Vaishnavi Bengaluru Mohan

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EDUCATION

University of Washington, Seattle, WA *Sep 2022 - Present*
Ph.D.: Computational Neuroscience of Vision under Prof. Geoffrey Boynton and Prof. Ione Fine
Research area: Visual Perception, Computational Modeling, Neural Prostheses, Blindness

University of Southern California, Los Angeles, CA *Aug 2017 - Dec 2018*
Master of Science: Electrical Engineering (Honors Program Fellow)

National Institute of Technology Karnataka, India *July 2013 - May 2017*
Bachelor of Technology: Electrical and Electronics Engineering

TECHNICAL SKILLS

Languages : C/C++, Python, Unix Shell Scripting, MATLAB, SQL
Softwares/Frameworks: PsychToolBox, Tensorflow, OpenVINO, Keras, Docker, EEGLAB, Github, Audacity, LaTeX

RESEARCH EXPERIENCE

Graduate Researcher - Vision Neuroscience *Sep 2022 - Present*
Vision and Cognition Lab, University of Washington, Seattle, WA

- My work entails understanding perception from neural data in the context of sight restoration for late onset of blindness.
- Designing efficient psychophysics experiments using adaptive Bayesian estimation procedures and information theoretical approaches to predict spatiotemporal contrast sensitivity as a comparison metric of visual acuity to inform design methodologies for sight restoration.
- Developed computational perception models by integrating neural and behavioral data to simulate percepts as experienced by individuals with visual prosthetics.
- Conceptualized a systematic mathematical framework to characterize perceptual distortions across various visual paradigms
- Built a virtual prototype capable of predicting perceptual outcomes from neural response data for any optogenetic protein - pioneering the first systematic framework to evaluate and optimize optogenetic technology for functional vision restoration.

PROFESSIONAL EXPERIENCE

Software Development Engineer - Computer Vision and Machine Learning *Feb 2019 - Sep 2022*
Intel Corporation, Hillsboro, OR

- **PoC: Microsoft Windows 11 Studio Effects**
  Lead AI scientist and software developer for low-power, low-latency AI applications for Intel edge platforms. Created the AI-based automatic framing and background effects PoC, now integrated into Microsoft Windows 11 OS.
- **PoC: Intel Horseshoe Bend Foldable Display Laptops**
  Led development of a comprehensive test suite of 310+ tests for Intel's foldable display laptop PoC (Horseshoe Bend) now in production with HP, Lenovo and Asus.
- **Model Performance Evaluation Tool:** Built a computer vision tracking pipeline for a smart home visual analytics solution. Designed and developed an automated framework to evaluate KPIs for computer vision applications.
- **Workload Optimization:** Led performance analysis and optimization of AI workloads across Intel mobile and desktop processors, including CPU, GPU, and the Vision Processing Unit (VPU), providing strategic recommendations for optimal hardware and large AI model workloads.

AI Solution Software Graduate Intern *May 2018 - Aug 2018*
Intel Corporation, Hillsboro, OR | Virtual Yoga coach using deep learning approach

- Designed and implemented an 'AI yoga coach' based on skeletal joint estimation to teach a user in real-time to enter into a template yoga pose. Trained a deep learning model based on CMU's OpenPose for skeletal joint detection.
- Developed an image-processing method to estimate user pose and depth from a 2D camera stream.
- Built a full-stack software solution delivering real-time feedback for users to learn and perfect poses using the virtual AI Yoga coach.

CONFERENCES AND TALKS

- **Mohan, V.**, Yucel, E.I., Boynton, G., Fine, I. *"Characterizing Perceptual Performance of Optogenetic Vision: Moving from Cellular Responsiveness to Functional Vision"*. The Eye and the Chip 13th World Research Congress on Artificial Vision, Southfield, MI, October 2023. [Poster]
- **Mohan, V.**, Emami, Z., Chau, T. *"Development of an optimal Brain Computer Interface based on Motor Imagery using Electroencephalography"*. 10th annual Anne & David Ward Family Summer Student Research Day, Toronto, July 2016.

PROJECTS

Attention-Driven Brain Computer Interface (BCI) | Graduate Student - Course Project [Slides]

- Investigated and built a viable brain computer interface based on covert shifts in attention. Being gaze-independent, this project addressed the problem of strain on user's eyes when used over long periods of time.
- Demonstrated that the changes in alpha band power in the parieto-occipital region effectively indicate covert attention shifts, noting variation in the most distinguishable directions across individuals.
- Achieved a 70.6% classification accuracy, showing the feasibility of a BCI using generalized linear models to detect covert attention shifts through EEG data.

Development of an optimal Brain Computer Interface based on Motor Imagery [Poster]
Institute of Biomaterials and Biomedical Engineering, University of Toronto

- Developed an innovative algorithm using frequency domain analysis to remove real hand motion artifacts in EEG data, boosting BCI performance.
- Collaborated with a teammate to build a BCI system based on imagined hand movement, achieving an 80% classification accuracy, offering a potential access solution for individuals with motor disabilities.
- Conducted a literature review and gathered EEG data from 10 participants across six 1-hour sessions.
- Presented a poster titled "Development of an Optimal Brain-Computer Interface Based on Motor Imagery" at the 10th Annual Summer Student Research Day, Holland Bloorview Kids' Rehabilitation Hospital, Toronto, Canada.

Automatic Estimation of Speaker Traits using Speech Signals | Undergraduate Thesis
Department of Electrical Engineering, Indian Institute of Science, Bangalore, India

- Created a machine learning solution to automatically estimate a speaker's height and age from speech signals, utilizing features like mel cepstral coefficients and filter bank features. This involved training a Gaussian mixture model for statistical analysis and support vector regression for accurate estimation.
- Achieved a mean square error of 6 cm for height and 5 years for age, aligning with then state-of-the-art technology.

HONORS AND AWARDS

- **Department recognition awards for innovation and timely execution, Intel Corporation** *Nov 2021*
  Our team was awarded by the department of Platform Software Engineering comprising about 2000 employees for our innovation in foldable-display laptops and the development of smart video conferencing solution.
- **3 peer recognition awards for fearless execution, Intel Corporation** *June 2019, June 2020, Nov 2020*

- **MS Honors Program Fellow, Dept of Electrical Engineering, University of Southern California** *Dec 2018*
  Highly selective program awarded to about 1% of Masters students in recognition of academic excellence by the Department of Electrical Engineering, University of Southern California.
- **Mitacs Globalink Summer Research Scholarship, University of Toronto, Canada** *May 2016 - July 2016*
  Fully funded scholarship program awarded to international undergraduate students to undertake research projects at Canadian Universities. Conducted research under Prof Tom Chau at the University of Toronto and Holland Bloorview Kids Rehabilitation Hospital.
- **Visiting Student Program Fellowship, Raman Research Institute, Bangalore, India** *May 2015 - July 2015*
  Funded fellowship program offered to undergraduate students with exceptional academic record to conduct research at RRI. Worked at Radio Astronomy Laboratory under the supervision of Mr. Girish B.S on analog to digital converters for signals in the frequency range of 2-5 GHz to be employed in Widefield Array of Radio Telescopes.

COMMUNITY INVOLVEMENT

- **Volunteer teacher, eVidyaloka, India** [Website] *Jan 2021 – May 2021*
  Conducted online classes for 6th and 7th grade students for 2 hours per week at a government school in Mugad, a village in Karnataka, India
- **Volunteer, Friends of Trees, Portland, OR** [Website] *Apr 2019*
  Volunteered in three-hour sessions per week to prepare the land and plant saplings in nature preservation sites in the Pacific Northwest
- **Volunteer, Oregon Food Bank, Beaverton, OR** [Website] *May 2018 - July 2018*
  Volunteered for two hours per fortnight to package food supplies for the homeless community
- **Volunteer scribe, Malleswaram Government Girls High School, India** *June 2017*
  Volunteered as a scribe for two students with visual disability to assist in writing 10th grade exams.