Meet Vyas

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Education

Ahmedabad University Gujarat, India

Bachelor of Technology in Mechanical Engineering, Minors in Physics and Computer Science *June. 2020 – Present*

Summer School

ZTF Summer School 2023 Zwicky Transient Facility

Theme - Transients *July 2023*

- The program included a series of lectures and workshops led by renowned astronomers and data scientists. I acquired in-depth knowledge about transient events, time-domain astronomy, and advanced data analysis techniques.
- Acquired hands-on experience in Python, data preprocessing, machine learning model development, optimization, and deployment

Conferences

Nancy Grace Roman Space Telescope Summer Conference 2023 NASA

Theme - Space Telescopes and Cosmic Exploration *June 2023*

- Engaged in a comprehensive series of sessions that delved into the optimization of optical components and system design to enhance the telescope's sensitivity and resolution
- Developed skills in visualizing astronomical data. Learned about strategies for engaging with diverse audiences and fostering public interest in space science

Gas Turbine Conference 2023 American Society of Mechanical Engineers

Theme - Gas Turbine and Renewables *December 2023*

- Engaged in a comprehensive series of sessions that delved into the optimization of gas turbines and turbo machinery.
- Gave a conference talk presenting the paper on "Experimental Investigation of a Concentrated Photovoltaic System Integrated with Water Sprinkler Generating Electricity and Hot Water".

LSST ToO Workshop 2024 Legacy Survey of Space and Time

Theme - Gravitational Waves, neutrinos, solar system object detection *March 2024*

- Participated in the workshop to create strategies by plotting light curves and calculating time budgets for detection of Gravitational Waves through Binary Neutron Star mergers, Neutron Star Black Hole merger, and Binary Black Hole mergers.
- Tested and brainstormed for different strategies for Strong gravitationally lensed GRBS along with cases for neutrino and solar system objects detection using the Vera C. Rubin observatory.

Experience

Summer Intern May 2023– July 2023

Physical Research Laboratory *Gujarat, India*

- Set up and carried out studies in a lab, such as CAD modeling for the Nernst Effect experimental configuration and Seebeck Effect tests with ensuing data processing.

Physics Journal Club Coordinator June 2021 – June 2022

Ahmedabad University *Gujarat, India*

- Managed the progression of the Physics Journal Club at the University.

Student Ambassador June 2021– January 2022

Ahmedabad University *Gujarat, India*

- Served as a student ambassador, leading campus tours, participating in outreach events, and providing guidance on university admission processes.

Undergraduate Teaching Assistant October 2023 – Present

Ahmedabad University *Gujarat, India*

- Managed student attendance, grades, and schedules; helped teachers prepare lessons; and offered remedial instruction to support the learning process.

Undergraduate Peer Tutor August 2021 – December 2021
Ahmedabad University *Gujarat, India*

- Helped students by guiding them in assignments and classwork
- Communicated with the Professor to encourage low scoring students in the class.

Undergraduate Research Assistant March 2022– August2022
Ahmedabad University *Gujarat, India*

- I created a data logger using an esp32 controller which communicated through internet to the purple air api for Purple Air Quality Sensor SD-2 and was dynamically stored in an spreadsheet.

Undergraduate Thesis

Non Gaussanity as a window to New Age Cosmology | *Cosmology* August 2023 – Present

- My thesis examines the large-scale structure of galaxies and the cosmic microwave background, challenging the Gaussian assumption by looking at Non-Gaussian signatures. The research provides important insights into early universe physics by examining dark energy and gravitational waves, assessing early universe dynamics, and putting limitations on important parameters using Planck 2018 constraints.

Projects

Design and Fabrication of a Piston Assembly System |
Learning Factory Project August 2023 – December 2023

- Designed and fabricated a working piston assembly with tolerance standards according to industrial specifications. The project is completed fabricated from metal and developed in the fabrication workshop at the University.

Algorithmic Solutions to the Vehicle Routing Problem |
Manufacturing Systems and Operations August 2023 – December 2023

- Developed and tested several algorithmic solutions to the Vehicle Routing Problem using Scheduling Algorithms, heuristics, and graph methods.

Neural Network along with 3-D SLAM for an autonomous robot | *Robotics* January 2023 – June 2023

- Designed and crafted a 10mm Acrylic chassis for a mobile robot. Developed an obstacle detection neural network using Roboflow, optimized for OpenCV AI Kit camera OAK-D. Integrated two L298N motor drivers with an Arduino Mega to control four Mecanum wheels, including the corresponding Arduino code. Implemented a 3D Simultaneous Localization and Mapping (SLAM) using the depthai-sdk to premap and real-time remap the environment. Ongoing work includes integrating these components to create a fully autonomous robot, with plans to transition the main device controller from a laptop to an NVIDIA Jetson Nano.

Scheduling Algorithms | *python, scheduling algorithms, graph methods* July 2022 – June 2023

- Developed a University Schedule, addressing the NP-complete nature of minimizing student course clashes through heuristics based on graph theory. Successfully obtained a clash-free proof of concept, with ongoing work to enhance and optimize the scheduling system.

Foraging Patterns of Weakly Electric Black Ghost Knife fish | *Epistemology* January 2023 – May 2023

- Designed and implemented a mechanical setup to observe and model the behavior of Black Knife Ghost Fish in low-light conditions using IR LEDs. Created IR LED circuits with breadboards, employed a 12 Megapixel Raspberry Pi camera for video capture, and configured a Raspberry Pi for controlled observation in a 4-foot swimming pool. Innovative solutions, like using Music Sheet Stands to mount LED lights, were implemented to minimize reflections. Employed ToxTrac software and RStudio to analyze gathered data, providing valuable insights into the nocturnal habits of the Black Knife Ghost Fish.

Music Recognition using Short Time Fourier Transform | *Python* August 2022 – December 2022

- I designed a Music Recognition program utilizing Short Time Fourier Transforms and 32-bit integer hash maps to match and identify songs stored in a database.

Gravitational Wave Analyzer | *Python* August 2022 – Present

- After developing the Music Recognizer, I created a database using available Gravitational Wave files provided by LIGO in a .wav format. This involved categorizing the files into distinct groups, specifically black hole mergers and neutron star mergers. The objective is to compare the new .wav files of recorded mergers with those stored in the dataset, allowing for the estimation of the type of merger. The ongoing efforts focus on refining and obtaining a proof of concept for this innovative technique, which were refined with the recent certification from the Gravitational Wave Open Science Center workshop 6.

Neural Network for classification of Stars and Galaxies | *Python* August 2022 – December 2022

- Used the Sloan Digital Sky Survey Data and made a neural network that can predict the nature of the object recorded based on the instrument data and Hubble's Law.

Discord Bots using Discord API and JSON | *Python* July 2020 – February 2021

- Made two discord bots using Python and JSON to manage, moderate, and add custom commands to servers on Discord, where the first bot was made using discord library for JSON and the second one was made using Discord API for Python.

Calorie Tracking Website | *Web Development* January 2022 – June 2022

- Developed a comprehensive calorie tracking website tailored for athletes to monitor their calorie intake and aid in sport-specific training. The website featured a daily calorie tracker, a Body Mass Index Calculator, and an extensive database housing over a million food items with detailed calorie and nutritional information. Ongoing efforts include refining the website for an enhanced user experience, and there are plans to extend the project by developing a dedicated mobile application.

Publications

Experimental Investigation of a Concentrated Photovoltaic System Integrated With Water Sprinkler Generating Electricity and Hot Water

ASME 2023 Gas Turbine India Conference (GTINDIA2023)

Effect of induction heating at different stages of rotary friction welding on joining characteristics of AISI 1018 mild steel rods

In Progress

On Primordial Blackholes, the Swampland and exotic inflationary models

In Progress

Negative Precession of Relativistic Orbits in charged black holes

In Progress

Certifications

- R Programming | *Coursera*
- Matlab Fundamentals | *MATLAB*
- Control Design Onramp | *MATLAB*
- Machine Learning Onramp | *MATLAB*
- Gravitational Wave Open Data Workshop | *Gravitational Wave Open Science Center*

Volunteerism

Khoj Museum | *Environment* January 2021 – April 2021

- As a volunteer, I worked on ideas for sustainability under the domain of water conservation with the sub-domain of Technology and Innovation.
- I made a newsletter, came up with ideas for water sustenance, helped in developing a game based on water sustenance, came up with new technologies for water sustenance, and created activities for the same.

Technical Skills

Languages: Java, Python, C/C++, JavaScript, HTML/CSS, R
Frameworks: React, Node.js, RESTAPI
Developer Tools: Git, Docker, Google Cloud Platform, VS Code, Visual Studio, CLION
Libraries: Pandas, NumPy, Matplotlib,discord, pickle, depthai, depthai-sdk,roboflowoak,serial,math, scipy, networkx, ortools,deap, tqdm, ztfquery,readligo,gwpy,emcee
Machines: Mechanical Operations - Table Saws, Milling Machines, CNC Machines, Lathes, Grinders, 3-D printers, Laser Cutters, Welding, Forging
Softwares: Matlab, Simulink, FLIR, ToxTrac, Canva, FLstudio, Audacity, Putty, CakeWalk, Gephi, Latex, Autocad, Fusion 360, ANSYS, Solidworks, LTspice, Tinkercad, CURA, Arduino, Mathematica, Weights and Biases