Aakash Kumar (Ph.D. Candidate)

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Education

PhD in Computer Science, University of Central Florida, USA Aug. 2020 – Present (Expected 2026)

Masters in Electronics and Communication, Shanghai Jiao Tong University, China 2018 – 2020

B.E Electrical Engineering, Sukkur IBA University, Pakistan 2011 – 2015

Publications and Articles

1. **Aakash Kumar**, Chen Chen, Ajmal Mian, Neils Lobo, and Mubarak Shah. "Sparse Points to Dense Clouds: Enhancing 3D Detection with Limited LiDAR Data," IEEE/RSJ International Conference on Intelligent Robots and Systems **(IROS)**, 2024, (Accepted).

2. **Aakash Kumar**, Jyoti Kini, Mubarak Shah, and Ajmal Mian. "Self-supervised Learning for Multiple Object Tracking in 3D Point Clouds," IEEE/RSJ International Conference on Intelligent Robots and Systems, **(IROS)**, Kyoto, Japan, 2022.

3. **Aakash Kumar**, Jyoti Kini, Mubarak Shah, and Ajmal Mian. "PC-DAN: Point cloud based deep affinity network for 3d multi-object tracking (accepted as an extended abstract for securing first position in JRDB-Act workshop at **(CVPR)**, 2021)."

Research Projects

Self-Supervised 3D Multiple Object Tracking: Developed the first self-supervised method for 3D object tracking using LiDAR, enhancing feature learning and object association without the need for annotated training data.
Funding: Lockheed Martine
Project Page: Self-Supervised 3D MOT

PC-DAN for 3D Multiple Object Tracking: Introduced a deep learning model for 3D multi-object tracking, processing LiDAR data with feature permutation to achieve top leaderboard performance at a Stanford University CVPR workshop.
Funding: Lockheed Martine
Project Page: PC-DAN

Sparse Points to Dense Clouds: Created a 3D detection method using sparse LiDAR data to reconstruct dense point clouds, achieving significant accuracy improvements on KITTI and JackRabbot datasets.
Project Page: Sparse Points to Dense Clouds

Real-Time Visual Saliency Detection: Proposed a CNN based model for saliency detection of Synthetic Aperture Radar (SAR) images, reducing computational complexity and enabling real-time remote sensing applications.
Funding: Shanghai Jiaotong University, China

Satellite Image Segmentation: Improved remote sensing image segmentation by modifying CNN based segmentation models, effectively classifying roads, buildings, grass, and water with enhanced accuracy.

Major Courses Taken

CAP-6614 Current Topics in Machine Learning   CAP-5415 Computer Vision
CAP-6419 3D Computer Vision   CAP-5610 Machine Learning
CAP-6411 Computer Vision Systems   CAP-5516 Medical Image Computing

Technical Skills / Expertise

Programming Languages: Python, MATLAB, C++, JAVA
Frameworks & Libraries: PyTorch, TensorFlow, OpenCV, Open3D
Tools & Platforms: Linux, Git, Docker

Academic Achievements

Won Stanford's JackRabbot Challenge 3D Tracking Competition at CVPR 2021.
Granted the Graduate Presentation Fellowship by UCF College of Graduate Studies, 2022.
Awarded the ORC Fellowship from the University of Central Florida (2021).
Received a fully funded 2-year Chinese Government Scholarship by CSC China for Master's degree (2018).
Awarded a fully funded 4-year National ICT Scholarship for undergraduate studies (2011)
Recognized with an Institutional Merit Scholarship for achieving highest GPA in the 7th semester of bachelor's

Relevant Experience

Graduate Research Assistant, University of Central Florida, USA   May 2024 – July 2024
Project: "HAYSTAC: Hidden Activity Signal and Trajectory Anomaly Characterization"
Developed ensemble methods, achieving a 4% gain in anomaly detection accuracy by enhancing the model's ability to detect rare trajectory patterns.

Graduate Research Assistant, University of Central Florida, USA   January 2021 – August 2022
Project: "Cognitive Sense Making"
Designed a self-supervised approach for 3D multiple object tracking in LiDAR point clouds, achieving state-of-the-art results without requiring annotated data.