SAQIB AZIM

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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*

INDUSTRY EXPERIENCE

Hitachi R&D Japan Oct '19 - Sep '21
Assistant Researcher, Intelligent Vision Research Group Tokyo, Japan

- Developed a **visual-inertial localization** system using SLAM and deep learning.
- Implemented feature-based camera tracking, 3D mapping, trajectory optimization.
- Proposed a time-efficient targeted inference segmentation network to detect dynamic scenes which reduces computation time by **5x** leading to **patent submission**.
- Achieved **47% reduction** in dynamic localization error over real-time SOTA methods.
- Deployed the visual navigation on Android devices, leading to **Hitachi product impact**.
- Showcased prototype to detect workplace hazardous activities and estimated risks to humans using computer vision techniques at a **Japanese Railway Factory**.
- Achieved **94% test accuracy** with a CNN model trained to identify hand-pointed objects using egocentric views to reduce industrial work-error.

Samsung R&D Institute May '18 - Jul '18
Machine Learning Intern Bengaluru, India

- Prototyped a **handwritten text recognition** system using Samsung smartwatch.
- Devised a novel data-collection framework, trained pipelined SVM + LSTM to learn relation between wrist movement and characters, achieving **95% test accuracy**.

SELECTED PROJECTS

Inverse Reinforcement Learning for Robot Manipulation Dec '22 - Ongoing
Graduate Research Assistant at Existential Robotics Lab

- Developing and improving Deep RL models for manipulation tasks in Mujoco simulator.
- Employed autoencoder-based **Soft Actor-Critic** and expert demonstrations to learn the latent state and action spaces from images for **Robosuite** and **DeepMind** tasks.
- Successfully transferred learned policies to a real-world Panda robot arm (**Sim2Real**).

6D Pose Estimation and Neural Radiance Field (NeRF) Fall '22

- Utilized **U-Net** 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 using IMU and LIDAR data.
- Implemented 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 Apr '22 - Aug '22

- Conducted empirical analysis of the **CLIP** model's resilience to adversarial perturbations and devised an attack mechanism to generate adversarial examples.
- Trained robust classifier with strong provable guarantees against adversarial attacks.

Vision Team Member, Autonomous Self-Driving Car 2017 - 18

- Proposed a compute-efficient image processing algorithm to mitigate the effects of shadows and varying lighting condition on roads.
- Managed the collection and annotation of Indian road dataset and trained the **YOLO** framework for road and obstacle detection.

EDUCATION

UC San Diego Sep '21 – Ongoing

- *MS* in *Machine Learning, Robotics, Computer Vision* (**GPA:** 3.91/4)

Indian Institute of Technology Bombay
Mumbai, India 2015 – 2019

- *Bachelor of Technology* in *Electrical Engineering* with minor in *Computer Science*
- **Undergraduate Research Award** for excellent research contribution to the project "Indoor Positioning Systems"

TECHNICAL SKILLS

- **Programming** - Python, C/C++, MATLAB, Bash, HTML/CSS, LaTeX
- **ML Frameworks** - Tensorflow, Pytorch, MLOps, OpenCV, Scikit-Learn, NumPy, Pandas
- **Dev Tools** - Git, Github, Docker, Android Studio, Unity, Jupyter, VS Code, Linux
- **Deep Learning** - CNNs, LSTMs, Transformers, GANs, Variational Autoencoders, U-Net, etc.
- **Vision & Robotics** - Object detection, segmentation, Structure from Motion, Optical Flow, Robosuite, MuJoCo, NeRF, SLAM, etc.

RELEVANT COURSES

- Deep Generative Models
- Deep Learning for 3D data
- Advanced Machine Learning
- Deep Reinforcement Learning
- Sensing and Estimation in Robotics
- Mathematics for Robotics
- Statistical Learning
- Advanced Computer Vision
- Convex Optimization and Applications
- Advanced Image Processing
- Statistical Signal Processing
- Data Structures and Algorithms

ACHIEVEMENT & ROLES

- Ranked among **top 0.75%** candidates in India's toughest entrance exam.
- **Teaching Assistant** at UC San Diego
  - Probabilistic Modeling & Machine Learning
  - Probability & Statistics for Data Science
  - Engineering Probability & Statistics
  - Image Processing
  - Linear Signals & Systems
- **Mentored** 8 students at IIT Bombay's *Summer of Science* program in '19 and '20.
- **Open-source** contribution to Kivy, KivEnt.