Dakshitha B Anandakumar

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Education

Georgia Institute of Technology, Atlanta, GA **GPA: 3.85/4.0**
Ph.D. in Biomedical Engineering, Advisor: Dr. Robert C Liu 2018–Current

- Relevant coursework: Quantitative Neuroscience, Neuroanatomy Systems Neuroscience

Georgia Institute of Technology, Atlanta, GA **GPA: 4.0/4.0**
M.S. in Electrical and Computer Engineering 2016–2018

- Relevant coursework: Advanced Computer Architecture, Advanced Programming Techniques, Advanced Operating Systems, Advanced Digital Signal Processing, Information Processing Models in Neural Systems

Ramaiah Institute of Technology, Bangalore, India **GPA: 9.80 /10.00**
B.S. in Electronics & Communication Engineering 2012–2016

- Institute Best Outgoing Student Award for all-round excellence

Publications

[1] K. K. Chong, **D. B. Anandakumar**, A. G. Dunlap, D. B. Kacsoh, and R. C. Liu, "Experience-dependent coding of time-dependent frequency trajectories by off responses in secondary auditory cortex", in *Journal of Neuroscience*, 2020, pp. 4469–4482.

[2] R. C. Liu, **D. B. Anandakumar**, and K. Lu, "Parent TRAP: Discriminating Infant Cries Requires a Higher-Order Auditory Association Area in Mice", in *Neuron 107.3*, 2020, pp. 399–401.

[3] N. Wang, R. Liu, N. Asmare, **D. B. Anandakumar**, and F. A. Sarioglu, "Decoding of Code-Multiplexed Coulter Sensor Signals via Deep Learning", in *20th International Conference on Solid-State Sensors, Actuators and Microsystems Eurosensors*, 2019, pp. 202–205.

[4] **D. B. Anandakumar**, D. Venkatesaiah, and K. Manikantan, "A novel Bi-level Artificial Bee Colony algorithm and its application to image segmentation", in *International Conference on Computational Intelligence Computing Research*, 2015.

Current Research

- **Contribution of neural manifolds in the auditory cortex of the brain to perception of learned social sounds that give rise to social behaviors**
  - I am investigating the population coding of natural vocalizations in the auditory cortex that result in social behaviors. Sounds with different acoustic properties are categorized in the auditory cortex according to their perceived behavioral meaning rather than their underlying acoustic properties
  - The auditory cortex in the brain specializes in processing sounds. There is a large variability in the production of social sounds from one member of a species to another. However, our brain is capable of ignoring these variations, and perceive sounds relevant for a task as belonging to one category to drive a specific behavior
  - For example, if the task is to identify the gender of a speaker, our brain ignores characteristics of the sound such as pitch and accents to quickly achieve the goal
  - It is still unclear how the brain might generalize across acoustic properties of sounds depending on the task to be performed. My research focuses on extracting the characteristics of sounds that helps an animal perceive it as behaviorally relevant and how the wiring of neurons in the auditory processing pathway drive such an encoding

Research Experience

Georgia Institute of Technology

A robust model for Human Object Recognition using Deep Neural Networks

- Constructed a convolutional neural network to demonstrate hierarchical processing of stimuli in the visual pathway. The hidden layers in the network process stimuli similar to the layers in the visual cortex
- Demonstrated that the network successfully incorporated contextual cues to determine the identity of the object irrespective of variations in the angle of viewpoint
- The performance of the network was further verified by conducting human psychophysics experiments on the same library of images

Closed loop feedback control of localized neural activation

- Implemented a feedback control network to localize the activation of a population of neurons and decouple the effect of causal interactions on their characteristics
- Simulated the behavior and firing rates of biological neurons by transfer functions and incorporated a PID controller in the feedback loop to modulate the feedback control to clamp firing rates at a fixed value

Cable theory modelling of a nerve cell

- Implemented a biological neuron as a Hogkin Huxley circuit wherein its characteristics are simulated by mathematical models of parallel connection of resistors and capacitors
- Extended the model to incorporate a network of neurons using the passive cable theory. Each neuron is represented as an electrical component that conducts electrical signals in the form of action potentials. The network is represented by series and parallel connection of electrical components
- The models were simulated in NEURON and MATLAB. While MATLAB requires the characteristics of each electrical component to be explicitly modelled as a list of transfer functions, NEURON has inbuilt library functions to model conduction properties of a neuron

Center for Neuroscience, Indian Institute of Science (IISc)

Summer Fellowship, Mentor: Dr. Supratim Ray

Real time neuro feedback of Local Field Potential (LFP)

- Devised an algorithm to analyse electroencephalography (EEG) signals in real time while subjects performed different tasks. Provided feedback to subjects during the task to control their brain rhythms
- Recorded alpha and gamma waves from the brain, used TCP/IP interface to communicate signals in real time

Industry Experience

Office of Graduate Studies, Georgia Tech

Professional Development Intern — May 2019 - July 2019

- Built a professional development certification program for graduate students at Georgia Tech to help them hone their cognitive, interpersonal and intrapersonal skills.

Qualcomm

Software Engineering Intern — May 2017 - August 2017

- Designed a tool to track transitions between various stages in 5G Radio down-link communication, each stage represented as a state in a finite state machine

Honeywell Technology Solutions

Software Development Intern — January 2016 - July 2016

- Worked on developing a gateway device that interfaces sensors with xls1000 panel modules and translates the messages between them through the use of communication protocols such as I2C and CAN.

Teaching

Graduate Teaching Assistant
Georgia Institute of Technology

- Graduate Groups (GT 6000) — Fall 2019, Fall 2020
- High Performance Computing (CS 6290) — Spring 2018
- Introduction to Computer Network Security (ECE 4894) — Fall 2017

Mentorship

Graduate Mentor, SURE program
Emory University

- Mentored an undergraduate student in the Summer Undergraduate Research Experience Program Summer 2019

Graduate Mentor, Pipeline program
Emory University

- Graduate Mentor and curriculum coordinator where I teach neurology and mental health to high school students. — Fall 2019- Current

Skills

- **Skill Group: Programming Languages** Python, MATLAB, C
- **Open Source Libraries:** PyTorch, Tensorflow, NEURON

Scholarships and Awards

- Women in Technology Scholarship, Zonta International — 2019
- Outstanding community service award, Georgia Tech — 2020
- Research award from Vision Group on Science and Technology, Government of Karnataka, India. — 2016
- Best Project Award for the project 'Novel method of automated counting of silkworm eggs using Looped Erosion technique' at Ramaiah Institute of Technology — 2016
- Outstanding Graduating Student Award at Ramaiah Institute of Technology — 2016

Leadership and Volunteering Experience

- Graduate Student Government, Emory University — May 2020 –Current
  Serving as Vice President of Community Engagement to foster a sense of community and togetherness amoung the diverse groups of graduate students at Emory University
- Women in Technology, Atlanta — 2019
  Mentored high school girls to encourage them to pursue higher education and careers in STEAM
- India Club at Georgia Tech — 2017–2019
  Served as the President of the club to enhance international students experience at Georgia Tech