Muhammad Zeeshan Karamat

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Education

Bachelor of Electrical Engineering Sept. 2017 – June 2021
School of Electrical Engineering and Computer Science (SEECS) *CGPA 3.56/4.00*
National University of Sciences & Technology (NUST), Islamabad, Pakistan
- Final year Thesis: "Whole Slide Image Scanner with Deep Learning Applications"

Technical Skills

Languages: C/C++, Python, Qml, SQL, MATLAB, JavaScript, HTML/CSS
Frameworks/Platform: ROS, PyTorch, Keras, fast.ai, CUDA, DeepStream, GStreamer, OpenCV, Qt
Development Tools: Linux, Git, CMake, Amazon Web Services, Jupyter Notebook, Anaconda, Google Colab, Qt Creator

Experience

Software Engineer II, ***vResolv LLC*** Aug. 2023 – Present
- Leading an AI project focused on detection, training and optimization of **Yolov7** model for improved inference.
- Integrated Deepstream **NvDCF** for real-time object tracking and deployed the model on Jetson Orin.
- Set up docker and integrated **Nvidia Hardware accelerated Gstreamer** pipeline with opencv for **H.264** encoding.
- Developed Qt-based **Linux** application plugins, and integrated a user-friendly graphical interface with live camera output.

Software Engineer, ***Conntac GmbH — Remote*** Jan. 2023 – Aug. 2023
- Development of Self Service Andriod and IOS app using Qt in Qml and **C++**
- Collaborated with the design team to transform designs into interactive UI using the **Model-View-Controller** pattern
- Developed the router login feature using camera scan with the **Google ML API**, enhancing user authentication convenience.

Development Engineer, ***Sedenius Engineering GmbH*** Aug. 2021 – Dec. 2022
- Research and Development of Autonomous Vehicle project "ABSOLUT"
- Development of **Sensor Fusion** algorithm for LIDAR, RADAR, and Vision data based on **Kalman Filter**.
- Development of ROS node for Object Detection, and Tracking and deployed on **NVIDIA DRIVE AGX**.
- Development of modules and user interfaces for Sensor-Data-Visualization and simulation software

Research Intern, ***University of Western Australia*** **[Presentation] [Paper]** July 2021 – Aug. 2021
- Worked on the Classification of synthesized galaxy images from computer simulations using deep learning.
- Addressed class imbalance in a large dataset for classification, and analyzed the physical properties based on the results.
- Arranged and conducted talks of speakers and led a team of interns in different cross-cultural activities.

Research Assistant, ***SIGMA Lab in collaboration with TUKL Lab*** July 2019 – Jan. 2021
- Researched about **GANs** for data augmentation for unbalanced classes in medical imaging.
- Worked with QuPath to extract image tiles from Whole slide images for AI-based computer-aided detection.
- Implemented SOTA Deep learning models in **PyTorch** on NVIDIA's Jetson Nano 4GB and 2GB kit, and compared metrics.

Projects

Whole Slide Image (WSI) Scanner with Deep Learning Applications [Demo] [Results] [Thesis] [Paper]
* Developed end-to-end automated robotic machine to digitize pathological slides for AI-based analysis.
* Developed an automated scanning system using actuators, incorporating autofocus algorithm based on edge detection.
* Developed Image stitching algorithm in Python based on **Cross-correlation** and **Laplacian blending**.
* Trained a **YOLOv4** object detection model to detect Mitotic cells and acquired **92.29% mAP**.

Agricultural Robot for Precision Spraying
* Developed autonomous robot for precision spraying using computer vision based on **ROS**.
* Trained a classifier to calculate the density of plants based on the area covered by leaves.
* Fed the density value to the controller which controls the amount of spray based on an algorithm.

Vision Based Smart Security System [Demo]
* Designed an intrusion detection system using the knowledge of embedded systems and Computer Vision.
* Trained a model for intrusion detection and optimized inference using **TensorRT SDK** for Nvidia Jetson Nano
* Designed **REST API** to communicate with the company app.

Image Segmentation for Epithelium Classification in Oral Squamous Cell Carcinoma
* Implemented a **U-NET** based epithelium segmentation utilizing masks extracted from annotated WSI and phone images.
* Evaluated performance on both smartphone-acquired and WSI-scanned images; identified a minor performance degradation in smartphone-based segmentation **(F1 score = 0.7631)** compared to WSI **(F1 score = 0.7846)**.

Classification of B-Acute Lymphoblastic Leukemia
* Trained deep learning model in **Keras** for classification of benign and malignant B-ALL cells.
* Utilized **GANs** to create synthetic cell images, significantly augmenting the dataset and improving model performance.

Emergency Response UAV for Swift Rescue Operations
* Developed a **YOLOv3** equipped UAV system for real-time detection of individuals in hazardous environments.
* Implemented a **REST API** for communication between the UAV and ground control, enhancing response efficiency.

AI/Neural Network Deployment on STM32 Microcontroller (TinyML)
* Deployed a cat and dog classifier on an STM32 microcontroller using the **CMSIS-NN** library, and tested in real time.

Honours and Awards

- **Rector Gold Medal** Award among the batch of 200 students
- **Distinction** at International level during SDURI program conducted by University of Western Australia
- Certification from Nvidia for **Jetson AI Specialist**
- **Full Merit Scholarship** at Pakturk International College