ARKAJYOTI MITRA

Email || LinkedIn || Google Scholar || Website

RESEARCH INTEREST

My research focuses on developing **secure, scalable, and adaptive autonomous vehicular perception systems (AVPS)** for autonomous driving. I investigate robustness in AVPS against adversarial threats, scalability through federated fine-tuning and personalized adaptation of **Vision–Language Models (VLMs),** and adaptability via multimodal integration such as wireless radio maps, to enrich latent representations for scene understanding. My work also explores generative models such as **Flow-matching** for scenario simulation and 3D reconstruction techniques such as **3D Gaussian Splatting (3DGS)** for environment modeling.

SELECTED RESEARCH ARTICLES

Arkajyoti Mitra, Paul Agbaje, Afia Anjum, Mert D. Pesé, Habeeb Olufowobi; **FedVLM: Scalable Personalized Vision-Language Models through Federated Learning**, *European Conference on Artificial Intelligence (ECAI'25) [Accepted]*
Arkajyoti Mitra, Pedram MohajerAnsari, Mert D. Pesé, Habeeb Olufowbi; **Beyond the Glow: Adversarial Analysis of Luminescent Markers in Autonomous Vehicle Perception Systems**, *USENIX Symposium on Vehicle Security and Privacy (VehicleSec'25)*
Aqsa Yousaf, **Arkajyoti Mitra**, Paul Agbaje, Afia Anjum, Habeeb Olufowobi; **DAPS-AGF: Depth-Aware Perceptual Similarity with Adaptive Gradient Filtering for Enhanced Outdoor Scene Reconstruction,** *End-to-End 3D learning (ICCV Workshop'25) [Accepted]*
Paul Agbaje, Afia Anjum, **Arkajyoti Mitra**, Habeeb Olufowobi; **Privacy-Preserving Intrusion Detection System for Internet of Vehicles using Split Learning,** *International Conference on Big Data Computing, Applications and Technologies (BDCAT'23)*
Paul Agbaje, Afia Anjum, **Arkajyoti Mitra**, Gedare Bloom, Habeeb Olufowobi; **A Framework for Consistent and Repeatable Controller Area Network IDS Evaluation,** *International workshop on Automotive and Autonomous Vehicle and Security (AutoSec'22) [**Best paper award**]*

EDUCATION

University of Texas, Arlington, USA — Fall'20 - Present
Doctor of Philosophy (Pursuing), Computer Science — *GPA: 3.9/4.0*

Indian Institute of Technology (Indian School of Mines), Dhanbad, India — 2017 - 2019
Master of Technology, Computer Science and Engineering — *CGPA: 8.65 / 10*

RESEARCH PROJECTS & EXPERIENCE

Vision-Language Model (VLM) for Visual Question-Answering (VQA) Tasks — Ongoing
- Fine-tuning VLMs (Florence2, SmolVLM2, Phi 1.5) on VQA benchmark datasets such as OK-VQA, Text-VQA, GSM100K.
- Leveraging VLMs for **reasoning** and **unknown terrain navigation.**

3D Reconstruction — Ongoing
- Building **digital twin** environment using **3DGS** for safer development of **Autonomous Driving**.
- Hyperparameter tuning for **scene reconstruction** and improving the quality of the scene while **reducing memory footprint**.

Generative Modelling — Ongoing
- Building **Flow-Matching** models to develop velocity fields for **point cloud generation**.
- Exploring **Diffusion models** such as **DDPM** for **spatial generation**.

MITRE eCTF Competition (Entered Attack Phase) — Jan. 2024 - April 2024
- Lead a team and developed a secure medical device using MAX78000FTHR Board
- Secured 25th position worldwide

CyberTractor Workshop — July 2022 - July2022
- Secured *second* position by identifying/patching a security vulnerability on control area network (CAN) through replay attacks.

CyberTruck Workshop — June 2022 - June 2022
- Developed a spoofing attack on CAN bus that can compromise vehicular components such as brakes and fuel indicator.

Computer-Aided Identification of Astrocytoma Tumor Grades using Brain MRI — June 2018 - May 2019
- Developed a framework that detects and classifies brain tumors from the MRI scans of patients.

TECHNICAL SKILLS

Programming languages and Software: Python, MATLAB, C++, C, CARLA (simulator)
Machine Learning Application Frameworks: PyTorch, TensorFlow, Diffusers, Transformers

WORK EXPERIENCES

University of Texas, Arlington August 2020 – Present
Graduate Teaching Assistant/Research Assistant
- Current research focus is applying vision-language models for autonomous driving and improving latent representation for seamless navigation. I conduct my research in the Cyber-Physical System Security (CSS) Lab.
- Collaboratively working on projects, reviewing as well as writing research papers, mentor undergrads and master students for doing research. Varied experiences are helping me in improving communication skills, critical thinking, and resource-and-time management.

Indian Institute of Technology (Indian School of Mines), Dhanbad July 2018 – May 2019
Teaching Assistant
- Being teaching assistant under different lecturers helped in gaining experience and working under various conditions and environment.

AWARDS AND SCHOLARSHIPS

- Travel grant to attend VehicleSec'25 August 2025
- Travel grant to attend VehicleSec'24 February 2024
- Travel grant to attend TAPIA'23 September 2023
- Travel grant to attend CyberTractor workshop June 2022
- Travel grant to attend CyberTruck workshop July 2022
- Best paper award in AutoSec'22 April 2022
- Second Best Paper award by Computer Society of India (CSI), Kolkata August 2016

OTHER ACTIVITIES

- Volunteered for VehicleSec'24
- Volunteered for SC'22