

# Yash Bachwana

Junior Undergraduate | Electrical Engineering  
Computer Graphics • Computer Vision • Machine Learning

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## EDUCATION

Indian Institute of Technology Gandhinagar	CGPA: 9.04/10
B.Tech in Electrical Engineering with Minors in Computer Science and Engineering	2022-2026
Spring Dale Public School, Pune	Percentage: 96.8
Class XII, Central Board for Secondary Education	2021-2022
Spring Dale Public School, Pune	Percentage: 97.4
Class X, Central Board for Secondary Education	2019-2020

## PUBLICATIONS

TensolS: Feed-Forward Heterogeneous Inverse Subsurface Scattering	
Ashish Tiwari, Satyam Bhardwaj, Yash Bachwana, Parag Sarvoday Sahu, Shanmuganathan Raman.	
Submission Under Review	
VayuBuddy: LLM-powered interface for Understanding Air Pollution	<a href="#">Paper</a> <a href="#">Project Link</a>
Yash Bachwana, Khush Shah, Nitish Sharma, Zeel B Patel, Nipun Batra, Sarath Guttikunda.	
ACM COMPASS Posters 2024	

## RESEARCH WORKS

TensolS: Feed-Forward Heterogeneous Inverse Subsurface Scattering	Submission Under Review
Computer Vision & Graphics   Prof. Shanmuganathan Raman   IIT Gandhinagar	Aug'24-Present
<ul style="list-style-type: none"><li>Estimated subsurface scattering parameters of heterogeneous participating media using multi-view images.</li><li>Developed a framework for VM Decomposition based parameter estimation for 3D reconstruction.</li><li>Constructed a large-scale dataset using Mitsuba 3, with heterogeneities generated using Fractal-Perlin Noise Model.</li></ul>	
VayuBuddy: LLM-powered Natural Language Interface for understanding Air Pollution Data	
LLM   Prof. Nipun Batra   IIT Gandhinagar   <a href="#">Project Link</a>   <a href="#">ArXiv</a>	Apr'24-Jul'24
<ul style="list-style-type: none"><li>Proposed and implemented an LLM-powered chatbot system to democratize urban air quality information.</li><li>Assessed the code generation ability of LLMs based on given system prompts describing the dataset.</li><li>Got an opportunity to deliver a lightning talk and present my work at the ACM Compass Conference.</li></ul>	
Adaptive Filtering Based on Censored Regression	Manuscript Under Revision
Adaptive Filtering   Prof. Nithin V George   IIT Gandhinagar   <a href="#">Project Link</a>   <a href="#">Manuscript</a>	Mar'24-Present
<ul style="list-style-type: none"><li>Proposed and implemented Normalized Least Mean Square Algorithm for Censored Regression (CR-NLMS).</li><li>Proposed and implemented a convex combination-based filter that is robust to hybrid data during adaptation.</li><li>Used MATLAB to illustrate the performance of the proposed algorithms against traditional data-specific models.</li></ul>	

## SELECTED PROJECTS

Fundamentals of Gaussian Splatting	
Computer Graphics   Prof. Shanmuganathan Raman   IIT Gandhinagar   <a href="#">Project Link</a>	Feb'25-Present
<ul style="list-style-type: none"><li>Studied the fundamentals of Gaussian Splatting by exploring the EWA (Elliptically Weighted Average) splatting paper.</li><li>Analyzed the mathematical framework behind 3D Gaussian Splatting, focusing on image reconstruction and rendering.</li></ul>	
Image Reconstruction using Random Fourier Features	
Machine Learning   Prof. Nipun Batra   IIT Gandhinagar   <a href="#">Project Link</a>	Feb'24-Mar'24
<ul style="list-style-type: none"><li>Implemented Random Fourier Features (RFF) to address image completion, super-resolution, and reconstruction tasks.</li><li>Compared performance of RFF for image completion and reconstruction with polynomial features based linear regression.</li></ul>	
Next Character Prediction with Multi-Layer Perceptron	
Machine Learning   Prof. Nipun Batra   IIT Gandhinagar   <a href="#">Project Link</a>	Mar'24-Apr'24
<ul style="list-style-type: none"><li>Implemented a Multi-Layer Perceptron (MLP) model for next character prediction using the Shakespeare dataset.</li><li>Processed the Shakespeare dataset by splitting text into character blocks, generating ground truth for supervised learning.</li></ul>	

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## Implementation of Data Structures and Algorithm Graph-Based Games using C

DSA | Prof. Balagopal Komarath | IIT Gandhinagar | [Project Link](#)

Aug'23-Dec'23

- Implemented advanced programming techniques such as graph traversal, memoization, and hashing in C.
- Developed puzzle solvers like a 2x2x2 Rubik's Cube Solver, an UpltUp Puzzle Solver, and Sim Game using these algorithms.

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

Digital Signal Processing | Prof. Nithin V George | IIT Gandhinagar | [Version 1](#) | [Version 2](#)

Aug'23-Apr'24

- Created an ecosystem to enable parents to track their children's location and trigger alarms in case of emergency.
- Version 1 of the app measured level of danger based on direct criteria like boundary crossing, fall detection, and overspeed.
- Version 2 of app measured danger levels using fuzzy logic developed cumulatively based on acceleration and sound levels.
- Implemented TCP/IP and UDP protocols to enable reliable data transmission and real-time communication within the app.

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## TEACHING EXPERIENCE

### Undergraduate Teaching Assistant (UGTA)

ES 114 : Probability, Statistics and Data Visualization | Prof. Nipun Batra | IIT Gandhinagar | [Course Page](#) Jan'25-Present

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## AWARDS AND ACHIEVEMENTS

- Received **A+ (11/10)** for exceptional performance in **EE333: Microprocessors and Embedded Systems**
- Attended **JTG Summer School'24, IIT-Hyderabad** on Signal Processing, Communications, and Networks
- Served as vice-captain of a 30-member team for an interdisciplinary project, (**EPCOT**): [News Article](#)
- Achieved  $2^{nd}$  runner-up in **Revive and Thrive Challenge**, organized by IR&P, IIT Gandhinagar
- Attained **Pupil** rank on Codeforces (Rating: 1333) and **3 Star Coder** on Codechef (Rating: 1607)
- Secured **AIR 3564** in **JEE Advanced**
- Scored **99.14 Percentile** in **JEE Mains**
- Achieved **First Rank** in **Class 12th** at Spring Dale Public School, Pune
- Achieved **6th Runner-up** in **All Gujarat UCMAS Abacus Mental Arithmetic Competition**

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## RELEVANT COURSES

Machine Learning • Data Structures and Algorithms • Digital Signal Processing • Signals, Systems, and Random Processes • Probability, Statistics, and Data Visualization • Numerical Methods • Data-Centric Computing • Calculus of Single Variable and Linear Algebra • Principles and Applications of Electrical Engineering

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## SKILLS

**Programming Languages:** Python C C++ MATLAB Verilog

**Tools:** MATLAB Android Simulink Mitsuba 3 Latex Git Autodesk Inventor Professional

**Libraries:** Numpy Matplotlib Pandas Seaborn Scikit-Learn PyTorch Langchain Streamlit

Kernel Adaptive Filtering Toolbox (MATLAB)