Syed Muhammad Kazim

Karachi, Pakistan

Email: kazimsyed4@gmail.com
Website: muhammad-kazim.github.io
Github: github.com/Muhammad-Kazim

Education

- **Kyung Hee University, Korea** Sep. 2019 – Feb. 2022
  Master of Science in Electronic Engineering
  Major Courses: Machine Learning and Pattern Recognition, Advanced Digital Signal Processing
  GPA: 4.21/4.30
- **National University of Sciences and Technology, Pakistan** Sep. 2014 – Jul. 2018
  Bachelor of Engineering in Electrical Engineering
  Major Courses: Communication Systems, Numerical Methods, Microwave Engineering
  GPA: 3.51/4.00

Work Experience

- **Endress+Hauser, Maulburg, Germany** Oct. 2021 – Present
  External AI Consultant – Hybrid

  Project: **Detection and Localization of Defects on Reflective Sensor Casings in Industry**

  The dataset consisted of 400 images of normal and defective metal casings each, including repetitions of the same casings with variable lighting and reflections. The data was augmented by splitting each image and its corresponding annotation into fixed-size patches/tiles. EfficientNet-B4 (pre-trained on ImageNet) was fine-tuned (early stopping was utilized for regularization) and a classification accuracy of $\approx 78\%$ was achieved on a test dataset of video frames collected in the production environment.

  Project: **Anomaly Detection using Machine Vision on mm-scale PCBs**

  The data consisted of 200 and 140 normal and anomalous images, respectively. Anomaly was described by a set of existing quality-control-based rules. Each image was transformed (background removal, orientation correction, perspective warp) to a standard. The contour of the border was compared with its convex hull to analyze intrusions in the PCBs. PaDiM was trained to detect defects in the critical regions of the PCBs.

  Project: **Vision-based Diameter Calculation of Holes in Mechanical Adapters**

  The diameter of the hole in adapters was detected accurately to the tenth of a millimeter using a Raspberry Pi and a Pi camera. The camera was placed in close proximity to the object along with two diffused light sources. This setup produced ambient light-invariant images. The diameter of the minimum enclosing circle which contained the contour of the hole was used as an estimate for the diameter of the hole.

  Project: **Vision-based Gel and Lid Detection on Electronic Boards**

  Three masks in the HSV color space were created for gel, red lid, and white lid, respectively for one object (target). The remaining images were first transformed such that the CDF of their pixel intensities matched the CDF of pixel intensities of the target image, which was followed by masking. The outputs were cleaned using a contour area and shape-based constraints.

- **Udacity, USA** Nov. 2022 – Feb. 2023
  Session Lead – Remote

- Explained and demonstrated the fundamentals of Python, PyTorch, and Neural Networks to two cohorts of 35+ students enrolled in the *Introduction to AI Programming with Python* Nanodegree.

- **Kyung Hee University, Yongin-si, Korea** Sep. 2019 – Feb. 2022
  Graduate Research Assistant
  Communications and Coding Theory Laboratory

- Developed parallelizable truncated normal distribution based resampling algorithm for particle filters with specialized applications in quantum state generation to reduce computational expense.
- Developed adaptive quantum state tomography heuristic based on eigenvalue decomposition of states to improve accuracy and rate of state characterization.
- Trained fully-connected neural networks to reconstruct 4-qubit ground states of 2-local Hamiltonians given noisy data with improved accuracy.

Skills

- Programming: Python (Pandas, Numpy, OpenCV, Pytorch, WandB, TensorBoard, Anomalib, Streamlit), MATLAB
- Others: Git, GitHub, LaTeX

Theses

1. S. M. Kazim, 'Adaptive Learning of Quantum Digits," Master's thesis, Department of Electrical and Information Convergence Engineering, Kyung Hee University, Yongin-si, Korea, Feb. 2022, Thesis Advisor: Professor Hyundong Shin.
2. S. M. Kazim, "Frequency Reconfigurable Patch Antenna using Liquid Crystals," Bachelor's thesis, Department of Electrical Engineering, National University of Sciences and Technology, Islamabad, Pakistan, Jul. 2018, Thesis Advisor: Professor Zubair Ahmed.

Honors and Awards

1. Graduate Student Scholarship, Kyung Hee University, 2019 – 2021
2. Undergraduate Merit Scholarships, National University of Sciences and Technology, 2014 – 2018

MOOCS

1. Introduction to AI Programming with Python - Nanodegree, Nov. 2022 – *Udacity*
2. Introduction to Git and GitHub, May 2021 – *Google*

Proficiency Exams

1. Graduate Record Examination (General): 327/340, Sep. 2020
2. International English Language Test (Academic): 8.0/9.0, Dec. 2022

Selected Publications

1. S. M. Kazim, J. Tayyub, M. Sarmad, and P. Werner, " Metal diaphragm seal defect detection using convolutional neural networks," *arXiv* Feb. 2022.
2. S. M. Kazim, A. Farooq, J. ur Rehman, and H. Shin, " Adaptive quantum state tomography with iterative particle filtering," *Quantum Inf. Process.* Sep. 2021.
3. S. M. Kazim, A. Farooq, J. ur Rehman, and H. Shin, " Applied Bayesian qubit state tomography," *Proc. Korea Information and Communications Society (KICS) Summer Conference*, pp. 190-192 Korea, Aug. 2020.