Aaron Jumarang

+1 (613)-863-9692 | adjumara@uwaterloo.ca | linkedin.com/in/aaronjuma | aaronjumarang.com

Education

University of Waterloo Sep. 2022 – Present

Candidate for Bachelor of Applied Science in Biomedical Engineering *Waterloo, Canada*

- **Awards**: First In Class for 1st Year, First In Class for 2nd Year, Velocity Incubator 5K Semi-Finalist, 2x President's Research Award
- **Clubs**: Filipino Club, Neuroscience Club, Data Science Club, Muay Thai Club, Basketball Club
- **GPA**: 93/100

Queen's University Jun. 2023 – Present

Neurotechnology Microcredential *Kingston, Canada*

- **Key Courses**: Neuroscience, Neuroelectronic Recording and Processing
- **GPA**: 94/100

Experience

Neural Decoding & Machine Learning Research Intern May. 2025 – Aug. 2025

Integrated Neurotechnologies Lab at EPFL *Geneva, Switzerland*

- Engineered a lightweight deep learning model using PyTorch for on-chip EMG spasticity detection, achieving 93% classification accuracy and enabling deployment in a portable patient-assistive neuroprosthetic device.
- Optimized encoder architectures to boost EMG-based finger position decoding by 5% (86% accuracy), supporting real-time robotic prosthetic control while maintaining low computational cost for embedded integration.
- Adapted the decoding model to EEG, ECoG, and intracortical spiking datasets, achieving up to 85% motor decoding accuracy and demonstrating robust cross-signal reliability for brain–computer interface applications.

Brain-Computer Interface Researcher Sep. 2024 – Present

WATOLINK *Waterloo, Canada*

- Evaluated SSVEP and motor imagery paradigms using Neurosity Crown and g.tec Unicorn EEG headsets, benchmarking their performance for a reliable brain–computer interface that can control a drone.
- Built a PyTorch-based deep learning pipeline to decode EEG signals into movement intentions in real time, achieving 70% classification accuracy.

Spiking Neural Network Researcher Sep. 2024 – May. 2025

WAT.ai *Waterloo, Canada*

- Investigated the potential of Spiking Neural Networks for decoding intracortical spiking data into kinematic outputs, demonstrating its application for low-energy and biologically inspired brain–computer interface systems.
- Developed Python scripts for spike–kinematics correlation data analysis, enabling evaluation of neural firing patterns and providing insights for brain-computer interface model development.

Neurogaming Research Assistant May. 2024 – Dec. 2024

Dr. John Munoz at the University of Waterloo *Waterloo, Canada*

- Developed a 3D neuroadaptive Unity game integrated with the Muse EEG headset which can dynamically adjust gameplay difficulty based on EEG activity to enhance player engagement.
- Collected and analyzed EEG data from 15+ participants, identifying EEG patterns linked to player performance and difficulty levels, such as the engagement index, theta-alpha patterns, and beta-gamma patterns.

Neuroscience Research Assistant May. 2023 – Aug. 2023

Dr. Simon Chen Lab at the University of Ottawa *Ottawa, Canada*

- Designed and executed an experimental study with neuroscientists, integrating pupil tracking and optogenetics to examine how noradrenergic modulation affects motor learning in autism-model mice.
- Applied transfer learning to train a convolutional neural network for mouse pupil size tracking, achieving mean pixel error of 1.4 px for high-precision behavioral measurement.
- Built real-time Python-based software integrating deep learning models to automatically trigger optogenetic stimulation, achieving low-latency performance (50 ms delay) on low-end hardware.

Technical Skills

Programming Languages: Python, C++, C#, Java, Matlab, JavaScript, HTML/CSS
Machine Learning: PyTorch, TensorFlow, scikit-learn, CNNs, RNNs, Transformers, Clustering, Model Optimization
Neurotechnology: EEG, EMG, ECoG, intracortical spikes, neural signal processing, brain-computer interfaces (BCIs)
Tools & Platforms: Git, VS Code, ONNX, Jupyter Notebook, Unity, Nengo, Flask

Projects

EEG-Controlled Minecraft | *Python, TensorFlow, BrainFlow* Sep. 2025

- Designed and implemented a multimodal BCI system for Hack the North Hackathon, enabling real-time Minecraft control using motor imagery from the g.tec Unicorn EEG and hand gestures from the MindRove EMG.
- Developed a lightweight deep learning model ($\sim$ 2K parameters) in Python and TensorFlow to decode EEG into movement intention and EMG into discrete gestures.
- Achieved 75% classification accuracy with only 5 minutes of training data, demonstrating model efficiency and suitability for a real-time brain-computer interface.

EEG Chess | *Python, C#, Unity, BrainFlow* Apr. 2025

- Developed a Chess game using Unity for the g.tec Spring School Hackathon, enabling users to control pieces through SSVEP EEG signals recorded with the g.tec Unicorn headset.
- Implemented an 8-class SSVEP controller by integrating Python-based EEG decoding (canonical component analysis, power spectral density features) with Unity for real-time gameplay.

EEG Tic-Tac-Toe | *Python, C#, Unity, BrainFlow* Jul. 2024

- Created a Unity-based Tic-Tac-Toe game controlled through SSVEP EEG signals using the g.tec Unicorn headset, demonstrating feasibility of EEG-controlled gameplay.
- Linked Python EEG decoding pipelines with Unity for real-time classification using canonical component analysis and spectral feature extraction.

EMG Spider-Man Webslinger Prosthetic | *Analog Circuits, Signal Processing, LTSpice* Jun. 2024

- Designed and 3D-printed a Spider-Man webslinger prosthetic for young hand amputees, allowing them to shoot webs like Spider-Man using EMG signals.
- Built an EMG circuit using analog filters, a full-wave rectifier, an envelop, a digitizer, and an Arduino to control a Spider-Man webslinger mechanism.
- Simulated the EMG circuit schematic using LTSpice to facilitate the development the EMG circuit design.

OpenBCI GALEA N-Back Test | *Python, Virtual Reality, PsychoPy, Unity, BrainFlow* May. 2024

- Collaborated with a team of 4 in validating and testing the OpenBCI GALEA virtual reality headset by running an N-back memory test in virtual reality and comparing the EEG signals with the g.tec Unicorn.
- Developed data acquisition software in Python to collect, store, and synchronize EEG signals from the GALEA during the N-back test.
- Programmed Python scripts for offline data analysis, eliminating noise from EEG data and performing ERP and band power analysis.