Ali Khalid

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Professional Summary

Experienced researcher driving innovation in real-time digital twin creation from camera and LiDAR data. Skilled in developing advanced systems that enhance autonomous cooperative perception and sports analytics.

Research Experience

2022 - present
Rochester, NY

Graduate Research Assistant, *Rochester Institute of Technology*

- Developing an AI camera system for real-time sports broadcasting, with capabilities in automated tracking, play analysis, and camera angle optimization.
- Developed a CPU-based 3D LiDAR compression algorithm for autonomous vehicles by leveraging spatiotemporal redundancies over extended period achieving 3× better compression ratio with only 1.5× compute overhead compared to SOTA.
- Designed a real-time V2I cooperative perception system for autonomous vehicles, enabling 3D LiDAR data transmission, localization, and fusion from roadside units to vehicles with 20 ms latency and 2 cm accuracy, surpassing SOTA performance.
- Developed a cooperative perception dataset with 500k real-world point clouds, ground truth poses, and maps, collected over two months using a 128-beam LiDAR mounted on a vehicle and a roadside unit.
- Generated scenario-specific data from CARLA and trained SOTA models for 3D object detection and 3D semantic segmentation to evaluate the performance of the autonomous vehicle perception systems.

Skills: 3D Localization & mapping, Visual SLAM, CARLA, ROS, PCL, Cloud Compare, Docker, CUDA, Python, C++

2021 - 2022
Lahore, Pakistan

Research Assistant, *Lahore University of Management Sciences*

- Spearheaded research in SAR polarimetry for enhanced land use classification accuracy and led efforts in green space identification, tree counting, travel time estimation, and road network extraction using satellite imagery.

Skills: 2D Object Detection & Segmentation, GEE, QGIS, ArcGIS, SNAP, Python

2020 - 2021
Lahore, Pakistan

Research Assistant, *Information Technology University*

- Developed innovative techniques for image relocalization through scene coordinates regression, estimating occlusion-aware optical flow using deep learning, and generating detailed 3D models of indoor environments using Structure From Motion, enhancing spatial understanding and navigation capabilities.

Skills: Structure From Motion, Optical Flow, COLMAP, OpenSFM, Python

2019 - 2019
Lahore, Pakistan

Research Intern, *Lahore University of Management Sciences*

- Conducted research leveraging Wi-Fi CSI to develop solutions for estimating rotor speeds of industrial machines, passively tracking multiple individuals, estimating occupancy through walls, and detecting soil moisture levels.

Skills: Wireless Localization and Tracking, USRP, MATLAB

2018 - 2018
Lahore, Pakistan

Research Intern, *Al-Khwarizmi Institute of Computer Science*

- Worked in a team to develop a brain-controlled wheelchair, contributing to the acquisition of brain signal training data, training machine learing model, and implementing an obstacle avoidance feature.

Skills: Emotive Epoc+, MindWave, Ultrasonic Distance Sensor, Raspberry Pi, Python

Education

2022 - 2027
Rochester, NY

PhD Computer Science, *Rochester Institute of Technology*
Dissertation: Creating digital twins in real-time to support cooperative perception and sports analytics.

Skills: 3D Computer Vision, 3D Reconstruction, Depth Estimation

2016 - 2020
Lahore, Pakistan

BSc Electrical Engineering, *University of Engineering and Technology*
Thesis: A smart assistant for homes and offices.

Skills: Machine Learning, Embedded Systems, Robotics, Signal Processing

Related Skills

3D Computer Vision
Object Detection & Tracking, Semantic Segmentation, Registration, Localization, Mapping

Deep Learning
Transformers, GANs, CNNs, RNNs, NeRF, MLPs, VAEs, FPNs, RPNs

2D Computer Vision
Object Detection & Tracking, Semantic Segmentation, Depth Estimation, Image Relocalization

Machine Learning
Regression, Classification, Clustering, Reinforcement Learning, Diffusion models

Frameworks
ROS, CARLA, OpenSFM, COLMAP

Software Infrastructure
Python, C++, CUDA, Docker, Bash, CMake

Programming Libraries
PCL, Open3D, OpenCV, NumPy, Pandas, SciPy

Machine Learning Frameworks
PyTorch, TensorFlow, Keras

Recent Publications

2025

Been There, Scanned That: Nostalgia-Driven LiDAR Compression for Self-Driving Cars
Ali Khalid, Jaiaid Mobin, Sumanth Appala, Avinash Maurya, ..., Fawad Ahmad (under review)
ACM MobiCom'25, *International Conference on Mobile Computing And Networking*, 2025

2024

VRF: Vehicle Road-side Point Cloud Fusion | Paper | Code & Dataset
Ali Khalid*, Kaleem Khan*, Yash Turkar, Kartik Dantu, Fawad Ahmad (*coprimary authors)
ACM MobiSys'24, *International Conference on Mobile Systems*, 2024