# SPARSH GARG

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## EDUCATION

**Carnegie Mellon University** — Pittsburgh, PA
MS Mechanical Engineering – **Robotics & CV Research** | GPA: 4.0/4.0 | **ATK-Nick G. Vlahakis Graduate Fellow** — May 2025
Courses: Visual Learning & Recognition, Learning for 3D Vision, Computer Vision, Deep Learning
TA: Introduction to Feedback Control Systems, Feedback Control Systems
Research: Kantor Lab – Developing advanced perception methods for robot manipulation in the real world

**Punjab Engineering College** — Chandigarh, India
Bachelor of Technology in Mechanical Engineering | GPA: 9.47/10.00 — Jun 2021

## PUBLICATIONS

Depth Any Camera: Zero-Shot Metric Depth Estimation from Any Camera *[**CVPR 2025**]*
A novel framework for zero-shot metric depth estimation across diverse camera types, including fisheye and 360-degree images, achieving state-of-the-art performance. Demonstrated superior generalization and reduced dependency on real-world depth annotations.

**SplatSim:** Zero-Shot Sim2Real Transfer of RGB Manipulation Policies Using Gaussian Splatting *[**ICRA 2025**] [Spotlight Presentation at CoRL Workshop]*
A photorealistic synthetic data generation framework utilizing Gaussian Splatting to bridge the Sim2Real gap for vision-based policy training. Achieved an overall success rate of 86.25% in zero-shot policy deployment across four tasks.

## ACADEMIC AND RESEARCH PROJECTS

**Spatio-Temporal Modeling for Fluid Rheology** — Sept 2024 - Present
Graduate Student Researcher at Kantor Lab, Robotics Institute, CMU — Pittsburgh, PA
- Developed a robust pipeline for liquid meniscus detection by fine-tuning SAM2.1, leveraging its segmentation capabilities
- Annotated masks for frames by integrating human-in-the-loop prompting for SAM, enhancing segmentation accuracy for transparent liquids
- Developed a deep learning framework for viscosity classification and regression based on video sequences of rotating fluids

**SplatSim: Path Toward Zero-Shot Sim2Real Transfer** — Mar 2024 - Sept 2024
Graduate Student Researcher at Kantor Lab, Robotics Institute, CMU
- Leveraged Gaussian Splatting to enable the zero-shot real-world transfer of RGB policies directly from sim learning
- Manipulate a static robot in the splat space by moving individual 3D gaussians to learn diffusion policy completely in the splat-sim space

**Deep Learning Assisted 3D Reconstruction for Agricultural Robotics** — Oct 2023 - Mar 2024
Graduate Student Researcher at Kantor Lab, Robotics Institute, CMU — Pittsburgh, PA
- Modified the RAFT-Stereo architecture for better performance on thin structure like grapevines to generate 3D point clouds from RGB images
- Deployed NeRF novel view synthesis to generate large amounts of stereo training data and used it to train the modified RAFT network
- Developed a custom real-time data pipeline that rectified images from multiple viewpoints for DL models for online deployment

**Transradial Myoelectric Prosthetic Arm** — Sept 2020 - May 2021
UG Senior Year Major Project — Chandigarh, India
- Led a team of 7 to design and fabricate an EMG-controlled transradial prosthetic arm
- Implemented a whippletree mechanism for underactuation in fingers, reducing the number of actuators and making the arm lighter
- Controlled servo motors using Arduino Uno and EMG sensor that monitored muscle fibers' electrical activity during contraction

## PROFESSIONAL EXPERIENCE

**Bosch Research** — Sunnyvale, CA
Research Intern: AI & 3D Perception — May 2024 - Nov 2024
- Spearheaded the development of depth estimation frameworks optimized for large field-of-view (FoV) cameras
- Achieved state-of-the-art performance on multiple fisheye and 360-degree datasets, demonstrating superior zero-shot generalization

**CynLr (Cybernetics Laboratory)** — Bengaluru, India
Design and Development Engineer — Jun 2022 - Mar 2023
- Developed stereo vision infrastructure for serial manipulators, enabling manipulation of random objects through visual inputs
- Devised a robot calibration system and an algorithm to find object coordinates from the robot base using vision input; validated experimentally

Sparsh3Dp — Bengaluru, India
Founder — May 2020 - Mar 2023
- Launched a venture for additive manufacturing as an online marketplace offering customized products
- Managed designing, branding, marketing, shipping, and customer feedback for the marketplace; Generated revenue of 10kUSD

## SKILLS

**Programming**: Python, PyTorch, OpenCV, Open3D, Point Cloud Registration, Stereo 3D Reconstruction, NeRFs, Gaussian Splatting, MATLAB, C/C++, Bash, NI Labview, ROS, Mutex, Git, Linux CLI, Deep Learning (Diffusion Models, Transformer, Attention), Model Predictive Control, Data Structures and Algorithms, Camera Calibration
**Software and Tools**: AzureML, NerfStudio, Colmap, Webots, DS Solidworks, Autodesk Inventor, Fusion 360, Catia V5, TinkerCAD, AutoCAD, ANSYS, Arduino Uno, MS Office, GD&T, RoboDK

## AWARDS & GUEST LECTURE

- **Samsung Research** - Delivered a talk titled *Beyond Data Scarcity: Scalable Approaches for Vision in Robotics* discussing scalable data generation and cross-domain learning in vision-based robotics — Feb 2025
- Recipient of **ATK-Nick G. Vlahakis Graduate Fellowship** — Feb 2025