ac.in ◇ linkedin ◇ Github

EDUCATION

PhD in Computer Science and Engineering, **Jul 2024 - Present**
Advisor: Prof Nipun Batra, Indian Institute of Technology, Gandhinagar
Prof Mayank Goel,Carnegie Mellon University, Pittsburgh

Masters of Technology in Computer Science and Engineering, **Jul 2022 - Jun 2024**
Advisor: Prof Nipun Batra, Indian Institute of Technology, Gandhinagar CPI : 9.0/10

Bachelors of Engineering in Electronics and Telecommunications, **Aug 2015 - May 2019**
Jabalpur Engineering College CGPA : 7.2/10

RESEARCH EXPERIENCE

ApneaEye : Sensing Apnea using Thermal Imaging **Oct 2023 - Present**
Under Review in Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT)

- Developed *ApneaEye*, a non-contact system for sleep apnea diagnosis using low-resolution thermal imaging.
- Achieved 89% accuracy in apnea severity classification, an R^2 score of 0.92 for Apnea-Hypopnea Index (AHI) estimation, and 94% accuracy in screening apnea patients, adhering to AASM guidelines.
- Evaluated using 300+ hours of thermal video from 44 participants containing 20 healthy and 24 apnea patients.
- Monitored nasal airflow and thoracoabdominal movements without on-body instrumentation, providing a cost-effective, at-home alternative to in-clinic polysomnography for sleep apnea diagnostics.

Machine-Learning for Materials Simulation. **Aug 2023 - Oct 2023**

- Developed a machine learning pipeline to accelerate traditional simulation process runtime from 7 hrs to seconds.
- Optimized Lennard-Jones parameters for materials simulations using the new machine learning approach.
- Collaborated with the chemistry department to test the pipeline, achieving a mean percentage error of less than 1% in estimating the target parameter for 3 out of 4 molecular systems.

SpiroMask : Spirometry using consumer-grade Mask. **Jan 2023 - Aug 2023**

- Designed SpiroMask, **a low-cost solution** using audio data as a proxy for traditional spirometry maneuvers.
- Created an **end-to-end machine learning pipeline** for audio processing, encompassing preprocessing and feature extraction of various temporal and spectral characteristics to support robust ML model development.
- The machine learning pipeline enabled the team to reduce mean absolute percentage errors from a range of 5-6% to 2.5-3% by employing machine learning techniques such as **Active Learning**.
- Lowered the cost from 50,000 INR to 3,000 INR, increasing accessibility to respiratory health assessment.

WORK EXPERIENCE

Application Developer, Enterprise Resource Planning (ERP) **June 2019 - Dec 2021**
IBM India Pvt ltd.

- Actively involved in the Software development lifecycle, with expertise in coding and maintaining applications.
- Developed internal assets to replace third-party applications, resulting in significant cost savings for the company.
- Enhanced IBM's package automation tool, automating the package deployment process and saving 7-10 hrs/week.
- Collaborated closely with senior developers to craft optimal technical designs for client requirements.

POSITION ON RESPONSIBILITIES

Teaching Assistant **June 2022 - May 2024**
Indian Institute of Technology, Gandhinagar

- **Introduction to Computing** Led a Python lab for 30 students, teaching them essential Python concepts, and helped manage logistics, invigilation, and quiz evaluation for a class of 300 students.
- **Probability, Statistics, and Data visualization** Successfully guided over 30 students in Python libraries, including Numpy, Pandas, Matplotlib, Scipy, and Scikit-learn, enhancing their data visualization skills.
- **World of Engineering** Mentored a group of 30 students in the identification, conceptualization, and modeling of a prototype to address a real-world problem, fostering their problem-solving abilities and teamwork skills.
- **Computer Systems** Graded assignments and assisted the professor run a class of 40 students smoothly.
- **Machine Learning:** Organised and evaluated quizzes, assignments, took vivas for a classroom of 300 students, while also playing a pivotal role in supporting classroom logistics.

On-Campus Employement Opportunity (oCEO) **Sept 2022 - Nov 2022**
Indian Institute of Technology, Gandhinagar

- Goal was to devise a bus tracking framework for IITGN having having an upwards of 2000 users
- Developed Android application utilizing mobile phones GPS, Flutter, and Firebase's Real-Time Database.
- Implemented real-time tracking of Institute buses' location and ETA, benefiting students, staff, and faculty

Council Member **May 2023 - Apr 2024**
Professional Development Council (PDC) – IIT Gandhinagar.

- Organized, facilitated, and hosted student-focused workshops with over 100 attendees, covering topics such as interview preparation, career guidance, resume building, and company-specific preparation.
- Provided guidance and mentorship to students, helping them shape their career trajectories.
- Provided personalized feedback on resumes, focusing on content and overall presentation for improved impact.

Coordinator **Sept 2017 - Oct 2017**
Cursus 2K17, Jabalpur Engineering College.

- Conducted a breadboarding and circuit-building workshop to share technical knowledge with junior students.
- Effectively managed and instructed a classroom-sized group of 50 students during the workshop.

PROJECTS

Tiny ML: Real-time Digit Recognizer **May 2023 - Jul 2023**
Indian Institute of Technology, Gandhinagar

- Real-time digit recognition model FOMO (Faster-Objects More-Objects) to identify digits within single frame.
- Utilized **Transfer Learning** techniques with a toy digit dataset to create a numerical digit recognition system.
- **Quantized** model for Arduino Nano compatibility with its limited **1MB flash memory and 128KB RAM**.
- Deployed FOMO on an Arduino Nano microcontroller chip for runtime inference using a camera module

Addressing Cold Start in Active Learning **Oct 2023 - Dec 2023**
Indian Institute of Technology, Gandhinagar

- Explored the Cold-start problem in **Active Learning**, implementing an image classification approach using **contrastive self-supervised learning** and experimented with various **clustering methods** .
- Achieved a 5% boost in test accuracy on the MNIST dataset with 100 samples, with gains decreasing as the sample size reached 1000. Noted a 2.2% improvement in test accuracy on the ImageNet dataset, validating the method on both smaller experimental datasets and larger real-world datasets.
- Demonstrated the effectiveness of contrastive learning and clustering in addressing the Cold-start issue.

Remote Controlled 6 Wheeled Self Stabilizing Rover, **Jan 2019 - July 2019**

B.E. Major Project, Jabalpur Engineering College, Jabalpur

- Designed a 6-wheeled rover equipped with a rocker-bogie mechanism having gyroscopic self-stabilization, capable of crossing double-sized obstacles while ensuring payload stability

Sign Language Convertor Glove, **Jan 2018 - Jul 2018**

B.E. Minor Project, Jabalpur Engineering College, Jabalpur

- Created a micro-controller-based system that converts finger and wrist movements into spoken alphabets, facilitating communication for individuals with speech impairments among non-sign language speakers.

SKILL SUMMARY

- **Languages:** Python, SQL , Fundamentals of C, C++, and Java.
- **Framework/Tools:** Numpy, Pandas, opencv, NLTK, Sklearn, PyTorch, TensorFlow, Keras, Arduino, Raspberry pi, Git ,etc.
- **ML Algorithms:** Active Learning, Machine Unlearning, Bayesian Machine Learning, Deep Learning, Generative Algorithms, Natural Language Processing, Computer Vision.

ACHIEVEMENTS

- Attained 98.16 percentile in Graduate Aptitude Test in Engineering 2022 (GATE'22).
- Secured the second position in Hackrush 23' ML challenge held at IIT Gandhinagar.
- Earned a Bronze Medal in Badminton at IIT Gandhinagar AAROHAN'22 Intramurals Competition.
- Achieved the first position in One-Act at Techno-cultural Fest of Jabalpur Engineering College - AUREOLE'16.
- Secured third position performing a Nukkad Natak in front of 500 people at TARANG'16 IIITDM, Jabalpur.
- Won first prize in the National Go-Kart Championship 2018 at Technocrats Institute of Technology, Bhopal.