SAQIB AZIM

✉ azimsaqib10@gmail.com ⋄ ☎ 858-319-6910 ⋄ 🌐 saqib1707.github.io ⋄ in linkedin.com/in/saqibazim ⋄ 🏠 SanDiego, CA

Research Interests: Reinforcement Learning, Representation Learning, Generative AI, Robot Perception, Computer Vision

EDUCATION

University of California San Diego   Sep '21 - Sep '23

· Master of Science (MS) in *Electrical and Computer Engineering*, **GPA : 3.92 / 4.0**
· **Courses:** Deep Generative Models, Deep Learning for 3D Data, Deep Reinforcement Learning, Statistical Learning, Advanced Computer Vision, Natural Language Processing, Sensing and Estimation in Robotics, Maths for Robotics, Convex Optimization and Applications, Search and Optimization, Statistical Signal Processing, Linear Algebra

Indian Institute of Technology Bombay   Jul '15 - Jun '19

· Bachelor of Technology (B.Tech) in *Electrical Engineering* with Minor in *Computer Science*
· **Undergraduate Research Award** *(for excellent research contribution)*   [2019]
· **Courses:** Deep Learning, Advanced Machine Learning, Computer Vision, Advanced Image Processing, Data Structures Algorithms

TECHNICAL SKILLS

· **Programming** - Python, C, C++, MATLAB, Bash, HTML, CSS
· **Frameworks** - PyTorch, TensorFlow, HuggingFace, Scikit-Learn, NumPy, Pandas, OpenCV, CUDA, Docker, Kubernetes, MLFlow
· **Deep Learning Stack** - LLMs (GPT, BERT, Llama), Transformers, CNN, RNN, LSTM, VAE, GAN, Diffusion models
· **Vision & Robotics** - SFM, SLAM, NeRF, multiview geometry, MuJoCo, ROS2, OpenAI Gym

PATENT & PUBLICATION

· **Visual Localization in Dynamic Environments with Targeted-Inference SLAM**   [report]
  Saqib Azim, Takumi Nito and Katsuyuki Nakamura
  Japan Patent Application, *filed Aug 2021 (pending)*

· **Indoor Distance Estimation using LSTMs over WLAN Network**   [arXiv/paper]
  Pranav Sankhe, Saqib Azim, Sachin Goyal, Tanya Choudhary, Kumar Appaiah and Sukumar Srikant
  In IEEE Workshop on Positioning, Navigation and Communications (WPNC 2019)
  Indian Patent 467255, Granted Nov 2023

WORK EXPERIENCE

San Diego Supercomputer Center, UC San Diego – AI/ML Engineer   Nov '23 - Present

· Developed a deep learning model using vision transformers to predict and deliver real-time assessments of wildfire structural damage by integrating aerial imagery, calfire damage reports, and satellite-based building footprints, achieving **91% test accuracy**.
· Developing an AI system to predict power outages using weather forecasts and vegetation data. **Optimized** feature extraction, model training, and inference pipelines for operational deployment, enhancing throughput by **10x** through advanced parallelism.
· Utilized **ConvLSTM** and video **vision transformer** based spatiotemporal models for fuel density prediction during prescribed fires
· Awarded the employee **performance award** from UCSD in May 2024

HITACHI R&D, JAPAN – Assistant Researcher, Intelligent Vision Research Group   Oct '19 - Sep '21

· Developed a **Visual-Inertial Localization and Navigation** system using **SLAM** and deep learning for dynamic environments.
· Implemented ORB keypoint-based camera pose estimation, keyframe 3D mapping, trajectory optimization, and loop closure in C++.
· Engineered a novel time-efficient targeted inference **semantic segmentation** for dynamic scene detection, integrated it with localization pipeline to **reduce computation time by 5x** leading to **patent** submission in Japan.
· Achieved **47% reduction** in localization error compared to state-of-the-art real-time methods in dynamic environments.
· Developed and **deployed** our real-time visual navigation system on Android devices leading to significant product impact.
· Created visual hazardous activity detection system using **Mask RCNN segmentation** and depth estimation. Successfully demonstrated a prototype at a Railway Factory and presented at the *Hitachi Research Symposium 2020*
· Implemented an interactive game in **Unity3D** graphics engine to generate synthetic data for deep learning training.
· Trained an end-to-end **MobileNet SSD** and **UNet** model to semantically segment hands using egocentric images, perform gesture classification, and identify hand-pointed objects with **94%** accuracy.

SAMSUNG R&D INSTITUTE – Machine Learning Intern   May '18 - Jul '18

· Prototyped a **handwritten text recognition** system by estimating wrist movements using Samsung smartwatch sensors.
· Improved raw IMU signal-to-noise ratio using adaptive filters and devised an automated data-collection framework.
· Trained a pipelined **SVM** and **attention-LSTM** model to learn the relation between hand movement and character patterns, and achieved **93%** text recognition accuracy.

Selected Projects

Robotic Manipulation using Deep Reinforcement Learning   Dec '22 - Aug '23
Graduate Student Researcher at Contextual Robotics Institute   *UC San Diego*

· Researched deep reinforcement learning techniques for dexterous manipulation tasks, focusing on real-world robotics applications.
· Employed **Soft Actor-Critic** (SAC) and **Adversarial Imitation learning** algorithms (GAIL, AIRL, VMAIL) to learn optimal task-policy in **Robosuite** and **DeepMind** control simulation environments.
· Enhanced agent performance by integrating multi-view camera inputs, diverse object shapes, and pose data across four manipulation tasks, improving robustness and task generalization.
· Successfully transferred learned policies to a real-world Panda robot arm (**Sim2Real**) using computer vision algorithms for object detection and pose estimation.

Object Pose Estimation and Neural Radiance Field (NeRF)   Fall '22

· Developed a 6D pose estimation pipeline to predict poses of objects in a scene using RGBD images.
· Utilized **PointNet** for object segmentation, followed by 3D point cloud formation, and **Iterative closest point** algorithm for point cloud alignment and to estimate the 6D pose of segmented objects, achieving **85%** test accuracy.
· Implemented **NeRF** to fit and generate photorealistic views of a scene, described by images and their poses.

Autonomous Vehicle Localization and Mapping   Winter '23

· Implemented a **Particle-Filter** SLAM algorithm for robot localization in an unknown environment using encoder and IMU odometry data, and generated a 2D occupancy-grid map using LIDAR measurements.
· Implemented a Visual-Inertial SLAM system for precise pose estimation of an IMU sensor attached to a car using an **Extended kalman filter** (EKF) and estimated 3D landmarks in the environment using stereo camera observations.

Robot Path Planning and Optimization   Nov '21 - Dec '21

· Generated and visualized **configuration space** for a differential-drive robot in a 2D obstructed environment.
· Implemented and optimized path planning algorithms - greedy search, probabilistic roadmaps (**PRM**), rapid exploring random trees (**RRT**) - to estimate shortest and safest paths.
· Performed comparative analysis by contrasting PRM and RRT for efficient robot path planning.

Autonomous Self-Driving Car – Member at Innovation Cell, IIT Bombay   Aug '17 - Jul '18

· Contributed to developing deep learning algorithms for vision and navigation pipeline of an autonomous driverless car.
· Used **path planning** algorithms (such as A*, RRT, PRM) with **ROS** for path planning and navigation.
· Proposed a compute-efficient image processing algorithm to mitigate shadows and varying lighting conditions on roads.
· Managed collection and annotation of a road dataset used to train **YOLO** framework for road and obstacle detection.

Enhancing Road-Scene Understanding using Image Inpainting   Winter '22

· Combined state-of-the-art semantic segmentation (**DeepLabV3**) model for removing undesired objects along with a Fourier-Convolution inpainting network for missing region completion.
· Trained and evaluated the model on the **CityScapes** dataset, generating superior image quality.

Teaching & Mentorship

· **Graduate Teaching Assistant**, UC San Diego
  - *Probabilistic Modeling and Machine Learning*   Spring '23
  - *Image Processing*   Winter '23
  - *Probability and Statistics for Data Science*   Fall '22
  - *Engineering Probability and Statistics*   Spring '22
  - *Linear Signals and Systems*   Winter '22
· **Teaching Assistant**, IIT Bombay - *Signals and Systems*   Spring '19