Smart Wearable Bio-Tracker for TeleRehabilitation & TeleMonitoring VIP

Under the Supervision of

Prof. S. Farokh Atashzar

ECE, MAE, BME, CUSP, NYU WIRELESS | **Link**

FAQs

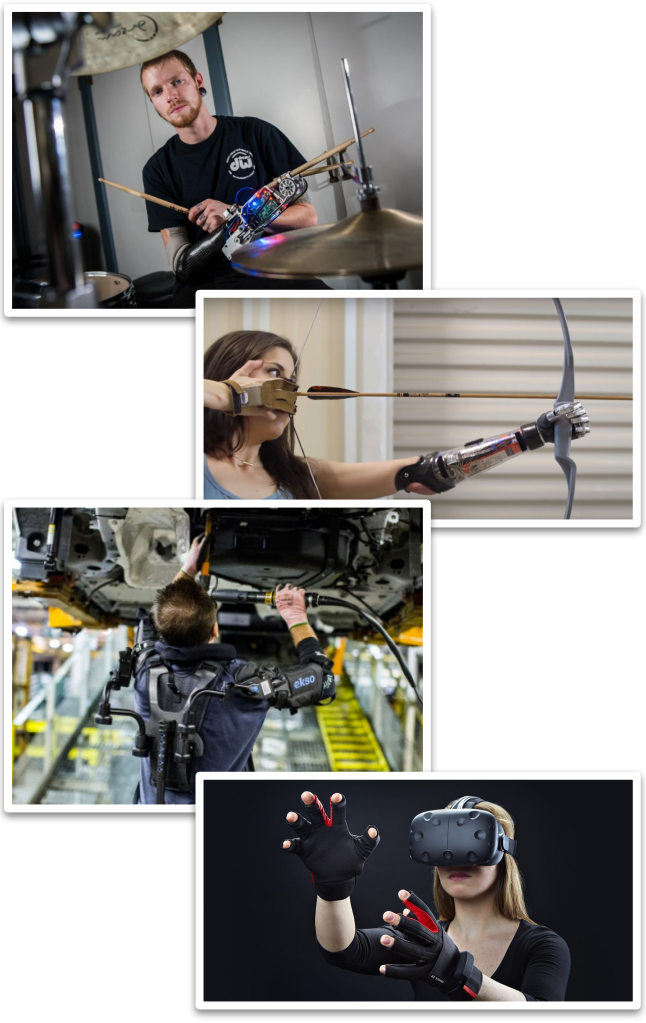
What is our main objective?

Our VIP focuses on creating a research team that builds smart wearable devices.

What is our vision?

Our vision is to create a Machine Learning enabled wearable device.

Medical Use: We want the wearable device to help amputees, Parkinson's patients, and stroke patients. We aim to capture the patient's movement intention and control their prosthetics and assistive devices to improve their quality of life.



Industrial Use: We want to utilize the wearable to control exoskeletons used by industrial workers whose tasks involve heavy weight lifting for prolonged periods of time.

AR/VR Integration: We want to replace the current state of the technology that utilizes handheld controllers and motion tracking cameras. This limits the user's movement and the space they can utilize when engaging in the virtual world. We want to exploit our wearable device's wireless and gesture classification capabilities to help users engage in the virtual world more seamlessly.

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What are our teams and their respective tasks?

Artificial Intelligence (AI) team

- Research, develop, and implement Deep Learning-based methods for gesture classification and prediction
- Implement signal processing methods

Hardware team

- ***Electrical Subteam***
  - Research, implement, and test electronic components
  - Design electrical schematics
  - Produce PCBs and assemble all electrical parts

- ***Mechanical Subteam***
  - Design the overall structure of the wearable device
  - Create 3D models and 3D print the mechanical components of the wearable
  - Research and experiment with different production materials and methods

- ***Wireless Subteam***
  - Research, implement, and test wireless communication protocols
  - Implement integration of the Machine Learning engine to the wearable device

- ***App development + AR/VR Subteam***
  - Design UX/UI design of data collection and visualization application
  - Research, implement, and test tech stacks for full-stack development and AR/VR development of the application

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What are the preferred qualifications for prospective students?

AI team prospects

- Strongly preferred to have a background in Python and Machine Learning
- Preferred to understand fundamental Machine Learning concepts (Perceptron, SVM, K-Means Clustering, Random Forest Classifier)
- Preferred to understand Deep Learning methods (Multi-Layer Perceptron, CNN, LSTM, Transfer Learning)
- Familiar with ML and DL Frameworks (TensorFlow, PyTorch, SciKit Learn)
- Experience with data processing tools (Pandas, PySpark, Numpy)

Electrical subteam prospects

- Strongly preferred to have finished a Physics 2 (Electricity and Magnetism) or Introduction to Circuits course
- Preferred to have experience with Arduino-based projects
- Familiar with embedded systems, especially different MEM sensors and microcontrollers

Mechanical subteam prospects

- Strongly preferred to have experience in 3D CAD Softwares (Solidworks)
- Preferred to be comfortable preparing prints and printing with FDM printers (Ultimaker S3, Prusa i3) and SLA printers (Formlabs Form 2/2B)
- Preferred to have good knowledge in additive manufacturing materials

Wireless subteam prospects

- Strongly preferred to have a background in Python and Arduino coding
- Familiar with IoT technologies and implementation

App development + AR/VR subteam prospects

- Strongly preferred to have a background in Python and Java
- Preferred to have development experience using the Unity platform
- Preferred to have a background in JavaScript and a JavaScript framework (React.js)

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FAQs

How often do we meet?

We meet online with our advisor **every Monday night**. We are expected to meet with our respective teams at least once a week to brainstorm, discuss, or update on our work. Hardware team members are expected to be available on-site. AI team members are able to contribute fully online.

What have we achieved so far?

- Our AI team published their first paper in IEEE Robotics and Automation Letters and was invited for presentation at the IEEE IROS 2022 in Kyoto, Japan. **Link**
- Our VIP won first place in the 2022 Tandon Research Excellence Exhibit. **Link**
- Our VIP was invited to present at the Times Higher Education World Academic Summit and the NYU Biomedical Research Poster Event. **Link**

Who is our advisor?

Our advisor is Professor S. Farokh Atashzar, the Principal Investigator of the Medical Robotics and Interactive Intelligent Technologies Lab (MERIIT Lab). He is affiliated with both the Electrical and Computer Engineering department and the Mechanical and Aerospace Engineering department. **Link**

How do I sign up?

Please send your resume to Professor S. Farokh Atashzar (sfa7@nyu.edu) to express your interest.

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