Muhammad Farhan

Github

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PROFESSIONAL EXPERIENCE

AI and Automation Engineer – *SOCO Engineers;* Gulgasht, Multan *Dec 2023 – Present*

- 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).

Research Assistant – *Human System Lab;* NUST, Islamabad, PK *Sept. 2022 – Nov.2023*

- 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 *June 2022 – September 2023*

- 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 Recognition Techniques – *Final Year Project* *June 2022 – June 2023*

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* *March 2022 – August 2022*

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* *September 2022 – June 2023*

- 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 *September 2019 – June 2023*
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

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* ***Status:*** *Under-Review*
Journal: *Heliyon*
Development of an Embedded System Based sEMG Driven Standalone Upper Limb Rehabilitation Training System: A Human-Computer Interaction – *Muhammad Mustafa Khan,* ***Muhammad Farhan****, Ammar Shahzad, Hamza Suhaib Qarni, Mobeen Hameed, Asim Waris, and O. Gilani* ***Status:*** *Not Approved*
Conference: *3rd IEEE International Conference on Digital Futures and Transformative Technologies (ICoDT2)*

SKILLS

Mechanical Software: SolidWorks, Creo, AutoCAD, COMSOL Multiphysics, *MATLAB & Simulink*
Mechanical Skills: CAD/CAM, FEA, Mathematical Modeling, Practical Workshop
Programming Software*:* Python, C++, SQL, Latex, Markdown, Linux, Arduino, Raspberry PI 4
Programming Skills: Data Analysis, Machine Learning, Deep Learning
Office Productivity: Microsoft office suite, Notion, Google Suite, Project Management
Designing Software: Adobe Photoshop, Adobe Illustrator, Inkscape

INTERESTS/MISCELLANEOUS

- **Google professional Certificate in Advanced Data Analytics** (In progress)
- **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.