Muhammad Mubeen

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Summary

A diligent and enthusiastic professional with over 4 years of experience in machine learning, computer vision, and deep learning. Proficient in developing and deploying vision-based models in production environments.

Experience

Darvis **Islamabad, PK**

Senior Machine Learning Engineer *Feb 2022 – Present*

Omniroom: AI-powered Asset Management Solution for Real-time Business Insights

- Working on an AI-powered asset management solution that provids real-time insights on physical assets and operations for businesses, resulting in improved efficiency and cost savings.
- Proactively maintained the codebase by implementing legacy code refactoring, bug fixing, and introducing new features through robust CI/CD pipelines for seamless deployments.
- Developed and implemented various features such as identity masking for privacy and plug-and-play model support for Nvidia's Deepstream-based pipelines.
- Designed and executed efficient end-to-end vision pipelines using GStreamer/Deepstream for different hardware platforms, including Nvidia GPUs and OpenVINO.
- Created an AI-powered counting algorithm with an accuracy rate of over $> 75\%$ for item insertions in complex environment.

Productivity Tracker: Real-time Staff Performance and Attendance Monitoring Solution

- Utilized computer vision technologies to track productivity and attendance, providing real-time data for better decision-making and improved workforce management.
- Spearheaded the development and implementation of features including facial recognition and person re-identification across multiple cameras for accurate and efficient staff tracking.

Android Developement

- Developed AI-based applications for gun detection in uncontrolled environments and bed state tracking in hospitals. Deployed on Android-based devices running AzenaOS.

Veeve **Islamabad, PK**

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

Smart Cart: An AI based self-checkout smart shopping cart

- Collaborated with a research team to develop and implement various algorithms deployed on store carts for a self-checkout based shopping system.
- Optimized and productionized C/C++ modules for Nvidia Jetson devices, utilizing Nvidia's DeepStream SDK and GStreamer framework to achieve efficient inference pipelines.
- Employed techniques such as LSVR and Few-Shot Learning, along with model optimizations, to improve SKUs/PLUs detection with up to 10% accuracy improvement and up to 3x inference speed up.
- Reduced storage requirements by over 10x by implementing depth stream compression.
- Developed shrinkage detection to track various items inserted into the cart, reducing theft cases.
- Implemented gesture detection for smart shopping carts, allowing for real-time tracking of item additions and removals.

OPTIMAL Lab, NUST **Islamabad, PK**

Machine Learning Engineer *Jul 2018 – Jul 2019*

AI Assistant for Blind

- Worked on a portable, edge AI system that could assist visually impaired by detecting/categorizing various indoor/outdoor items, estimate their relative distances and then guide them using audio feedback.
- Designed and implemented various modules (input stream, inference, output feedback) of the system in C/C++.
- Collected and processed data for training and testing machine learning models, and optimized model inference to achieve up to 3x faster processing times.
- Conducted user testing with a group of visually impaired individuals to assess the final prototype's design and usability, receiving positive feedback on its effectiveness and ease of use.

Research Assistant *Aug 2017 – Jun 2018*

Forensic Speaker Verificiation Using Speech Signals

- 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.
- Our approach achieved competitive results on NIST based datasets, including TIMIT, NTIMIT, KING.

Projects

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

- Designed an edge AI based surveillance in C/C++ for home envirionments.
- Implemented gstreamer based efficient pipelines for live feed retrieval and storage along with the TensorRT based optimized model inference..
- Uses various real-time algorithms to detect the current state along with person detection/recognition.

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

- Implemented an adversarial system to fool state of the art ImageNet based models.
- Image is updated minimally using back-propagation to output high probability for any selected class.
- Project was submitted as part of semester project & implementation is available on github along with a blog post..

Brain Tumor Segmentation using CNNs | *Python, PyTorch*

- Developed a brain tumor segmentation model using CNNs on MRI images to segment healthy tissues from tumorous regions.
- Classified the segmented image into four categories: Edema, Enhancing Tumor, Non-enhancing Tumor, and Necrotic Core.
- Optimized the model's hyperparameters and conducted extensive experimentation to improve the segmentation accuracy and reduce false positives, resulting in an accuracy rate of over 90%.

Panorama extraction from Multiple Views of a Scene | *Python, OpenCV, Scikit-Learn*

- Implemented panorama construction using multiple images taken from camera with the same center.
- Used basic computer vision concepts including theory of single-view geometry and image homography along with Discrete Linear Transform (DLT) and Meta-Heuristic optimization in order to stitch images.

Education

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

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

- **CGPA:** 3.02/4.00
- **Relevant Coursework:** Machine Learning, Computer Vision, Digital Image Processing, Data Structures and Algorithms, Object Oriented Programming, Digital Signal Processing

Technical Skills

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
Databases: Redis, MongoDB
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.
• **Mentorship**: Mentored various projects related to Machine Learning at "*Bootcamp on Artificial Intelligence & Machine Learning*" conducted at SEECS, NUST.