

# ALISHA MENON

## EDUCATION

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- *Nov '23* – **Post-doctoral fellow at Rice University** on intelligent wireless sensors for bio-monitoring
- *Fall '18 – Fall '22* – **Ph.D. in EECS at UC Berkeley** with Prof. Jan Rabaey with a research focus on hardware for machine learning for biosensing, understanding and feedback systems with complex intelligence, shown with an EMG-based neural prosthetic. **Managing a large-scale, interdisciplinary team** with over **11 undergraduate/masters students** during Ph.D. for a wearable system combining electrode-based biosensing with on-device machine learning.
  - **Publications:** 9 authored/co-authored papers. Full list on [Google Scholar](#)
  - **Awards:** [NSF Graduate Research Fellowship](#), UC Berkeley Graduate Research Fellowship, UC Berkeley EECS Excellence Award, SRC Research Scholar, & prestigious [Rising star in EECS 2022](#).
    - Awarded [UC Berkeley 2022 Outstanding Graduate Mentor Award](#) for outstanding commitment to mentoring & advising undergraduate students, especially fostering inclusivity & diversity. First awardee from the college of engineering.
  - **Masters:** M.S. in 2020. Thesis on a **highly energy-efficient machine learning processor** for ExG sensor classification using Hyperdimensional Computing, also implemented on RISC-V CPU
- *Fall '15 – Spring '18* – **B.S. in Electrical Engineering** from Arizona State University in 3 years
  - Graduated with **4.0 GPA Summa Cum Laude** as Mouer Award Recipient
  - Awarded **FURI Research Scholarship** to conduct research with **Dr. Hugh Barnaby at ASU** on designing neuromorphic computing elements as integrated circuits to mimic spiking neurons
- *Fall '13 – Spring '15* – Graduated high school in two years in June '15 - **4.21 GPA**
- Highly Proficient in **Electrical Engineering & Computer Science** – skills include ASICs, FPGA, Embedded Systems, C, Verilog, digital logic design, computer architecture, hardware for machine learning, algorithms, Cadence, Python, Arduino, Assembly, MATLAB, HTML/CSS
- **Excellent Presentation and Communication skills** drawing from extensive experience in theater and performing arts (**over 200 main stage performances**).

## EXPERIENCE

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- *March '23* – present - Founder & CEO of Aurelia Vitals, developing wireless, intelligent vitals monitoring systems for better patient care, remote monitoring, and early critical condition detection.
- *Summer '21* - Exploratory Hardware Technology Design Engineer at **Apple** focused on **energy-efficient ML** architecture for novel sensor application.
- *Summer '18* - Hardware Engineer at **CTRL-Labs** (since acquired by Facebook), a neural engineering Startup focused on EMG Sensors. Involved in designing testing protocols, developing Python scripts for data analysis, and **evaluation of ICs**.
- *Winter '17* - **Winner of Neural Engineering Hackathon** at University of Washington for interactive EMG-based rehabilitation system developed over 36 hours.
- *Summer '17* - Research and Development Engineer w/**Dr. Jan Rabaey at UC Berkeley** focusing on a hardware interface that utilizes hyperdimensional signal processing for EMG gesture recognition.
- *Summer '16* - Visiting Researcher w/ **Dr. Joshua Smith at University of Washington** focusing on developing automated testing system applied to JFETs for applications in implanted EMG sensing.
- *Summer '16* - Visiting Researcher w/ **Dr. Jan Rabaey at UC Berkeley** focusing on **embedded systems** software for sensor hardware interface.
- **Founded [TYE Oregon](#)** - TiE Youth Entrepreneurs program for fostering entrepreneurship among High School students.

## DETAILS

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- March 2023 – present - Founder & CEO of Aurelia Vitals developing a prototype in collaboration with Dr. Monica Patil & Dr. Caraciolo Fernandes at Baylor College of Medicine.
- Winter 2023 - [National NSF I-corps](#) Entrepreneurial Lead with 7 weeks of customer validation for wireless, intelligent biosignal monitoring technology.
- June 2023 - Received a fellowship to attend 20th IEEE BIO-X workshop in Crete, Greece on Data Science and Engineering in Medicine and Biology, co-sponsored by the IEEE EMB Society, the IEEE BRAIN, the Department of Biomedical Engineering at University of Houston, and the Technical University of Crete.
- Aug 2018 – Dec 2022 - EECS Ph.D. student at UC Berkeley with Prof. Jan Rabaey. Research focused on neural prosthetic system using hardware-efficient machine learning for biosignal classification of EMG collected by flexible electrode array. Awarded [NSF Graduate Research Fellowship](#), UC Berkeley Graduate Research Fellowship, & UC Berkeley EECS Excellence Award for duration of Ph.D. program.

Publications can be found on [Google Scholar](#)

Presentations:

- 6/1/2023 - “Accelerating Hyperdimensional Computing with Vector Machines” at IEEE international Conference on Robotics and Automation (ICRA) 2023, London, UK.
- 5/22/2023 - “Accelerating Hyperdimensional Computing with Vector Machines” at IEEE Circuits & Systems Conference (ISCAS) 2023, Monterey, CA.
- 11/11/2022 – Won **Best Poster award** for “Neural Prosthetic with Human-in-the-Loop Shared Control” at 2022 IEEE Brain Discovery Neurotechnology Workshop at UCSD
- 11/8/2022 – **Invited talk at UC San Diego** on in-sensor machine learning applied to neural prosthetics
- 10/26/2022 – **Invited talk at UT Austin** for Biomedical Engineering seminar series on “Neural Prosthetic with Brain-inspired Shared Control”
- 10/13/2022 – “Brain-inspired Multi-level Control of an Assistive Prosthetic Hand through EMG task Recognition” at 2022 IEEE Biomedical IEEE International Conference on Biomedical Circuits and Systems (**BioCAS**)
- 7/19/2022 - “Augmented prosthetics through multi-level control”, to a public audience for Popping the Science Bubble, a **Berkeley Public Library** program.
- 6/15/2022 - “Augmented prosthetics through multi-level brain-inspired shared control”, to 16 NSF **REU community college undergraduate researchers** joining Berkeley Engineering for the summer.
- 5/25/2022 - “On the Role of Hyperdimensional Computing for Behavioral Prioritization in Reactive Robot Navigation Tasks” at IEEE international Conference on Robotics and Automation (**ICRA**), Philadelphia.
- 10/8/2021 - “A highly energy-efficient hyperdimensional computing processor for wearable multi-modal classification,” at 2021 IEEE International Conference on Biomedical Circuits and Systems (**BioCAS**), virtual.

- Fall 2022 – Awarded prestigious [Rising Star in EECS](#), invited to annual workshop launched by MIT in 2012, held at UT Austin in 2022, for graduate students with historically marginalized or underrepresented genders who are interested in pursuing careers in electrical engineering, computer science, and AI and decision-making
- Fall 2022 – Accepted into [NextProf](#) workshop, national workshop to diversify the next generation of **leaders in engineering**.
- Winner of 2022 UC Berkeley [Outstanding Graduate Mentor Award](#). This award, presented by The Graduate Assembly, honors four Berkeley graduate students annually "who have shown an outstanding commitment to **mentoring, advising**, and generally supporting **undergraduate students**" and **fostering “inclusive and supportive communities** in their workspaces.” Have involved 11 undergraduate students in my research during my Ph.D., each working on different projects and ideas. This has given me the opportunity to mentor and advise, and also taught me to manage teams working on large projects.
- Summer 2022 – **Designed lesson plans and lecture slides** for Advanced Digital Design and Integrated Circuits at UCB discussion sections. I planned concepts and developed slides for a 14-week course to improve students understanding of all the critical topics. I created very clear explanations of the concepts and problems with a focus on simplicity, inclusion, and creating understanding. The slides covered concepts ranging from FSM and Verilog to complex adders and SRAM. When handing slides over to the TAs, I was **asked to give a teaching demo** of my style which **emphasizes inclusion** through encouraging student participation in asking questions and creating a supportive environment to do so, where everyone regardless of their background feels comfortable enough to raise their hand.
- Fall 2021 – Spring 2022 — TA for Advanced Digital Design and Integrated Circuits at UCB. Ran weekly FPGA lab where students were introduced to Verilog and completed final projects programming a RISC-V processor onto a Xilinx Pynq FPGQA. Held **weekly discussion sections teaching concepts** in the areas of Verilog, Finite State Machines, RISC-V, CMOS, inverters, logical effort, wires and energy, adders, latches and flip-flops, SRAM, and memory.
- Summer 2021 – Hardware Technology Exploratory Design research intern at Apple. Worked on **energy-efficient ML** architecture for a novel **biosignal** application. Compared against traditional neural network to understand overall ML approach for the application. Developed a framework to explore efficient architectures for other signal types.
- Fall '18 – Spring '20 – Received **M.S. in EECS** at UC Berkeley. Thesis focused on developing a Hyperdimensional **machine learning** physiological **sensor fusion** algorithm. This was implemented on an **ASIC** for wearable **biomedical applications**. Architectural and hardware-software co-design used to optimize energy efficiency, including a resulting ~96% reduction in memory usage. Early/late fusion was explored for **hardware efficiency**. Additionally, for a more generic RISC-V CPU, the Hwacha vector accelerator was integrated and the algorithm was vectorized, achieving 200x speedup through a strategic combination of code optimizations and algorithm vectorization.
- Summer 2018 – Hardware Engineer working on **EMG Sensors** at **CTRL-Labs (since acquired by Facebook)**, a Neural Engineering startup, involved in designing and implementing testing protocols, developing Python scripts for analysis and assessment of testing data, and **evaluation of potential ICs** for EMG sensor board.
- 2015 - 2018 – ASU Undergraduate EE program. Completed courses in **Electrical**

**Engineering and Computer Science.** Building strong engineering & computer science skills in analog and digital circuits, signal processing, hardware-design language, digital design, computer organization, assembly language programming, engineering electromagnetics, properties of electromagnetic materials, and random signal analysis. Graduated **Summa Cum Laude** as **Mouer Award Recipient** for ASU's Spring 2018 graduating class, awarded to graduates with the **highest academic standing**.

- Fall 2017 - Spring 2018 – Awarded **FURI Research Scholarship** to conduct research with Dr. Hugh Barnaby at ASU on designing **neuromorphic computing elements** as integrated circuits to mimic spiking neurons.
- Fall 2017 – Completed **Machine Learning** curriculum through Coursera covering linear and logistic regression, **neural networks**, support vector machines, unsupervised learning and **principal component analysis**. Received certificate and grade of **96.5%**.
- Summer 2017 – **Research and Development Engineer** with **Rabaey Lab** at **UC Berkeley** on a hardware interface that utilizes hyperdimensional **biosignal processing** for **EMG-based gesture recognition**. Was previously involved in the development of a neuromodulation device to read and process EEG signals, spent 10 weeks adapting it for EMG signals including **real-time filtering, processing and selection** of the 64 EMG sensors and implementation of **parallel computing**.
- Spring 2017 – Presented poster at **Stanford Undergraduate Research Conference** on Analog Backscatter for Implanted EMG Sensing research. Previous work has shown that the Periauricular Muscles which will remain functional in even the highest of spinal cord injuries, can be repurposed to provide basic control signals to assistive devices via measurements of the EMG signals by external interface. That system only has access to low quality surface EMG. Proposed solution involves connecting the EMG-signaling musculature to a minimally invasive sensing system. Signals can be transmitted at up to 2 Mbps via the ultra-lowpower, low-cost, battery-free analog backscatter system for real-time analysis by an external system. This solution is predicted to improve the SNR by 25 to 40%.
- Winter 2017 – **Winner of 2017 Neural Engineering Hackathon** at University of Washington Center for Sensorimotor Neural Engineering. Developed over 36 hours, Dropstop is an **interactive rehabilitation system** for foot drop patients. Health professionals recommend physical therapy for almost all patients with foot drop. However, therapy can be extremely frustrating for patients, as the exercises - movements that were easy before their stroke or injury - are extremely difficult to perform. This makes them less motivated to complete tasks on their own. Research heavily suggests that **visual and audio feedback in rehabilitation** and training can help patients better understand their own performance and improvement in a clear and motivating manner. DropStop measures the anterior tibialis muscle activity via **surface EMG sensors** that are connected to an OpenBCI Cyton biosensing board. The Cyton records and **communicates wirelessly** with the computer connected to an Arduino Uno through a USB dongle based on the RFDuino radio module driving audio and visual feedback.
- Summer 2016 – Visiting Researcher with Dr. Joshua Smith at Sensor Systems Lab in EE department at **University of Washington**. Was accepted into the **highly competitive Research Experience for Undergraduates (REU)** at Center for Sensorimotor Neural Engineering Program. Worked on Analog Backscatter for **implanted EMG Sensing** focusing on developing a test system to determine highest JFET signal-to-noise ratio. Wrote,

tested and implemented a Python automated testing algorithm to upload 100 test signal of frequencies between 1Hz and 10 kHz to a AFG3252 that was connected to the JFETs and to **collect, process and interpret data** on each trial. SNRs for all 24 JFETs at all frequencies were calculated and compared allowing the project to move forward with the successful JFETs. **Presented poster and summary of work** for experts in the field.

- Summer 2016 – Visiting Researcher with Dr. Jan Rabaey at **UC Berkeley**. Was involved in the development of a **Brain-Machine Interface** for **prosthetic** applications. Collaborated with graduate students and faculty in the development of **embedded system software** for the processing of neural signals acquired by the hardware interface, and in the interpretation thereof. **Wrote, tested and integrated an API in C** for the processing of data collected by an accelerometer (motion detector) placed on the system to interpret motion and corresponding neural data. Developed C code utilizing circular buffers & data structures to store and manage accelerometer data into neural data stream.
- Summer 2015 – Intern at the Blood-Brain-Barrier Lab at **OHSU** under Dr. Ed Newuelt and Dr. Leslie Muldoon with a focus on **Scientific Processes & Design of Experiments**. Selected specifically because of **high academic achievement** and interest in gaining experience in the field. Focused on gadolinium-based contrast agents and chemotherapy drugs. Mastered essential lab skills including colorimetric assays, cell lysate isolation, ICP-MS technique for metal concentrations, data analyzing, focus, precision and consistency. Ran, observed, analyzed, **developed and designed over 61 experiments** in 10 weeks. **Presented summary** of project at the end of the summer for leaders in the field.
- 2013 - 2015 – **High School curriculum completed** at Oregon Connections Academy in **two years** – concentration in Math and Science – including Honors Courses in Biology and Chemistry and **AP Courses** with score **5/5** in Calculus, Statistics and Economics. Scored **2370 on general SAT** and **800 on SAT math II**. Received 23 college credits including college-level math courses in Advanced Algebra, Statistics, Differential & Integral Calculus.
- December 2013 – 2016 – Collaborated with TiE Oregon and **founded [TYE Oregon](#)**- a youth chapter that promotes **business and leadership** skills in high school students with a focus on diversity and inclusion – over 200 participants since founded – 48% of students were minority, 40% were female in 2016.
- 2011-2013 - **Summa Stoller** Middle School **accelerated program** after receiving **99<sup>th</sup> percentile** on the Talented and Gifted tests for Math and Reading – completed high school level Math & Science credits.
- Summer 2013 – Underwater Robotics Program – focused on Robot Design and Software Development.
- Summer 2012 - Chosen to participate in G2CS – NSF Funded “Girls Gather for Computer Science” program at Pacific University – field studies at **Microsoft, Amazon & WebMD**.
- 2003 – Present - **More than 12 years of experience** in the Performing Arts including Musical Theater, and Indian classical Dance. **Performed over 200 main stage productions** in prominent musical theaters in Portland.
- **Advanced Spanish Proficiency**