Syed Waleed Hyder

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Education

- **National University of Sciences and Technology (NUST)** — Islamabad, Pakistan
  Bachelor of Engineering in Software Engineering; GPA: 3.67; Percentage: 91% — *Sep 2016 – May 2020*

Research Experience

- **Retrocausal** — Redmond, Washington
  Research Engineer — *Jul 2022 - Present*

  Retrocausal is the industry leader in intelligence augmentation systems that help manufacturing workers avoid assembly mistakes, be more efficient at their daily jobs, and improve the processes they drive.

  - **Video Understanding**: My research is on supervised and unsupervised fine-grained human activity segmentation at video and dataset levels using both frames and skeletons (pose information).

- **Data Science in Earth Observation, Technical University of Munich** — Munich, Germany
  Research Assistant — *Summer 2019*

  This group focuses on utilizing satellite data to solve the various problems at hand. Under the supervision of Prof. Lichao Mou and Dr. Muhammad Shahzad, the following is an overview of my work in the lab.

  - **Slum mapping in satellite imagery using deep learning**: Collected the image data on slums for Karachi and Islamabad, filtered the data. Used the Fully Convolutional Networks (FCN) to segment the slums from non-slums. Using loss functions to characterize the class imbalance since in majority of slum datasets the foreground pixels are dominant. An extension of this work is my bachelor's thesis (final year project).

- **TUKL-NUST R&D Center, NUST** — Islamabad, Pakistan
  Research Assistant — *Sep 2018 - Nov 2018*

  Following is a rough overview of my work in the lab under the supervision of Dr. Muhammad Shahzad.

  - **Real-time Vehicle Detection & Tracking in infrared video-feed**: My work was to use YOLOv3 for the detection of vehicles and using Kalman Filtering for tracking the vehicle objects in a non-polarized infrared real-time video feed.

- **CVML Lab, NUST** — Islamabad, Pakistan
  Research Assistant — *Summer 2018*

  - **Vehicle Tracking in Unconstrained Natural Scenes**: My work was to research and implement an end-to-end trainable Siamese Network with Kalman Filtering.

Final Year Thesis (Undergrad)

- **Slum mapping in satellite imagery using deep learning**: I collected a novel dataset for semantic segmentation of slums in metropolitan cities of Pakistan (Karachi, Islamabad). Since the slum covered a relatively little area in the obtained imagery, vanilla semantic segmentation architectures were not giving the expected results due to imbalanced pixel distribution in the slum dataset. To characterize this imbalanced pixel distribution, I started out working on distributions with a focus on experimenting with loss functions including cross-entropy loss (weighted, balanced), Focal loss, Dice loss, and different combinations of these. Furthermore, for robust feature representation learning, images of the same patch at different wavelengths and resolutions from the satellite were stacked together to form a datacube. In addition to this, I used transfer learning and adversarial domain adaptation to align the embeddings of the Karachi and Mumbai slum dataset which was already available.

Professional Experience

- **OMNO AI** — Lahore, Pakistan
  Machine Learning Engineer — *Sep 2021 - Present*
  - **SportsEye. AI-powered football analytics platform.**: Track every movement on the pitch using broadcast streams to run our analysis, without any extra hardware to be installed on stadiums. Player and Ball Detection using Single Stage Detectors. Player tracking and re-identification using deep sort. Broadcast view classification using custom CNNs. Field Line Masking using Pix2Pix GANs. Camera Pose estimation with classical Homography estimation. Timer localisation using EAST detector and recognition using OCR based methods.
  - **RetailWiz. Targeted Ad platform for retail stores**: Designed and implemented the AI pipeline for smart gondola capable of person tracking and profiling gender, age and emotions from the facial crop and use it for targeted advertisement. Optimized the pipeline for memory on Jetson Nano by writing a custom Python wrapper for TensortRT C++ (2 YOLOv5 detectors, 2 binary classifiers).
  - **Adlytic. Audience Analytics platform for retail stores**: Implemented the pipeline capable of footfall counting with age and gender classification, area-wise heatmap generation and dwell time. Developed APIs to help KPI dashboard consume the analytics. This system is deployed using docker in 50+ different retail stores and analytics are above 90% accurate. (YOLOv5, DeepSORT, BYTETrack).

- **Systems Limited** — Karachi, Pakistan
  Machine Learning Consultant — *Aug 2020 – Aug 2021*
  - **Regeneron Pharmaceuticals. Platform for data analysis of Patient Wearable Devices**: Developed a platform using Apache Nifi for data ingestion, PySpark for ETL and post-ingestion, Hive and AWS Redshift for analytics, and AWS S3 for cloud storage. Performed gait analysis using machine learning (ML) algorithms on time series-data from sensors of Moticon device. Classified the human activity using ML algorithms on time-series data from accelerometer of Actigraph device.

- **IOPTIME** — Islamabad, Pakistan
  Machine Learning Engineer — *Jun 2020 – Jul 2020*
  - **NailsRoom. Nails Segmentation in human hands using deep learning**: Improved the mean IOU score by 100% using the existing data of nails. Increased the speed of the model on Android from 10 FPS to 25 FPS. Used the modified U-Net to segment the nails from hands. Used loss functions to characterize the class imbalance since the foreground pixels were dominant.

Projects

- **Word senses visualizer using SenseGram and Sense2Vec**: Using the SenseGram and Sense2Vec I trained custom models on the corpora containing different topics. Using the ensemble methods, I combined the embeddings from different models to generate better senses of words. Using dimensional reduction techniques, I visualized the embeddings of the different bags of words, to better compare the effectiveness of the embeddings.

Programming Skills

- **Languages**: Python, R, C++, SQL
- **Technologies**: Tensorflow, PyTorch, scikit-learn, OpenCV, NumPy, multiprocessing, Flask, Pandas, Docker, Apache Nifi, PySpark, AWS Redshift