Parag Sarvoday Sahu

Senior Undergraduate | Electrical Engineering with Minors in Computer Science and Engineering
3D Computer Vision | Computer Graphics | Machine Learning

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EDUCATION

Indian Institute of Technology Gandhinagar **9.02**/10
B.Tech in Electrical Engineering with Minors in Computer Science and Engineering 2022-2026

Chhattisgarh Public School, Raipur Percentage: **95.8**
Class XII, Central Board for Secondary Education 2020-2021

Chhattisgarh Public School, Raipur Percentage: **94**
Class X, Central Board for Secondary Education 2018-2019

PUBLICATIONS

TensoIS: A Step Towards Feed-Forward Tensorial Inverse Subsurface Scattering for Perlin Distributed Heterogeneous Media
Ashish Tiwari, Satyam Bhardwaj, Yash Bachwana, **Parag Sarvoday Sahu**, Shanmuganathan Raman
Pacific Graphics 2025 (CGF Journal Track)
Project Page | DOI: 10.1111/cgf.70242

EXPERIENCES

Research Internship, 3DVisLab

Advisor: Prof. Avinash Sharma • IIT Jodhpur • Blog *July '25 - Present*

- Exploring learning-based reflective symmetry detection frameworks to identify all reflective symmetries in 3D shapes and investigate their use for compression-like tasks.
- Investigating high-fidelity 3D human head modeling using mesh processing and deep learning techniques.

Summer Research Internship, Photonic Sensors Lab *SRIP, IIT Gandhinagar*

Advisor: Prof. Arup Lal Chakraborty • IIT Gandhinagar • Project Link *May '24 - Jun '24*

- Worked on developing a mobile ambient methane gas concentration detection setup.
- Understood the working of a lock-in amplifier and worked on its implementation on an FPGA board.
- Implemented Serial Peripheral Interface (SPI) protocol-based data transfer between an FPGA board and a Raspberry Pi.

RESEARCH WORKS

Real-Time 3D Gaussian Splatting for Novel View Synthesis

Computer Graphics | 3D Gaussian Splatting Challenge, SIGGRAPH Asia 2025 *Oct '25 - Nov '25*

- Designed a coarse-to-fine training strategy that progressively increases image resolution during optimization.
- Integrated an efficient rasterizer inspired by Speedy-Splat, enabling strong PSNR within a 60-second training budget.
- Contributed to securing 2nd place in the international challenge and an invitation to present at SIGGRAPH Asia 2025.

Inverse Rendering of Heterogeneous Translucent Objects

Computer Vision & Graphics | Prof. Shanmuganathan Raman | IIT Gandhinagar *Aug '24-Present*

- Estimated **subsurface scattering parameters** of heterogeneous translucent media from **multi-view RGB images** using a feed-forward inverse rendering pipeline.
- Generated a large-scale dataset using Mitsuba 3, with heterogeneities generated using Fractal-Perlin Noise Model.
- Captured real-world objects and corresponding environment maps to evaluate generalization beyond synthetic data.

In-Band Full Duplex Radios with Self-Interference Cancellation

Adaptive Filtering | Prof. Nithin V. George | Video Presentation *Jan '24 - Apr '24*

- Studied existing literature to understand the principles of In-Band Full Duplex radio systems.
- Implemented Steepest Descent algorithm in MATLAB for self-interference cancellation in both batch and online settings.
- Evaluated algorithm robustness under noise; observed degradation in non-Gaussian environments.

SELECTED PROJECTS

3D Gaussian Splatting Renderer and Training Pipeline

Computer Graphics | IIT Gandhinagar *Oct '25 - Nov '25*

- Implemented a simplified 3D Gaussian rasterizer in PyTorch, including 3D-to-2D projection, covariance transformation, and differentiable splatting.
- Developed alpha and transmittance computation for ordered Gaussians, and blended colour, depth, and silhouette maps through accumulated transmittance.
- Trained isotropic 3D Gaussian representations from posed multi-view images (toy truck dataset), achieving high PSNR/SSIM on held-out views.

Scene Describer for the Visually Impaired

Embedded Systems & AI Integration | Prof. Jhuma Saha | IIT Gandhinagar | Project Link *Mar '25 - Apr '25*

- Built a low-cost assistive system to capture and audibly describe scenes for visually impaired users using AI.
- Integrated ESP32-CAM, Azure AI Vision, and ESP8266 for image captioning and audio playback.
- Developed a Python controller for image retrieval, AI captioning, speech synthesis, and audio streaming.

Panorama Stitching using Feature Matching and RANSAC

Image Processing | Prof. Shanmuganathan Raman | IIT Gandhinagar | Project Link *Sep '24 - Oct '24*

- Built a panorama stitching pipeline using SIFT feature matching and RANSAC-based homography estimation.
- Analyzed performance on varied image sets by tuning matching thresholds and geometric transformations.

Spatial Filtering and Edge Detection Techniques

Image Processing | Prof. Shanmuganathan Raman | IIT Gandhinagar | Project Link *Aug '24 - Sep '24*

- Implemented spatial filters including box, Gaussian, and Laplacian to smooth images and enhance structural features.
- Applied Sobel and Prewitt operators for edge detection, tuning thresholds and kernel sizes to study sensitivity and robustness.

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

Digital Signal Processing | Prof. Nithin V. George | IIT Gandhinagar | Project Link *Aug '23 - Nov '23*

- Created an ecosystem to enable parents to track their children's location and trigger alarms in case of emergency.
- The app measured level of danger based on direct criteria like boundary crossing, fall detection, and overspeed.
- Employed TCP/IP and UDP protocols to enable reliable data transmission and real-time communication within the app.

AWARDS AND ACHIEVEMENTS

- **IndiaAI Fellowship** - awarded to students pursuing projects in Artificial Intelligence from top institutions in India.
- Secured **2nd place** in the **3D Gaussian Splatting Challenge**, SIGGRAPH Asia 2025.
- **Dean's List**, 6th semester - awarded to the top 5% of students in a discipline for academic excellence (Official Listing).
- Awarded the **Bipin and Rekha Shah Scholarship** for academic and overall excellence at IIT Gandhinagar (Official Listing).
- Awarded the **Prof. DV Pai Scholarship** for academic and overall excellence at IIT Gandhinagar (Official Listing).
- Successfully led a 20-member student team managing event operations for **TEDxIITGandhinagar 2024**.
- Ranked in the **top 1%** among over one million candidates in **JEE Advanced 2022** for admission to the IITs.
- Secured 1st rank in Chhattisgarh in NAEST 2020, conducted by IAPT to assess experimental and conceptual physics skills.

SKILLS

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

Tools: MATLAB Android Simulink | Mitsuba 3 | Latex | Xilinx Vivado | Git | Arduino IDE | Autodesk Inventor

Libraries: Numpy | Matplotlib | Pandas | PyTorch | Seaborn

RELEVANT COURSES

Computer Vision | **Machine Learning** | Data Structures and Algorithms | Matrix Methods for Signal Processing, Data Science and Machine Learning | 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