

# Aseem Subedi

Troy, NY, USA

subeda@rpi.edu

LinkedIn: <https://www.linkedin.com/in/aseem-subedi-691b46259/>

Personal website: <https://axiom5.github.io/>

## EDUCATION

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### **Ph.D. in Mechanical Engineering** | Rensselaer Polytechnic Institute | Troy, NY | **Aug 2025 (Expected)**

- GPA: 3.58/4.0, Thesis: Bimanual Motor Skill Assessment Using Raw Neuroimaging, Explainable AI, and Multimodal Integration

### **M.Eng. in Mechanical Engineering** | Rensselaer Polytechnic Institute | Troy, NY | **May 2024**

- GPA: 3.69/4.0, Project: A Dilated Causal Convolutional Model for Surgical Skill Assessment Using Optical Neuroimaging

## TECHNICAL SKILLS

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**AI & Machine Learning:** Deep Learning (CNNs, Transformers, WaveNet, Autoencoders, BERT), Unsupervised Learning, Generative AI, Multimodal Fusion, Time-Series Analysis, Explainable AI (XAI)

**Domains & Applications:** Brain-Computer Interfaces (BCI - fNIRS/EEG), Computational Neuroscience, Health Sensing & Analytics, Physiological Signal Processing (ECG, Pupillometry, HRV), Surgical Skill Assessment, Human Activity Recognition

**Programming & Data Science:** Python (5+ yrs; PyTorch, Tensorflow, JAX, Scikit-learn, Pandas, NumPy, SciPy), MATLAB, R, C, AWS

**Neuroimaging & Biosignal Tools:** Homer3, MNE-Python, EEGLab, Biosignal Processing Toolboxes

**Engineering & Design:** CAD (SolidWorks, AutoCAD), Simulation (ANSYS Fluent/CFD), Design for Manufacturing (DFM), Mechanism Design, Systems Integration, Rapid Prototyping

**Advanced Methods:** Numerical Optimization, System Identification, Information Theory, Algorithm Design, Biostatistics (Hypothesis Testing, Multivariate Analysis, Statistical Modeling)

## RESEARCH EXPERIENCE

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### **Graduate Researcher** | CeMSIM, RPI | Troy, NY | **Jan 2020 – Present**

- Developed novel Deep Learning models (WaveNet, Transformers, CNNs) for skill assessment from raw, variable-length neuroimaging (fNIRS/EEG) & physiological signals.
- Pioneered multimodal fusion (BERT-inspired) & custom Explainable AI (XAI channel attention) techniques for enhanced interpretability in BCI.
- Engineered robust Python data pipelines (100GB+ scale) for acquisition, preprocessing & analysis (PyTorch, Scikit-learn, MNE).
- Provided data-driven insights influencing experimental design for IRB-approved human subject studies.

## PROFESSIONAL EXPERIENCE

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### **Teaching Assistant** | School of Engineering (RPI) | Troy, NY | **Jan 2020 – May 2020**

- Mentored 200+ students in graduate (Machine Dynamics) & undergraduate (Numerical Methods) engineering courses.

### **R&D Co-Director & Co-Founder** | GRIT Engineering Pvt. Ltd. | Kathmandu, Nepal | **May 2018 – Sep 2023**

- Led R&D and full product lifecycle (design, DFM, fabrication, installation) for custom electromechanical systems.
- Managed client projects & supervised teams; delivered key projects like automated systems for 'The Voice Nepal' TV franchise.

### **Robotics Intern** | Paaila Technology | Kathmandu, Nepal | **Dec 2017 – May 2018**

- Contributed to the design and fabrication of mobility/articulation subsystems for a commercial humanoid service robot.

## **SELECT PUBLICATIONS**

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- **A. Subedi** et al. "End-to-End Deep Learning for Real-Time Neuroimaging-Based Assessment of Bi-manual Motor skills", *npj Digital Medicine (Under Review)*.
- C. Eastmond, **A. Subedi**, S. De, X. Intes, "Deep Learning in fNIRS: A Review", *Neurophotonics 9(4)*.
- **A. Subedi**, et al., "A Dilated Causal Convolutional Model for Surgical Skill Assessment...", *Clin. Transl. Neurophotonics, 11945*.
- FNU Rahul, A. Dutta, **A. Subedi**, et al., "A Deep Learning Model for a priori estimation...", *Brain Stimulation*.

## **PROJECTS**

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### **Applied ML for Edge Computing & Process Optimization** | Graduate Coursework, RPI | Python, TensorFlow, Deep-Learning libraries | **2021-2023**

- Implemented lightweight CNN (MobileNetV2) for Human Activity Recognition on resource-constrained hardware; researched ML methodologies for floor layout optimization (semiconductor mfg).

### **Foundational Algorithm Implementation** | Graduate Coursework, RPI | MATLAB, Numerical Methods, Design Optimization | **2020-2021**

- Implemented core algorithms from scratch: Neural Network with backpropagation (MATLAB), advanced finite difference schemes, Gaussian Process surrogate modeling.

## **ACTIVITIES & AWARDS**

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- Robotics Competitions: Represented Nepal at ABU Robocon (**Team Awards: 2015, 2016**).
- Social Initiatives: Organized alumni-funded winter supply distribution; Deployed 100+ post-earthquake relief houses (Nepal, 2015).
- IOE Entrance Scholarship: Full-tuition, merit-based award.