MARIYA TOHFAFAROSH

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EDUCATION

Master of Science in Biomedical Engineering
New Jersey Institute of Technology (NJIT)

Bachelor of Engineering in Instrumentation and Control Engineering
Sarvajanik College of Engineering and Technology (SCET)

WORK EXPERIENCE / PROJECTS

Graduate Research Assistant | Jan 2024 – Present

New Jersey Institute of Technology

- Engineered a cutting-edge rehabilitation game in **Unity 3D** by seamlessly integrating **Delsys EMG sensors**, **MVN Xsens IMUs**, and **Moticon insoles**, enhancing real-time tracking and feedback accuracy to support post-stroke recovery.
- Designed and implemented a custom stand for lower limb exoskeleton testing in our lab, collaborating with team members to meet specific project requirements, streamlining the testing process, and enhancing setup efficiency.
- Mastered hands-on operation of **HD-EMG** systems (Sessantaquattro from Bio Electronica), applying advanced bioelectronic techniques to capture high-resolution muscle activity, enhancing precision in neuromuscular data collection.
- Assisted in conducting a research study on upper limb exoskeletons with human subjects, supporting the implementation of IRB-approved protocols to ensure compliance and maintain ethical standards.
- Authored and presented a conference poster at **NEBEC 2024** on data-driven prediction of vertical ground reaction forces during static stance motions, leveraging custom pressure insoles to enhance biomechanical insights.

Projects

- Designed and developed advanced biomechanical models using **SolidWorks** and **Creo Parametric**, including:
  - **Prosthetic Leg:** Engineered a functional prosthetic leg using SolidWorks and Creo Parametric, focusing on enhanced durability and user comfort.
  - **Robotic Hand:** Designed a robotic hand, optimizing movement precision and flexibility to simulate human-like dexterity.
  - **Hand Exoskeleton:** Developed a hand exoskeleton for rehabilitation, improving structural support and motor functionality.
  - **Tibial Plate:** Modeled a tibial plate to support orthopedic research, ensuring structural strength and anatomical compatibility.
- Advanced Simulation and Analysis Projects Using **ANSYS**
  - **Carreau Blood Flow in Coronary Artery**: Performed Computational Fluid Dynamics (CFD) analysis to evaluate the impact of stenosis on flow properties, improving understanding of cardiovascular dynamics.
  - **Knee Tibial Component Stress Analysis**: Conducted stress analysis on a tibial component designed in Creo Parametric, optimizing structural durability under load-bearing conditions.
  - **Finite Element Analysis on Hip Implant**: Executed finite element analysis (FEA) for a hip implant used in femur arthroplasty, assessing implant performance and biomechanical stability.
- Executed inverse kinematics analysis in OpenSim to model sit-to-stand and squatting activities, optimizing biomechanical accuracy for improved understanding of joint movements and muscle coordination.

Study of Instrumentation Maintenance Activity and Process Control | Jan 2023 – Mar 2023

Krishak Bharati Cooperative Limited-KRIBHCO
(KRIBHCO is a premier National level Cooperative Society of India engaged in fertilizer production and distribution)

- Optimized plant operations by gaining hands-on experience with Urea formation processes and monitoring critical functions of the Ammonia plant, Urea plant, Power plant, and Offsite area using Rockwell Automation DCS systems.
- Ensured environmental compliance by performing data logging and emission monitoring (SOx, NOx, CO) at the CEMS station, transmitting data to the Central Pollution Control Board.

Summer Internship - Project Trainee | **Jun 2022 – Jul 2022**

Hema Automation

- Engineered efficient dye mixing processes by assisting in PLC programming for a textile mill, streamlining production workflows.
- Designed intuitive SCADA interfaces by collaborating on HMI and SCADA systems, developing detailed SCADA diagrams for a milk packaging system to enhance monitoring and control.
- Automated industrial blower systems using Schneider ATV 310 (VFD), Siemens S7-200CN (PLC), and a three-phase induction motor, improving operational efficiency and system reliability.

SKILLS & ABILITIES

Programming Skills

- **Python:** Developed data-driven algorithms for analysis and automation in engineering projects.
- **C#:** Built applications in Unity for real-time sensor data processing and integration.
- **Arduino:** Created sensor-based control systems, enhancing industrial automation prototypes.
- **MATLAB:** Conducted signal processing and numerical analysis for instrumentation projects.
- **PLC Programming:** Executed Ladder Logic for automation, streamlining industrial processes.

Other Skills

- **SolidWorks:** Modeled biomechanical components, optimizing structural integrity for applications.
- **Unity 3D:** Developed interactive applications, integrating sensor tech for enhanced user experiences.
- **ANSYS:** Conducted simulations for fluid dynamics and stress analysis in engineering research.
- **Microsoft Office Suits:** Analyzed data and managed project timelines to enhance team communication.
- **Project Management:** Coordinated research initiatives, ensuring timely completion and resource optimization.
- **OpenSim:** Modeled musculoskeletal movements for accurate biomechanical studies.
- **Creo:** Utilized for precise 3D modeling of mechanical components in device development.

CERTIFICATIONS

- **SOLIDWORKS CAD Design Associate:** Earned certification demonstrating proficiency in 3D modeling and design principles.
- **Biomedical Research Certification:** Completed CITI Program training, enhancing skills in ethical research practices and compliance.
- **RCR Basic Course:** Attained CITI Program certification in Responsible Conduct of Research, emphasizing ethical research standards.
- **SAP CSR Achievement:** Recognized in the CodeUnnati program for contributions to Industry 4.0 technologies (2022-2023).
- **Arduino IDE Workshop**: Completed a 2-day workshop, gaining hands-on experience in programming and project development with Arduino. (2021)

LEADERSHIP

- **Secretary**, Graduates for Inclusion, Diversity and Equity: Led initiatives promoting diversity and equity at NJIT (Jan 2024 – May 2024).
- **Secretary**, International Society of Automation: Drove engagement and organized events for the college committee (2021-2022).
- **Event Coordinator**, Automation Professionals Day: Successfully orchestrated a key networking event, enhancing professional connections (Apr 2022).
- **Coordinator**, Techfest 2022: Demonstrated leadership by organizing a tech-centric event, fostering innovation and collaboration.

LinkedIn