SAQIB AZIM

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EDUCATION

Indian Institute of Technology Bombay, *Mumbai, India* July '15 - July '19
Bachelor of Technology, Department of Electrical Engineering

- **GPA**: 8.37/10
- **Minor Degree**: Computer Science and Engineering

PATENT FILED

- Pranav Sankhe, **Saqib Azim**, Sachin Goyal
  Indoor Positioning System using LSTMs over WLAN Network
  Indian Patent Filed with **Application No. 201821047043**

PUBLICATIONS

- Pranav Sankhe, **Saqib Azim**, Sachin Goyal, Tanya Choudhary, Kumar Appaiah & Sukumar Srikant
  Indoor Positioning System using LSTMs over WLAN Network
  (submitted to **International Conference on Communications (ICC) 2019**)

RESEARCH INTERNSHIPS & PROJECTS

Airwriting Handwriting Recognition using Smartwatch May '18 - July '18
Dr. Shankar Venkatesan, Advanced Technology Lab *Samsung Research Institute, Bangalore*

· Developed an end-to-end Airwriting Handwriting Recognition system using samsung smartwatch
· Employed frequency based filtering techniques (spectral subtraction and butterworth filter) followed by adaptive threshold algorithm to improve signal-to-noise ratio and mitigate integration-drift effect
· Developed the entire procedure for creation of dataset using Vacom Tablet. Trained an SVM on the created dataset for classification of sensor signals into handwriting and non-handwriting segments
· Implemented an LSTM-based network for furthur recognition of handwritten segments and achieved an accuracy of 87% for recognition of english alphabets

Indoor Positioning System using LSTMs over WLAN Network January '17 - December '17
QuarterFinalist, India Innovation Challenge *IIM Bangalore & Texas Instruments*

· Designed and developed a system to locate a specific wifi node on a wifi network in indoor environment
· Implemented **Multi-Array Antenna** model to estimate angle of receiver w.r.t the transmitting node
· Built an **LSTM** network with inputs as received signal strength, path loss exponent and time difference of arrival (TDoA) to estimate distance of target object from the reference node and achieved an accuracy of 5.85 cm with a confidence interval of 93%

Zero Shot Learning (ZSL) for Object Recognition May '17 - August '17
Prof. Subhasis Chaudhury, Vision & Image Processing Lab *Electrical Engineering, IIT Bombay*

· Implemented a semi-supervised VGG16 based model (in tensorflow) to predict labels of classes unseen during training by transferring information from seen to unseen classes.
· Investigated and provided a solution to the projection domain shift problem in ZSL
· **Improved** accuracy from **58.7%** to **65.3%** on AwA (benchmark dataset) unseen classes using Deep Visual-Semantic Embedding Model

[1]Use URL saqib1707.github.io in case hyperlinks don't work

Shepherding of multiagent system with optimal pursuer trajectory July '18 - Present
Final Year Project under Prof. Debraj Chakraborty *Electrical Engineering, IIT Bombay*

- Working towards minimizing the path length of pursuer during aggregation and driving stages of shepherding of multiple evaders with puruser-evader and evader-evader interaction force
- Analyzed the trajectories of pursuer and evaders with only pursuer-evader repulsive interaction for driving evaders to predefined fixed destination
- Proposed a novel controller for the aggregation of multiple evaders and demonstrated the optimal pursuer trajectory validated by extensive simulations

SCHOLASTIC ACHIEVEMENTS

- Secured 99.99 percentile in JEE Advanced out of 150,000 candidates [2015]
- Secured 99.96 percentile in JEE Mains among 1.6 million candidates [2015]
- **Bronze Medal (3rd out of 23 participating IIT)** in the TV Audience Measurement Challenge at the 7th Inter IIT Technical Meet, IIT Bombay [2018]

MISCELLANEOUS PROJECTS

Image Registration using FFT (Selected in Top 5/40 projects) January '18 - April '18
Digital Signal Processing under Prof. Vikram Gadre *Electrical Engineering, IIT Bombay*

- Built a FFT based tool for registering and mosaicing images captured from different view-points and scales. Used **Phase Correlation** in log polar coordinates for rotational alignment, impulse location for translation alignment. Achieved better results than SIFT based alignment in case of aerial and **satellite images**. Presented this project at **MHRD-TEQIP-KITE** Resource Creation Workshop under initiative of MHRD, Govt. of India

Simultaneous sensing & sparsifying dictionary optimization February '18 - April '18
Advanced Image Processing under Prof. Ajit Rajwade Computer Science & Engineering, IIT Bombay

- Implemented a framework for joint design and optimization of sensing matrix and non-parametric dictionary. **Improved** reconstruction accuracy on image patches using **Coupled-KSVD** and **OMP Algorithm** compared to using gaussian random sensing matrix and overcomplete dictionary learned using standard KSVD

Photoplethysmogram (PPG) Signal Acquisition Module January '18 - April '18
Electronics Design Lab under Prof. Prem C Pandey *Electrical Engineering, IIT Bombay*

- Developed a hardware module for faithful acquisition of PPG signal with low noise and minimal filtering. Implemented baseline restoration and auto-LED intensity control to account for varying skin color, shapes & pressure. Provided bluetooth based connectivity to display the acquired PPG signal on smartphone and laptop

Music Information Retrieval from EEG signals September '17 - November '17
Probability & Random Processes under Prof. Gaurav Kasbekar *Electrical Engineering, IIT Bombay*

- Applied onset detection techniques on EEG recordings to extract tempo of the corresponding stimulus. Implemented Tempogram Estimation using autocorrelation technique assuming EEG as the novelty curve. Achieved a difference of 1 bpm in actual tempo and calculated tempo from the EEG data

Pipelined Reduced Instruction Set Computer August '17 - November '17
Microprocessors under Prof. Virendra Singh *Electrical Engineering, IIT Bombay*

- Designed and implemented a 6-stage pipelined multicycle RISC processor in VHDL, consisting of arithmetic, logical and branching instructions, and tested on DE0-Nano FPGA board. Implemented the

NMRU scheme and developed fully associative cache, flushing, data-forwarding, etc. to maximize the theoretical throughput of the processor.

Driverless Car (SeDriCa) September '17 - March '18
Mahindra Rise Driverless Car Challenge *Innovation Cell, IIT Bombay*

· Studied the problem of shadow effect and lighting conditions on roads, lanes and provided solution using image processing based techniques. Developed proof-of-concept with Neural Network trained on Indian Road Dataset (created by our team of 10 students) for road and obstacle classification

Hand Gesture Recognition System May '16 - June '16
Institute Technical Summer Project *Electronics Club, IIT Bombay*

· Built hand gloves for transliterating Sign Language (hand gestures in ASL) into text and speech in order to help differently abled people communicate. Developed an android app using java based android studio to interpret the sensor signal and convert it to speech

Kivy & Open Source Contribution December '16 - April '17

· Contributed to several open source projects for Kivy. Merged 9 Pull Request to Kivy and 2 Pull Request to Kivent. Introduced a new feature in Kivent to get tile index given the pixel values for orthogonal, isometric, staggered isometric and hexagonal game maps by analyzing their geometrical construction

RELEVANT COURSES

- **Electrical Engineering** - Probability & Random Processes, Data Analysis & Interpretation, Estimation & Identification, Analytical Signal Processing[2], Information Theory[2], Control Systems, Digital Signal Processing, Digital Communication, Microprocessors.
- **Computer Science** - Data Structures & Algorithms, Machine Learning, Computer Vision[2], Image Processing, Advanced Image Processing, Operating Systems, Computer Networks.
- **Miscellaneous** - Optimization Techniques, Multivariable & Vector Calculus, Linear Algebra, Differential Equations I & II, Complex Analysis, Matrix Computations[2].

TECHNICAL SKILLS

- **Experienced** - Python, C/C++, MATLAB, VHDL, Arduino
- **Familiar** - Java (Android), Javascript, Assembly, Scilab, Spice, AutoCAD
- **Tools** - TensorFlow, OpenCV, Git, Quartus, Wireshark, GNU Radio, Eagle, LaTeX

EXTRACURRICULAR

- Mentored 2 freshmen teams in XLR8 '16 in building their obstacle avoiding remote-controlled bots. Helped a freshmen team during ITSP '17 w.r.t the ideation and implementation of their project.
- Completed **one** year teaching Maths and Science to NGO students as a Volunteer of Educational Outreach under **National Service Scheme**, IIT Bombay [2015-16]
- Presented Indoor Positioning System at **Tech & Rnd Exposition**, IIT Bombay [2017]

[4]Tentative Course for Spring 2019