Siddharth Katageri

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PROFESSIONAL SUMMARY

Machine Learning Engineer and Researcher with **3+ years** of experience developing AI-driven systems across **computer vision, generative modeling,** and **3D vision**. Skilled at building **end-to-end learning pipelines** that combine **deep learning, optimization,** and **representation learning** for real-world applications in **autonomous systems, AR/VR,** and **digital twins**. Experienced in **multimodal learning, vision-language models (VLMs),** and **large language models (LLMs)** for enabling cross-modal understanding and content generation. Strong technical foundation in **camera calibration, multi-view geometry, 3D reconstruction,** and **differentiable rendering**.

EDUCATION

International Institute of Information Technology, Hyderabad (IIIT-H) Aug 2021 - Aug 2024
Masters by Research, Computer Science and Engineering, GPA: 8.57/10

KLE Technological University, Hubballi Jul 2017 - Jun 2021
B.Eng. in Computer Science and Engineering, GPA: 8.66/10

EXPERIENCE

○ **TCS Research**
Researcher - Visual Computing and Emboddied AI Nov 2024 - Present

- **Generative AI and digital twins:** Developing cutting-edge spatial mapping frameworks for high-fidelity 3D world creation, generating interactable virtual environments with realistic geometry and textures.
- **Core technologies:** Leveraging **generative AI, differentiable rendering,** and **multi-view 3D reconstruction** to enhance **immersive AR/VR experiences** and facilitate accurate **digital twin generation**.
- **Deployment and scale:** Collaborating with cross-functional teams to **deploy research prototypes** into scalable solutions for **metaverse** and **mixed-reality environments**.

○ **International Institute of Information Technology, Hyderabad (IIIT-H)**
Research Fellow - Machine Learning Lab (MLL) Aug 2021 - Jul 2024
advised by **Prof. Charu Sharma** and **Prof. Kai Han**

- **ML research:** Conducted research on **generative modeling (diffusion models), 3D representation learning, human–scene interaction modeling,** and applying principles of **multimodal learning** and **optimization**.
- **Algorithm developments:** Designed, trained, and optimized novel **contrastive and optimal transport-based frameworks** for unsupervised 3D domain adaptation; work published in **WACV 2024**.
- **Technical mentorship:** Mentored students on deep learning frameworks (PyTorch) and multi-modal model training.

○ **KLE Technological University, Hubballi**
Research Intern - Center of Excellence in Visual Intelligence (CEVI) Mar 2021 - Aug 2021
advised by **Prof. Uma Mudenagudi**

- **ML research:** Developed attention-based decomposition networks to decompose 3D shapes and improved downstream classification and segmentation tasks.
- **Demonstrated impact:** Co-authored and published results in prominent computer vision venue workshops (**ICCVW 2021, CVPRW 2021**).

○ **Indian Institute of Technology, Delhi (IIT-D)**
Project Trainee Jun 2019 - Jul 2019

- **Medical application:** Contributed to a collaborative project with **AIIMS, Delhi**, by developing a computer vision system for surgical training assessment.
- **Classical ML and vision:** Implemented a **Gaussian mixture model (GMM)** detector for automated knot assessment in micro-suturing images, providing quantitative feedback for trainee neurosurgeons.

PUBLICATIONS

MOGRAS: Human Motion with Grasping in 3D Scenes
Kunal Bhosikar, **Siddharth Katageri**, Vivek Madhavaram, Kai Han, Charu Sharma
British Machine Vision Conference Workshops (BMVC 2025) - Human Modeling

Synergizing Contrastive Learning and Optimal Transport for 3D Point Cloud Domain Adaptation
Siddharth Katageri*, Arkadipta De*, Chaitanya Devaguptapu*, VSSV Prasad, Charu Sharma, Manohar Kaul
Winter Conference on Applications of Computer Vision (WACV 2024), **Oral**

Metric Learning for 3D Point Clouds Using Optimal Transport
Siddharth Katageri, Srinjay Sarkar, Charu Sharma
Winter Conference on Applications of Computer Vision Workshops (WACVW 2024) - Pretrain

ABD-Net: Attention Based Decomposition Network for 3D Point Cloud Decomposition
Siddharth Katageri, Shashidhar Kudari, Akshay Gunari, Ramesh Tabib, Uma Mudengudi
International Conference on Computer Vision Workshops (ICCV 2021) - StruCo3D

PointDCCNet: 3D Object Categorization Network using Point Cloud Decomposition
Siddharth Katageri, Sameer Kulmi, Ramesh Tabib, Uma Mudengudi
Conference on Computer Vision and Pattern Recognition Workshops (CVPR 2021) - WiCV

KEY PROJECTS

○ **Learning Human-Object Interactions using Generative Models**
- **Developed a novel conditional diffusion model** to generate human motion and grasp actions, addressing the need for models that can generate both walking and optimized grasping in arbitrary 3D scenes.
- **Engineered a specialized synthetic data pipeline** combining SoTA motion diffusion models (e.g., PriorMDM) with optimization frameworks (e.g., FLEX) to get realistic grasping poses and minimize body/scene intersection.
- Keywords: Generative AI (Diffusion Models), Constrained Optimization, Data Synthesis, Embodied AI.

○ **3D object detection and tracking in outdoor LiDAR scans.**
- Benchmarked 3D **object detection and tracking** models on large-scale LiDAR datasets (e.g., nuScenes).
- Contributed in building a preprocessing pipeline to identify and filter dynamic objects, directly supporting the creation of static 3D digital city maps.
- Keywords: Object Detection/Tracking, Model Benchmarking, LiDAR Data, Autonomous Systems. Project was carried out under the guidance of **Dr. Avinash Sharma** and **Dr. Charu Sharma**.

○ **Computer Vision System for Automated Surgical Skill Assessment**
- Collaborated with AIIMS, Delhi, to design and implement an algorithm for automated **evaluation and quantitative scoring** of surgical proficiency (micro-suturing).
- Utilized classical ML (Gaussian mixture models) and image processing to detect and evaluate created knots, transitioning a research concept into a practical training tool.
- Keywords: Applied Computer Vision, Image Processing, Classical ML (GMM), Quantitative Metrics.

○ **Mesh-Based Cloth Simulation**
- Implemented and enhanced "Learning Mesh-Based Cloth Simulation with Graph Networks" .
- Keywords: **Graph Neural Networks (GNNs)**, Deep Learning for Physics, Simulation.

SERVICE AND CERTIFICATION

○ Delivered hands-on tutorials on 3D Vision and Deep Learning Fundamentals during the IIIT Hyderabad Summer School (2022, 2023). (slides).
○ Co-organized workshops on Machine Learning and Computer Vision for over 100 participants at the IIIT-H Summer School on AI (2023).
○ Completed the Improving Deep Neural Networks, Neural Networks and Deep Learning, Structuring Machine Learning Projects, and Deep Learning in Computer Vision from Coursera.

TECHNICAL SKILLS

Languages: Python, C, C++
Framework: PyTorch, Scikit-Learn, Tensorflow
ML Topics: Deep Learning, Generative AI, Multimodal Learning, Representation Learning, Optimization
Computer vision and graphics topics: Multi-view Geometry, Differentiable Rendering, Camera Calibration, SLAM/Reconstruction, ICP, NeRF, Gaussian Splatting
Tools and Platforms: Git, WandB, Docker, Blender, MeshLab, Linux, NvDiffRast, Open3D, OpenCV, Trimesh