Muhammad Mubeen

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Professional Experience

Darvis Inc. **Islamabad, Pakistan**

Senior Machine Learning Engineer *Feb 2022 – Present*

- Working as a software engineer at a US-based startup focused on automating the tracking of various items in different environments.
- Developed and implemented various features such as face anonymization (for privacy) and plug-and-play model support for Nvidia's Deepstream-based pipelines.
- Designed and executed effecient end-to-end vision pipelines using GStreamer/Deepstream for different hardware platforms, including GPUs and OpenVINO.
- Created an AI-powered counting algorithm with an accuracy rate of over $> 80\%$ for item insertions in complex environment.
- Developed AI-based applications for gun detection in uncontrolled environments and bed state tracking for hospitals, available on android-based devices (AzenaOS).

Veeve Inc. **Islamabad, Pakistan**

Machine Learning Engineer - II *Jan 2020 – Jan 2022*

- Worked as part of the research team at a US-based start-up focused on developing a self-checkout shopping cart.
- Contributed to the productionization and optimization of various algorithms in C/C++ for Nvidia's Jetson devices, using the Nvidia DeepStream SDK and GStreamer framework for efficient inference pipelines.
- Leveraged LSVR and Few-Shot Learning techniques to enhance the accuracy of SKUs/PLUs detection, resulting in up to 10% model accuracy improvement and 3x inference speedups.
- Implemented depth stream compression to minimize storage requirements, resulting in a more than 10x reduction in storage space.
- Developed a shrinkage detection system to track the items inserted into the shopping cart, reducing the incidence of theft.

OPTIMAL Lab, SEECS, NUST **Islamabad, Pakistan**

Machine Learning Engineer *Jul 2018 – Aug 2019*

- Developed a portable Edge AI system to assist the visually impaired by detecting and categorizing indoor and outdoor items, estimating their relative distances, and providing audio guidance.
- Designed and implemented the various components of the system, including the input stream, inference, and output feedback, using C/C++.
- Conducted data collection, trained and tested models, and optimized the model inference to achieve up to 3x speed-ups.
- Validated the final prototype with visually impaired individuals, receiving positive feedback on the system's design and usability.

Research Assistant *Aug 2017 – Jun 2018*

- The aim of this final year project was to train deep learning based models to extract speaker-specific information from speech signal invariant to the environment, noise, and other factors.
- Various approaches including Auto-Encoders, Contrastive Learning, Siamese Networks .etc were used to extract information from MFEC based speech features and then clustered using Gaussian Mixture Models.
- In the end, we achieved near state of the art results on NIST based datasets (TIMIT, NTIMIT, KING)

Projects

Home Surviellance System | *C/C++, TensorRT, GStreamer*

- An edge AI based project in C/C++, which I am currently working on, for surveillance at my home.
- It implements GStreamer based efficient pipelines for live feed retrieval and storage along with the TensorRT based optimized model implementation.
- It uses various real-time algorithms to detect the current state along with person detection/identification.

Generating Adversarial Examples to Fool CNNs | *Python, PyTorch*

- Implemented an adversarial system to fool ImageNet based AlexNet model.
- To do this, the image is updated minimally using back-propagation to output high probability for a selected class.

Education

National University of Sciences & Technology, SEECS **Islamabad, Pakistan**

Bachelor in Electrical Engineering (BEE) *Sep 2014 - July 2018*

- Relevant Coursework: Machine Learning, Computer Vision, Digital Image Processing, Data Structures and Algorithms

Technical Skills

Programming/Scripting Languages: Python, C/C++, MATLAB, JAVA, SQL
Deep Learning Libraries: PyTorch, Tensorflow, TensorRT, CAFFE, Keras, Sklearn
Libraries/Frameworks: OpenCV, Numpy, Pandas, Scipy, Matplotlib, NVIDIA DeepStream SDK, GStreamer
Technologies/Tools: VS Code, Linux, Version Control (git), Docker, NVIDIA Jetson devices, GCP, MLOps

Workshops/Leadership

• **Computer Vision Workshop**: Conducted a workshop at SEECS, NUST titled "*Latest Trends in Machine Vision*" where I delivered a lecture on "*Latest advancements in Computer Vision*" along with conducting a hands-on lab session.
• **LEGO Workshop**: Lead two workshops in which students of 9^{th} Grade at Scienta Vision College, Islamabad and Educators, Islamabad were taught how to program LEGO kits.