GUNTAS SINGH SARAN

Machine Learning • Computer Vision
Junior Undergraduate | Computer Science and Engineering

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EDUCATION

Indian Institute of Technology Gandhinagar (IITGN) — CPI: **9.45**/10
B.Tech in Computer Science and Engineering — 2022-2026

Dr. Kitchlu Public School, Moga — Percentage: **99.4**
Class XII, Central Board for Secondary Education — 2020-2022

Sacred Heart School, Moga — Percentage: **98.6**
Class X, Indian Certificate of Secondary Education — 2006-2020

SELECTED PROJECTS

Sparsifying Networks while Preserving Communities

Research Project | Prof. Anirban Dasgupta | IITGN | Project Link — *Mar'24 - Apr'24*

- Implemented several graph sparsifying techniques by edge sampling including edge betweenness based sampling, effective resistance based sampling, and global and local edge similarity based sampling.
- Leveraged the NetworkX and CDLib libraries to extract out the community structures out of the sparsified graphs and compared the quality of these communities with other baseline sampling techniques.

Binary Image Classification Using VGG Architecture

Project | Prof. Nipun Batra | IITGN | Project Link — *Mar'24 - Apr'24*

- Implemented VGG1 and VGG3 architectures for Convolutional Neural Networks and tested their performance on the classification of two image classes.
- Performed Augmentation over the dataset and trained the VGG3 model over this augmented dataset.
- Performed Transfer Learning over the pre-trained VGG16 models while both freezing and un-freezing the fully connected layers.
- Compared the performance of all these models by the gradual increase in classification accuracy over the testing images, changes in training and validation losses using Tensorboard.

Text Generator based upon next character prediction from an MLP

Project | Prof. Nipun Batra | IITGN | Project Link — *Feb'24 - Mar'24*

- Developed a pipeline model for next character prediction based on the context of previous k characters.
- Trained models on several corpora like Gulliver's Travels, English Wikipedia 8, Atomic Habits, Tolstoy's Essays, Alice in the Wonderland with varying embedding size of the vocabulary.
- Deployed a Streamlit application with all the trained models to allow the user to select various hyperparameters graphically.

Human Activity Recognition (HAR) Analysis

Project | Prof. Nipun Batra | IITGN | Project Link — *Jan'24 - Feb'24*

- Utilised the UCI-HAR dataset containing time-series data of thirty subjects performing six activities.
- Leveraged TSFEL library to extract features out of the time-series, performed Principal Component Analysis (PCA) for dimensionality reduction.
- Trained a Decision Tree model on the featurised data and utilised the Physics Toolbox Suite app to collect the activity data to test the model.

Child Safety Monitoring App using MATLAB's Simulink Support Package for Android

Project | Prof. Nithin V. George | IITGN | Project Link — *Aug'23 - Nov'23*

- Designed and implemented an Android app for a smart bicycle equipped with embedded hardware sensors (gyroscope, accelerometer, GPS) built into child's android device to monitor the child's safety during cycling.
- Engineered a fall detection mechanism with the capability to distinguish actual falls from false detections.
- Leveraged Simulink Support Package for Android Devices along with the TCP/IP models for efficient data transmission and communication between the cycling device and the parent's device.

Logical Puzzle and Graph based Games developed using C and C++

Project | Prof. Balagopal Komarath | IITGN | Project Link — *Aug'23 - Nov'23*

- Developed games like Connect4, Up-it-Up, Sudoku Solver, and 2x2x2 Rubik's Cube Solver using optimal move strategy between two player moves and graph traversal algorithms.

- Leveraged the SFML graphics library of C++ along with Entities, Components, Systems paradigm for designing simple interactive games.

Numerical Modelling of Oil Spillage over Water Surface using Convection-Diffusion Equation

Research Project | Prof. Dilip Srinivas Sundaram and Prof. Akshaa Vatwani | IITGN | Project Link *Oct'23 - Nov'23*

- Developed a comprehensive mathematical model to simulate the effects of oil spillage using the convection-diffusion equation in a 2D domain using Python's MatplotLib.
- Investigated the concentration profiles of oil under varying velocity fields by setting the suitable boundary conditions and employing forward and backward difference in Euler's Method.

Analysis of Datasets using Probability, Machine Learning, and Statistics

Project | Prof. Shanmuganathan Raman | IITGN | Project Link *Jan'23 - Apr'23*

- Implemented statistical and probabilistic analysis on several datasets including the American College Data (AAUP and US News), Goodreads Books, and the 2013 Grand Slam Tennis.
- Uncovered critical insights through advanced data manipulation and visualisation techniques using Python libraries such as NumPy, Seaborn, Plotly, Pandas, Scikit-Learn.

AWARDS AND ACHIEVEMENTS

- Presented with the **Award for Academic Excellence** for highest CPI in the batch for the AY **2022-23**.
- Felicitated with **Dean's List Award** IITGN for **Semester I, II, IV** for excellent academic performance.
- Secured a grade of **A+ (11/10)** for outstanding performance in the courses **Calculus of Single Variable and Linear Algebra** and **Principles and Applications of Electrical Engineering**.
- Secured **2nd Position** in the Machine Learning challenge at IITGN's Annual Hackathon - HackRush 2023.
- Secured an All India Rank of **1297** in the Joint Entrance Exam (Advanced).
- Secured an All India Rank of **598** in the Joint Entrance Exam (Main).
- Recognised as a **KVPY** (Kishore Vaigyanik Protsahan Yojana) Scholar with All India Rank **1402**.

SKILLS

Languages: Python | C | C++ | Verilog

Tools: Xilinx Vivado | Git | Autodesk Inventor | LaTeX | VS Code | Arduino UNO

Libraries: PyTorch | Tensorboard | NumPy | SciPy | Pandas | Plotly | Matplotlib | Seaborn | Scikit-Learn | Streamlit | NetworkX | CDLib | PyVis | OpenCV | TSFEL | SFML (C++)

RELEVANT COURSES

Machine Learning **[A]** • Introduction to Data Science **[A]** • Data Structures and Algorithms II (*Algorithms Design*) **[A-]** • Signals, Systems, and Random Processes **[A]** • Probability, Statistics, and Data Visualization **[A]** • Calculus of Several Variables **[A]** • Data-Centric Computing **[A-]** • Calculus of Single Variable and Linear Algebra **[A+]** • Principles and Applications of Electrical Engineering **[A+]**[1].

[1] **A-** is 9/10, **A** is 10/10, **A+** is 11/10, awarded in expectional cases.

POSITIONS OF RESPONSIBILITY & EXTRA CURRICULAR

- **Core Committee Member, Amalthea '23 - IIT Gandhinagar's Annual Technical Summit** *Apr'23 - Feb'24*
  - Successfully managed two teams: **Finance and Design**.
  - Managed the financial aspects of the entire summit, prepared the budget, tracked expenses, and maintained financial stability throughout the summit.
  - Worked closely with the Design team of 25 members to develop creative visual assets, including branding materials and visual presentations that enhanced the overall experience of the summit both at the IITGN Campus and Sabarmati Riverfront, Ahmedabad.
- **General Member, Technical Council, IITGN** *May'23 - Apr'24*
  Contributed to IIT Gandhinagar's own centralized hub and interactive platform for students - **metaiitgn**.