Rohith Reddy Rachala

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Education

- **University of California, San Diego** — La Jolla, California
  Master of Science, ECE, Signal and Image Processing; GPA: 3.89/4 — *Sept 2022 - Present*
  Courses: Computer Vision 1, Advanced Computer Vision, Intro to Visual Learning, Deep Generative Models, Deep Learning and Applications, Statistical learning 1, Digital Image Processing, Digital Signal Processing, Linear Algebra
- **Indian Institute of Technology, Palakkad** — Kerala, India
  Bachelor of Technology, Electrical Engineering; GPA: 8.53/10 — *Aug 2017 - Apr 2021*
  Courses: Wireless Communications, VLSI Architectures for Signal Processing, Microprocessors System Design and Interface

Technical Skills

- **Languages**: C, C++, Python, Dart, PHP, Verilog, MATLAB, Embedded C
- **ML Frameworks**: PyTorch, Keras, TensorFlow, Scikit
- **Libraries**: NumPy, OpenCV, Pandas, Matplotlib, Flask, React, Streamlit, Flutter, Qt(Python/C++)
- **Tools**: Kubernetes, Docker, GIT, PostgreSQL, MySQL

Experience

- **Graduate Student Researcher - Data Science** — Nov 2022 - Present
  SOPAC Lab, Scripps Institute of Oceanography, UC San Diego, La Jolla, CA
  - Developing a multi-threaded desktop software application using Python/C++ Qt, incorporating server-client architecture and APIs to connect to and process data from hundreds of NTRIP/socket servers. Implemented advanced data processing techniques, including coordinate correction in RTCM messages and data publishing to a new NTRIP server.
  - Collaborated with the NASA JPL team to analyze time series data using both supervised and unsupervised learning methods to accurately identify and classify various types of anomalies in the data.
- **Software Development Engineer,R&D** — July 2021 - Sept 2022
  ITS Planners and Engineers, Hyderabad, India
  - Designed and implemented Nayanam, a low-weight real-time image processing algorithm using OpenCV and Python to count the number of vehicles crossing stop lines using live CCTV footage.
  - Developed and deployed traffic management software, including adapters and algorithms, for TIMv2 on Raspberry Pi, optimizing traffic flow and integrating traffic detectors into the Traffic Intelligent Server. Released two stable versions which can be directly installed on edge device.
- **Software Development Engineer Intern,R&D** — Apr 2020 - Jul 2020
  ITS Planners and Engineers, Hyderabad, India
  - Developed back-end codes and APIs using Python, PostgreSQL(PostGIS) to analyze public transport data, including selective vehicle priority algorithms and scripts for generating alerts like bunching alerts, speed alerts, geofencing alerts.
  - Developed Margadarshi app using Flutter, which integrates a multi-modal journey planner using OpenTripPlanner API.

Projects

- **Accurate 3D-Hand Pose Estimation via Multi-Modal Fusion**
  Mentor: Dr. Nuno Vasconcelos, UC San Diego — *Jun 2023 - Present*
  - Researching multi-modal fusion techniques (sensor and image) to improve 3D hand pose estimation in highly occluded scenarios. Developing an automated approach to generate ground truth annotations from multi-view cameras for training a transformer-based architecture.
- **Counterfactual Image Generation using Latent Transformations**
  - Developed a pipeline for counterfactual image generation using GANs and neural networks, enabling the creation of visually similar alternative reality images with desired attribute changes for improved image editing and explainable AI.
  - Implemented a multi-step process utilizing StyleGAN(trained on CelebA) for random image sampling, attribute classification, and shift prediction to generate high-quality counterfactual images with specified target attributes.
- **Instance Eraser**
  - Developed an algorithm inspired by Google's MagicEraser to remove specified objects from images. Utilized instance segmentation and Pix2Pix GAN model for image reconstruction, achieving contextually relevant background recovery.
  - Implemented a user-friendly interface for object removal. Experimented with Mask R-CNN and generative models. While not state of the art, achieved decent results and demonstrated potential for further improvement through experimentation.
- **Multiple Stream Vehicle Detection and Tracking**
  - Created a GPU-based edge device vehicle detection and tracking system employing YOLOv5 and DEEPSORT, enabling model switching for accuracy and live stream needs. Implemented socket server for real-time detection data broadcasting to authenticated clients, with deployment on Jetson board for four live streams processing using SORT algorithm.

Publications

- **Hand-Drawn Electrical Circuit Recognition using Object Detection and Node Recognition**
  Co-author: Dr. Mahesh Panicker, IIT Palakkad — *Github Link*
  - Developed a real-time algorithm for automatic recognition of hand-drawn electronic circuits, enabling circuit schematic reconstruction using object detection and circuit node recognition. Pioneered a novel approach applicable to graph and flowchart generation from hand-drawn sketches, expanding computer vision research possibilities.