SAQIB AZIM

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INDUSTRY EXPERIENCE

HITACHI R&D LAB
Oct '19 - Sep '21

Assistant Researcher, Intelligent Vision Research Group **Tokyo, Japan**

- Developed a **Visual Localization** and **Navigation** system using deep learning & **SLAM**.
- Implemented **ORB**-keypoint based camera pose estimation, keyframe-based 3D mapping, trajectory optimization and loop closure in **C++**.
- Engineered a novel time-efficient targeted inference segmentation network to detect dynamic objects, reducing mean localization time by **5x** leading to **patent submission**.
- **Improved** dynamic scene localization error by **47%** compared to SOTA methods.
- Deployed navigation system on Android (Java & C++) with significant **product impact**.
- Created visual hazardous activity detection using **Mask R-CNN** segmentation model and depth estimation. **Showcased** working prototype at a Railway Factory.
- Achieved **94% accuracy** in segmenting and classifying hand gestures using egocentric images by training end-to-end **MobileNet SSD** and **UNet** models.
- Used **Unity** engine to generate synthetic visual data for training deep learning models.

SAMSUNG R&D INSTITUTE
May '18 - Jul '18

Machine Learning Intern Bengaluru, India

- Developed a **handwritten text recognition** system using Samsung smartwatch.
- Devised a data-collection framework and trained a combined **SVM** and **LSTM** models to learn relation between wrist movement and characters, achieving **93% accuracy**.

SELECTED PROJECTS

Graduate Research Assistant - Existential Robotics Lab
Dec '22 - Ongoing

- Developing **Deep Reinforcement Learning** models for robot manipulation tasks.
- Employed **Soft Actor-Critic**, **PPO** and **Adversarial Imitation Learning** algorithms (GAIL, AIRL, VMAIL) to learn optimal task-policy in **Robosuite** and **DeepMind** environments.
- Transferred learned policies to robot arm (**Sim2Real**) using computer vision algorithms.

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

- Utilized **PointNet** for object semantic segmentation, **Iterative Closest Point** algorithm for estimating 6D pose of segmented objects with **96% test accuracy**.
- Implemented **NeRF** to fit and generate photo-realistic novel views of a scene.

Autonomous Vehicle Localization and Mapping
Winter '23

- Implemented **Particle-Filter SLAM** for robot localization and occupancy grid mapping.
- Developed visual-inertial SLAM for pose estimation of an autonomous vehicle using an **Extended Kalman Filter (EKF)** and estimated 3D landmarks using stereo camera.

Adversarial Robustness Analysis of Deep Models
Apr '22 - Aug '22

- Utilized attack methods (FGSM, PGD, Auto-Attack) to generate adversarial examples.
- Conducted empirical analysis of CLIP model's resilience to adversarial perturbations.
- Developed **robust CLIP**-based classifier against l_2-norm perturbations using adversarial training and randomized smoothing. Evaluated on **CIFAR10**, **ImageNet** datasets.

Pursuer-Evader Optimal Trajectory Estimation
Aug '18 - Jul '19

- Designed a **novel control algorithm** to drive a multi-agent system to target destination.
- Utilized **global iterative solvers** to estimate optimal paths in constrained conditions.
- Learned to accurately predict pursuer-evader trajectory using **attention-LSTM** model.

Team Member - Autonomous Self-Driving Car
2017 - 18

- Contributed to the development of **vision** and **navigation** algorithms for driverless car.
- Proposed **compute-efficient** algorithm to mitigate effects of varying lighting on roads.
- **Managed** collection and annotation of autonomous driving dataset and trained **YOLO** framework for road and obstacle detection.

EDUCATION

UC San Diego
Sep '21 – Ongoing

- **Master of Science (MS)** in **Machine Learning and Intelligent Systems** **GPA :** 3.92/4.0

Indian Institute of Technology Bombay
Mumbai, India 2015 – 2019

- **B.Tech** in **Electrical Engineering** with Minor in **Computer Science**
- **Undergraduate Research Award** in 2019.

PUBLICATION & PATENT

- **Saqib Azim**, T. Nito and K. Nakamura, "**Visual Localization in Dynamic Environments with Targeted-Inference SLAM**", *Japan Patent Application, filed Aug '21 (pending)*
- P. Sankhe, **Saqib Azim**, S. Goyal, T. Choudhary, K. Appaiah and S. Srikant, "**Indoor Distance Estimation using LSTMs over WLAN Network**", *IEEE Workshop on Positioning, Navigation and Communications 2019 & Indian Patent Application, filed Dec '18*

TECHNICAL SKILLS

- **Programming** - Python, C++, MATLAB, Bash, Java, HTML, CSS
- **ML Frameworks** - TensorFlow, PyTorch, Scikit-Learn, NumPy, Pandas, CUDA, OpenCV
- **Dev Tools** - Git, Github, Docker, Android Studio, Unity, Google Colab, Jupyter, Linux

RELEVANT COURSES

- Deep Generative Models
- Deep Learning for 3D data
- Advanced Machine Learning
- Reinforcement Learning
- Statistical Learning
- (Intro) and (Advanced) Computer Vision
- Sensing and Estimation in Robotics
- Mathematics for Robotics
- Convex Optimization and Applications
- Advanced Image Processing
- Linear Algebra and Applications

ACHIEVEMENT & ROLES

- Secured rank of **1133** (*out of 1.5 million*) in **IIT-JEE** (India's toughest entrance exam).
- **Teaching Assistant** for 5 undergraduate and graduate courses at UC San Diego.
  - Probabilistic Modeling & Machine Learning
  - Probability & Statistics for Data Science
  - Engineering Probability & Statistics
  - Image Processing
  - Linear Signals & Systems
- Awarded **Bronze medal** (3rd/23 teams) by BARC India at Inter-IIT Technical Meet 2018.