

Alisha Kodibagkar

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EDUCATION

Johns Hopkins University

Master of Science in Engineering (M.S.E), **Biomedical Engineering**
Computational Medicine Focus Area, Graduate GPA: 4.0

Baltimore, Maryland
August 2020 - May 2021

Johns Hopkins University

Bachelor of Science (B.S.), **Biomedical Engineering**
Computational Medicine Focus Area, Undergraduate GPA: 3.54

Baltimore, Maryland
August 2017 - May 2021

SKILLS

Programming Languages (Fluent): Python, MATLAB, Java, JavaScript, Objective-C, HTML

Neural Data Analysis: resting state fMRI, task-based fMRI, graph representations of axonal arbors

Software Development: Open-source Python package development (version control, documentation, unit testing (pytest), object-oriented programming), iOS development, shell scripting (bash), high performance computing clusters, database management (Firebase), cloud services (AWS, Azure), containers, machine learning and deep learning (pytorch)

Bioengineering Experimental Design: Needs screening, concept generation/selection, validation study and pilot study design, research subject recruitment, project design for low-resource settings, project management for cross-institutional and global projects, engineering design for clinicians

Wet lab and Animal: Cell culture, gel electrophoresis, synthesis of polymers, nanoparticle synthesis, handling of mice, handling of marmosets, marmoset psychophysical experiments, immunohistochemistry

HONORS/AWARDS

- May 2021 - Graduated with General Honors from Johns Hopkins University
- May 2021 - Graduated with Departmental Honors in Biomedical Engineering from Johns Hopkins University
- May 2021 - Graduated with Honors from Johns Hopkins National Honor Society in Neuroscience (Nu Rho Psi)
- March 2020 - Caltech Summer Undergraduate Research Fellowship (SURF) for Summer 2020, Canceled (COVID-19)
- March 2020 - Finalist: TCU Values and Ventures Competition for Pulsatile Tinnitus Diagnostic Tool, Canceled (COVID-19)

MANUSCRIPTS SUBMITTED

1. Xu, H., Desman, J., Huang, Q., Igboko, M., **Kodibagkar, A.**, Wang, Z., Gong, K., Winslow, R., Greenstein, J., Stevens, R. *Machine Learning Prediction of Responsiveness Phenotypes in Non-Neurological ICU Patients* [SUBMITTED, IN REVIEW: The Lancet Digital Health]

MANUSCRIPTS IN PROGRESS

1. **Kodibagkar, A.**, Kirungi, U., Haase, E., Jarso, S., Proposed Title: *Mobile Health Solutions for Maternal and Neonatal Health in Africa*
2. Parks, S., **Kodibagkar, A.**, Stamoulis, C., Proposed Title: *NGNDA: A Novel Computing Infrastructure for Massive Analyses of High-Dimensional Brain Networks and Next-Generation Research in the Neurosciences*
3. Rao, D., **Kodibagkar, A.**, Suk, J.S., Proposed Title: *Bioreducible Cationic Polymers to Increase Transfection and Decrease Cytotoxicity of Tumor Specific Brain Penetrating Nanoparticles for the Treatment of Aggressive Brain Tumors*

POSTERS AND ABSTRACTS

1. **Kodibagkar, A.**, Athey, T., Le, M., & Vogelstein, J. (2021, June 15-17). *Predicting Axon Collaterals Using Branch Angles* [Conference Poster] The 2021 BRAIN Initiative Investigators Meeting, Virtual Meeting.
2. **Kodibagkar, A.**, Athey, T., Le, M. & Vogelstein, J. (2021, October 6-9). *Predicting Axon Collaterals Using Branch Angles* [Conference Poster] 2021 BMES Annual Meeting, Orlando, FL, United States.
3. Xu, H., **Kodibagkar, A.**, Desman, J., Igboko, M., Huang, Q., Wang, Z., Winslow, R., Greenstein, J., & Stevens, R. (2021, May). *Coma Predictor: Prediction of Neurological Trajectories in Non-Neurological ICU Patients* [Design Poster] Johns Hopkins Engineering Design Day 2021, LINK: <https://designday.jhu.edu/design-day-projects-2021/entry/1867/>
4. Vasu, S., **Kodibagkar, A.**, Iyer, S., Park, M., Kirungi, U., Baingana, F., & Jarso, S. (2021, October 6-9) *Strategies to Increase Antenatal and Postnatal Care in Eastern Uganda* [Conference Poster] 2021 BMES Annual Meeting, Orlando, FL, United States.
5. Kim, M.J., Foley, T., Kavteladze, D., Kodibagkar, A., Ni, J., Chan, R., Lee, A., Verma, E., McLane, I., West, J., Slinowsky, M., Hui, F., Carey, J., Sun, D., Matin S., (2020, May), *A Pulsatile Tinnitus Diagnostic Device to Record and Store Sound from the Tympanic Membrane* [Design Poster] Johns Hopkins Engineering Design Day 2020
6. Xu, Haoyin¹; Desman, Jacob²; Huang, Qianqi²; Igboko, Munachiso²; **Kodibagkar, Alisha²**; Wang, Zixuan²; Gong, Kirby²; Winslow, Raimond²; Greenstein, Joseph²; Stevens, Robert³. 771: MACHINE LEARNING PREDICTION OF RESPONSIVENESS PHENOTYPES IN NON-NEUROLOGIC ICU PATIENTS. Critical Care Medicine: January 2022 - Volume 50 - Issue 1 - p 379 doi: 10.1097/01.ccm.0000809408.76862.7c, LINK: https://journals.lww.com/ccmjournal/Citation/2022/01001/771_MACHINE_LEARNING_PREDICTION_OF_RESPONSI_VENESS.737.aspx

7. Xu, H., Desman, J., Igboko, M., Huang, Q., Wang, Z., **Kodibagkar, A.**, Gong, K., Winslow, R., Greenstein, J., & Stevens, R. (2021, October 26-29). *A Computational Model to Predict Discharge Responsiveness in Non-Neurological ICU Patients* [Conference Poster and Abstract] Neurocritical Care Society Virtual 19th Annual Meeting, Virtual Meeting.
8. Xu, H., Desman, J., Igboko, M., Huang, Q., Wang, Z., **Kodibagkar, A.**, Winslow, R., Greenstein, J., & Stevens, R. (2021, October 3-6). *A Machine Learning Model to Predict Responsiveness in Non-Neurological ICU Patients* [Conference Poster and Abstract] European Society of Intensive LIVES 2021, Virtual Meeting.

RESEARCH - LABORATORY EXPERIENCE

Senseable Intelligence Group | McGovern Institute of Brain Research at MIT

April 2022 – Present

Technical Associate | Principal Investigator: Dr. Satrajit Ghosh

- *Mumble Melody* | Primary Project Collaborator: Dr. Rébecca Kleinberger
 - Managed and organized for Mumble Melody, a project between the MIT McGovern Institute and MIT Media Lab to increase fluency for people who stutter (PWS) using altered auditory feedback (AAF).
 - iOS development using Objective-C of a phone-based application implementing AAF for improved application features and database management (Firebase)
 - Recruited subjects for preliminary study to gather user feedback and usage data for app.
 - Launched application on the App Store; achieved 105 downloads.
 - Analyzed data from subject app usage data stored in online database. Created auto-updating online dashboard to display app usage.
 - Designed and currently implementing a month-long consented targeted longitudinal experiment to examine the effect of AAF for PWS in an ecological setting. Generating experiment protocols with Reproschema, a standardized data collection schema within ReproNim, an organization to improve reproducibility of neuroimaging science.
 - Presented to project catalysts at the Deshpande Center for Technological Innovation.
 - Conducting a literature review on uses of auditory feedback, and a fellowship proposal on using AAF to investigate the neural basis of sensory feedback in speech using behavioral, neuroimaging, and neurocomputational methods.
- *Neuroimaging Study of Medical Marijuana Card Use* / Primary Project Collaborator: Dr. Jodi Gilman
 - Performed structural and functional MRI analysis to understand the impact of longitudinal medical marijuana card ownership on brain structure and function for subjects with pain, anxiety, and insomnia.
 - Performed preliminary search on cannabis-related fMRI studies and coordinated development of task activation data analysis scripts in Python with lab members.
- *Automated Stuttering Disfluency Detection*
 - Processed voice recordings of stuttered speech gathered in the lab for automated disfluency detection. Researched prior stuttering detection implementations in literature.
- *Voice as a Biomarker of Health*
 - Involvement in an NIH based research project (bridge2ai) on data acquisition for voice as a biomarker of health. Searched and collected datasets of voice disorder recordings.
- Auditing courses
 - HST.583 – Functional Magnetic Resonance Imaging: Data Acquisition and Analysis
 - SHBT.200 – Introduction to Sound, Speech, and Hearing

Computational Neuroscience Lab | Boston Children's Hospital/Harvard Medical School

June 2021 – Feb 2022

Research Assistant II, Adolescent Medicine | Principal Investigator: Dr. Caterina Stamoulis

- *Next-Generation-Neural-Data-Analysis* (NGNDA)
 - Wrote MATLAB code to contribute to fMRI analysis portion of NGNDA, a novel computational infrastructure for massive analyses of high-dimensional brain networks and next-generation neuroscience research. D
 - Developed and implemented mathematical and statistical methods to preprocess, denoise, and calculate network connectivity for resting state fMRI brain data from the *Human Connectome Project – Aging* study and the *Adolescent Brain Cognitive Development (ABCD)* study, with a goal to build tools to analyze brain connectivity patterns over a lifetime.
 - Contributed to development of manuscript in progress for submission on NGNDA: wrote description of tool and performed literature search on fMRI and EEG analysis.

Neuro Data Lab | Johns Hopkins Univ.

June 2020 – June 2021

Research Intern | Principal Investigator: Dr. Joshua Vogelstein

- *Classification of Axon Collaterals*
 - Developed experimental design and created Python scripts to study axon geometry in individual neuron traces from whole mouse brain images, for semester-long independent research study. Previously, the lab classified a main axon's trajectory using the longest root-to-leaf path within the axon; this ignored local axon branching patterns. I applied algorithm evaluating branching points on neuron traces and used branch angles to determine whether following trajectories would be continuation of main axon or axon branch. Applied method to 33 neuron traces. Prepared poster on results.
- *Software Development: Open-source Python Package*
 - Developed Python code integral to neuron trace analysis for Github repository of Brainlit: an open-source Python package containing methods for whole brain mouse image analysis, in process for merging into larger scientific libraries. Personal contribution: representation of neuron traces as Python objects for improved lab's neuron trace handling, format conversion, and morphology analysis.

- *Neuron Segmentation Algorithms*
 - Analyzed state-of-the-art neuron segmentation algorithms separating neuron clusters into individual neurons to Mouselight dataset, a light microscopy dataset. Applied previously developed package (G-Cut) separating densely weaving neuron clusters into individual neurons by representing axonal branches as parametric curves in 3D space, describing orientation of branches with respect to individual somas, and applying a linear programming algorithm for segmentation to determine globally optimized neuron trees. Simulated connected graphs with multiple neurons in Mouselight dataset and applied G-Cut to simulated data.

Center for Imaging Science (CIS) | Johns Hopkins Univ.

May 2018 – July 2018

Research Intern | Principal Investigator: Dr. Tilak Ratnanather

- Applied 3D image reconstruction to transfer physical atlas of the cat brain to computational model for research on deafness.

Laboratory of Auditory Neurophysiology | Johns Hopkins Univ.

September 2018 – January 2019

Research Intern | Principal Investigator: Dr. Xiaoqin Wang

- Performed preliminary design for an iPad based in-cage two-alternative forced choice paradigm to study marmoset auditory behavior and perception – including detection and discrimination thresholds - through psychophysical experiments. Gained training on handling of marmosets. Learned JavaScript for preliminary work on iPad tool creation. Collaborated with Dr. Elias Issa at Columbia Univ. to understand implementation of method in other labs.

Center for Nanomedicine (CNM) | Johns Hopkins Univ.

May 2019 – March 2020

Research Intern | Principal Investigator: Dr. Jung Soo Suk

- Designed, synthesized, and tested bioreducible cationic polymers to increase the transfection efficacy and reduce cytotoxicity of non-viral gene delivery to the brain via DNA nanoparticles for the treatment of high-grade gliomas. Refined ideal synthesis steps for maximal efficacy and lowest cytotoxicity. Tested particles in-vitro for glioblastoma cells and in-vivo for mice. Coauthored for manuscript in progress for submission.

RESEARCH - BIOENGINEERING PROJECTS

Neonatal & Maternal Health Radar | Biomedical Design Project

May 2020 – Present

Founder & Leader | Faculty Mentors: Dr. Eileen Haase, Dr. Samson Jarso, and Shababa Matin

- Founded and led an international biomedical collaboration between Johns Hopkins and the Mbarara University of Science and Technology to develop a phone-based system to send health education messages to pregnant mothers in rural Eastern Ugandan communities. Conducted project management, needs assessment, and solution design for phone-based tool. Contributed to preparation of poster on methods and preliminary review in progress for submission of mHealth based solutions for neonatal and maternal health in Africa.
- Advising current research members conducting a pilot study to deploy technological solution for postnatal care in Mbarara, Uganda.

Coma Predictor | Precision Care Medicine Project

August 2020 – June 2021

Team Member | Medical PI: Dr. Robert Stevens, Engineering PIs: Dr. Raimond Winslow, Dr. Joseph Greenstein

- Applied machine learning techniques on ICU patient physiological data to predict coma onset and emergence, within a biomedical engineering team interacting with clinicians in Department of Anesthesiology and Critical Care Medicine at Johns Hopkins Hospital. Trained machine learning model with data collected in the first 24 hours after ICU admission to predict neurological responsiveness at discharge. Applied classifiers including adaptive boosting decision trees, Gaussian Naïve Bayes, logistic regression, extremely randomized trees, random forest, and gradient boosted decision trees. Personal contribution includes project conceptualization, data preprocessing, hyperparameter tuning, testing of ensemble machine learning models, preliminary work on sliding observation windows to predict short-term changes in consciousness, preparation of manuscript, abstract, and posters. Manuscript submitted to Lancet Digital Health (under review).

TinnitX | Biomedical Design Project

March 2019 – May 2020

Design Team Engineer | Faculty Mentor: Shababa Matin, Medical PIs: Dr. Ferdinand Hui, Dr. John Carey, Dr. Daniel Sun

- Collaborated with clinicians in the Department of Otolaryngology and Department of Radiology at Johns Hopkins Hospital and the Center for Bioengineering Innovation and Design to develop a non-invasive device that can be used to aid in diagnosis of pulsatile tinnitus (PT). Collaborated with Dr. James West lab in JHU Department of Computer Engineering and Mechanical Engineering to develop miniature microphones for sensitive sound detection in ear canal. Personal contribution included device drafting and design, project presentation, and preliminary device building (prior to March 2020).
- Finalist to participate in TCU Values and Venture Competition 2020 (Canceled).

TEACHING EXPERIENCE

Biomedical Engineering Department Teaching Assistant and Grader

October 2019 – December 2020

- Data Science Lab | Professor: Dr. Kwame Kutten | Teaching Assistant (August - October 2020) | 10h/week
- Computational Cardiology Lab | Professor: Dr. Eileen Haase | Teaching Assistant (October – December 2020) | 10h/week
- Linear Signals and Systems | Professor: Dr. Michael Miller | Grader (October – December 2019) | 5h/week

LEADERSHIP ACTIVITIES

JHU Hippocrates Medical Review

February 2018 – May 2021

Biotechnology Writer

- Wrote biotechnology articles for medical journal to describe current technological advancements in medicine. Select articles published in written journal and online website.

- #1: “Prosthetics with a Sense of Touch and Pain”: written journal, Hippocrates Medical Review ISSUE NO. 3 - SPRING/FALL 2019
- #2: “How Dueling Neural Networks are Fighting for the Next Steps in Medicine”, online: hippocratesmedreview.org 1/09/2020
- #3: “Xenobots: The First Living Robots”, online: hippocratesmedreview.org, 4/09/2020
- #4: “Self-healing soft robots”, online: hippocratesmedreview.org, 11/13/2020

JHU Kranti

September 2017 – May 2021

Performance Director and Soloist

- Directed a team of 15-20 students and choreographed for competitive events in the South Asian a capella national circuit. Soloed for competitive events. Soloed and recorded for album featured on Spotify. Placed 2nd and 3rd in national competitions at UPitt, UC Berkeley, and NC State.

RELEVANT COURSEWORK

- *Speech and Hearing*
 - ELEC.520.315 - Introduction to Bio-Inspired Processing of Audio and Visual Signals | Institution: Johns Hopkins University | Grade: A
 - BMED.580.625 - Structure and Function of the Auditory and Vestibular Systems | Institution: Johns Hopkins University | Grade: A
 - SHBT.200 - Introduction to Sound, Speech, and Hearing | Institution: Massachusetts Institute of Technology | Audit
- *Computational and Engineering*
 - BMED.580.243 - Linear Signals and Systems | Institution: Johns Hopkins University | Grade: A-
 - BMED.580.475 - Biomedical Data Science | Institution: Johns Hopkins University | Grade: A
 - BMED.580.477 - Biomedical Data Science Lab | Institution: Johns Hopkins University | Grade: A
 - CS.605.202 - Data Structures | Institution: Johns Hopkins University | Grade: A
 - BMED.580.680 - Precision Care Medicine I | Institution: Johns Hopkins University | Grade: A
 - BMED.580.681 - Precision Care Medicine II | Institution: Johns Hopkins University | Grade: A
 - BMED.580.737 - Seminar Series in Computational Medicine | Institution: Johns Hopkins University | Grade: Pass (Pass/Fail scale)
- *Neuroscience: Basic, Computational, and Engineering*
 - PSYC.200.141 - Foundations of Brain, Behavior, and Cognition | Institution: Johns Hopkins University | Grade: A
 - NEUR.080.305 - Neuroscience: Cellular and Systems I | Institution: Johns Hopkins University | Grade: B
 - BMED.580.424 - Neuroengineering Lab | Institution: Johns Hopkins University | Grade: A
 - BMED.580.439 - Models of the Neuron | Institution: Johns Hopkins University | Grade: Pass (COVID Pass/Fail scale)
 - BMED.580.697 - Neuro Data Design I | Institution: Johns Hopkins University | Grade: A
 - BMED.580.638 - Neuro Data Design II | Institution: Johns Hopkins University | Grade: A
- *Neuroimaging*
 - Open Online Course: Center for Brain, Minds, and Machines - FMRI Bootcamp, A two day workshop presented by Rebecca Saxe | Institution: Massachusetts Institute of Technology | Online Audit (Asynchronous)
 - HST.583 - Functional Magnetic Resonance Imaging: Data Acquisition and Analysis | Institution: Massachusetts Institute of Technology | Audit