Muhammad Farhan

Website

Address: Zakariya Hostels, NUST Islamabad LinkedIn: https://www.linkedin.com/in/farhan-zafrani/

PROFESSIONAL EXPERIENCE

AI & Automation Engineer - SOCO Engineers; Gulgasht, Multan

- Automated preprocessing and post-processing simulation workflows for BMW Group projects.
- Maintained high-quality code for topology optimization algorithms in C++ and Python.
- Developed four projects, including file conversion automation, auto meshing, database generation from test output files, and FEA analysis using Graph Neural Networks (GNN).
- R&D project in field of using computation sciences and AI to improve the CEA results and lessen the simulation execution time

Research Assistant – Human System Lab; NUST, Islamabad, PK

- Conducted a comprehensive study to design and fabricate a Stand-Alone design for rehabilitation of the Upper Limb Stroke Patients. Supported professor in analyzing the EMG data to predict the hand gesture of the stroke patient. Fabricated the Mechanical model for the Soft Robotic Glove to assist the stroke Patient in hand Gesture
- Analyzed the results of the machine learning models i.e., Random Forest Classifier, Decision Tree Classifier and Xgboost Classifier using Fitt's Law to get statistically proven output from the Machine learning model. Calculated an accuracy of about 92% on the personalized real-time data, and about 98% on the generalized offline dataset of 10 subjects
- Programmed a standalone protocol for the real time EMG data collection, signal processing, machine learning model prediction and at the end the pneumatically controlling the Soft Robotic Glove using Raspberry PI 4

Machine Learning Intern – Human System Lab; NUST, Islamabad

- Worked on EMG data for the prediction of hand gestures using Ensemble Learning Algorithm. Designed a data acquisition protocol for Trigo Delsys and programmed the data pipeline for real-time analysis of the hand gesture prediction
- Achieved an accuracy of 96% on the generalized test dataset and 99% training dataset which show overfitting on the Boosting algorithms like Xgboost, and Adaboost
- Programmed simple games that were to be played with hand gesture prediction of the machine learning models, to make
- the rehabilitation process interactive and engaging

FINAL YEAR PROJECT

Design and Fabrication of Soft Robotics Glove for the Rehabilitation of Stroke Patients using EMG data and Pattern Jun. 2022 – Jun. 2023 **Recognition Techniques** – Final Year Project

Fabricated a right hand Soft Robotic Glove to assist the Stroke Patients in their Rehabilitation.

- Fabricated a soft robotic glove for stroke rehabilitation, achieving 92% accuracy in hand gesture prediction.
- Controlled the actuator using the Raspberry PI 4 that was programmed using Python based on Machine Learning algorithms.
- Designed actuators using CAD and simulated them in ANSYS for optimal pressure requirements.

LEADERSHIP SKILLS

Bazm-e-Paigham, Islamabad – Student Counsellor

Participate in their Career Campaign "Make the Diamond shine" to motivate the student about their future goals and studies

- Worked with them for the 2-week-long campaign in which we visited 4 indigenous schools of Islamabad
- Covered over 400 students' group-wise, to educate them about "How to study?"
- Work on their personal skills and guide them to become a better citizen of Pakistan

Final Year Project – Group Lead

- Led a team of 4 students, achieving 1st place in mid-defense evaluations for the final year project.
- Coordinated with the Professors and Graduate students to educate the team members on how to achieve the desired goals

EDUCATION

National University of Sciences and Technology NUST - Islamabad, PK

School of Mechanical and Manufacturing Engineering - Bachelor of Mechanical Engineering GPA: 3.42/4.00

Concentrations: Computational Sciences and Engineering & Robotics and Automation Honors: Inter NUST Volleyball Champion (2019); Winner in Cart design Challenge (2019); inter NUST Volleyball Champion (2021); FYP Mid Defense Winner (2022); High Achiever 2023

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Dec 2023 – Present

Mar. 2022 - Aug. 2022

Sept. 2022 – Jun. 2023

Sept. 2019 - Jun. 2023

Jun. 2022 – Sept. 2023

Sept. 2022 - Sept. 2023

PUBLICATIONS

An sEMG-Driven Multiple DOFs Interactive Games Based Rehabilitation Protocol for Stroke Patients: Assessing Real-Time User Performance Feedback – Ammar Shahzad, Muhammad Mustafa Khan, Muhammad Farhan, Hamza Suhaib Qarni, Asim Waris, and O. Gilani Journal: Heliyon Development of an Embedded System Based <u>sEMG Driven Standalone Upper Limb Rehabilitation</u> Training System: A Human-Computer Interaction – Muhammad Mustafa Khan, Muhammad Farhan, Ammar Shahzad, Hamza Suhaib Qarni, Mobeen Hameed, Asim Waris, and O. Gilani Conference: 3rd IEEE International Conference on Digital Futures and Transformative Technologies (ICoDT2) <u>SKILLS</u> Mechanical Software: SolidWorks, Creo, MATLAB & Simulink CAE Software:

BETA Ansa, BETA Meta, GNS Animator, LS-Dyna, OptiStruct, Abaqus, Nastran

Programming Languages & Tools:

Python, C++, SQL, LaTeX, Markdown, Linux, Arduino, Raspberry Pi 4

Python Packages:

Pydantic, FastAPI, SQLAlchemy, subprocess, sys, re, os, pathlib, NumPy, Pandas, SciPy,

Machine Learning Frameworks:

TensorFlow, Keras, PyTorch, Hugging Face Transformers, Scikit-learn, Statsmodels

Design Software:

Adobe Photoshop, Adobe Illustrator, Inkscape

INTERESTS/MISCELLANEOUS

- Google professional Certificate in Advanced Data Analytics
- Specialization in Deep Learning from Coursera (deeplearning.ai)
- Mathematics for Machine Learning and Data Science from Coursera (deeplearning.ai)
- Proficient with Bloomberg Terminal and Microsoft Office: Excel, Word, Notion, PowerPoint
- College Captain (awarded Most Valuable Player), Volleyball, Basketball, and Cricket

REFERENCES

Supervisor:

Name: Dr. Muhammad Asim Waris Phone No: (+92) 3445662330

Email: asim.waris@smme.nust.edu.pk

Dr. Muhammad Asim Waris is an Assistant Professor at the Aerospace department SMME, NUST. He was my supervisor for the bachelor's (BE) final year project, and currently, I was working with him as a research assistant on a research project at the Human System Lab, SMME, NUST.

Course Teacher:

Name: Dr. Ibraheem Haneef Phone No: (+92) 3314288863 Email: ibraheem.haneef@smme.nust.edu.pk

Dr. Ibraheem Haneef is a Professor at the Aerospace department SMME, NUST. He has taught me Project Management and also coordinated me in my final year project. I took a workshop of Practical Reinforcement Learning under his supervision.