

# Muhammad Farhan

[Website](#)

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## PROFESSIONAL EXPERIENCE

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**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).
- 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

Sept. 2022 – Sept. 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

Jun. 2022 – Sept. 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

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**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

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**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

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**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**

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**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**

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### **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**

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- **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**

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### **Supervisor:**

**Name:** Dr. Muhammad Asim Waris

**Phone No:** (+92) 3445662330

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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](mailto: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.