

# Adam Li

NEURAL DATA SCIENTIST · APPLIED MACHINE LEARNING · STATISTICS AND MATHEMATICS · ENGINEERING LEADERSHIP AND PROJECT MANAGEMENT

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## Positions

### Postdoctoral Research Scientist in the Causal AI Lab

COLUMBIA UNIVERSITY | COMPUTER SCIENCE DEPARTMENT (ADVISOR: ELIAS BAREINBOIM)

- NSF Computing Innovation Fellow

New York City, NY

Jan. 2022 - Present

## Education

### PhD in Biomedical Engineering

JOHNS HOPKINS UNIVERSITY | GPA: 3.8

- Advisor: Dr. Sridevi Sarma | Thesis: *Localization of the Epileptogenic Zone: A Dynamical Systems Perspective*
- NIH NETI Fellow, NSF-GRFP Fellow, Whitaker Fellow, Chateaubriand Fellow, ARCS Chapter Scholar

Baltimore, MD

Aug. 2015 — Dec 2021

### MS in Applied Mathematics and Statistics

JOHNS HOPKINS UNIVERSITY | GPA: 3.8

- Coursework in: Statistical Learning Theory, Optimization, Matrix Analysis, Real Analysis

Baltimore, MD

Aug. 2019 — May 2021

### B.S. Bioengineering, B.S. Mathematics - Applied Sciences

UNIVERSITY OF CALIFORNIA SAN DIEGO | MAJOR GPA: 3.75

- Tau Beta Pi, Gordon Scholar & Fellow, Provost's Honors

La Jolla, CA

Sep. 2010 — Mar. 2015

## Journal Publications, Preprints and Working Submissions

### Neural Fragility as an EEG Marker of the Seizure Onset Zone - pdf

ADAM LI, ET AL.

2021  
*Nature Neuroscience* (Oct Cover)

### Manifold Oblique Random Forests: Closing the Gap on Convolutional Neural Networks - pdf

ADAM LI\*, ET AL.

2021  
*ArXiv* (in review at SIMODS)

### Classification of Stereo-EEG Contacts in White Matter vs. Gray Matter Using Recorded Activity - pdf

P. GREENE, ADAM LI, J. GONZÁLEZ-MARTÍNEZ, S. V. SARMA

2021  
*Frontiers in Neurology*

### Using network analysis to localize the epileptogenic zone from invasive EEG recordings in intractable focal epilepsy - pdf

ADAM LI\*, ET AL.

2018  
*Network Neuroscience*

### Source-sink connectivity: A novel interictal EEG marker for seizure localization - pdf

GUNNARSDOTTIR, K., LI, ADAM, ET AL.

2021  
*In Review at Brain*

### Neural Fragility of the Intracranial EEG Network Decreases after Surgical Resection of the Epileptogenic Zone - pdf

ADAM LI, P. MYERS, N. WARSKI, K. GUNNARSDOTTIR, S. KIM, V. JIRSA, A. OICHI, H. OTUSBO, G. IBRAHIM, S. V. SARMA

2021  
*In Review at Brain Communications*

### Towards the clinical translation of quantitative measures for localizing the epileptogenic zone from intracranial EEG

ADAM LI\*, J. BERNABEI, A. REVELL, N. SINHA, R. J. SMITH, K. GUNNARSDOTTIR, I. ONG, S. V. SARMA, B. LITT

2022  
*In Review at Brain*

## Patents

### GEAR (Game Enhancing Augmented Reality) - A lower limb alternative control interface for computers.

GYORGY LEVAY, ADAM LI, NATE TRAN

Patent Application No. 16309183

May 23rd, 2016

## Identifying the Epileptogenic Zone using Network Fragility Theory

SRIDEVI SARMA, ADAM LI, JORGE GONZALEZ

Patent Application No. 62421037

Nov. 11th, 2017

## Identifying the Epileptogenic Zone using Virtual Cortical Stimulation

SRIDEVI SARMA, ADAM LI, JORGE GONZALEZ

Provisional Patent

Feb. 11th, 2019

## Peer-Reviewed Conference Proceedings

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### Temporal and morphological characteristics of high-frequency oscillations in an acute in vivo model of epilepsy

SOPHIA ZHAI, DANIEL EHRENS, ADAM LI, FADI ASSAF, YITZHAK SCHILLER, SRIDEVI V. SARMA, RACHEL JUNE SMITH

IEEE EMBS - EMBC

Glasgow, Scotland UK 2022

### Network Fragility in Seizure Genesis in an Acute in vivo Model of Epilepsy

ADAM LI, DANIEL EHRENS, FADI AED, YITZHAK SCHILLER, SRIDEVI V SARMA

IEEE EMBS - EMBC

Montreal, Canada 2020

### Evaluating Invasive EEG Implantations in Medically Refractory Epilepsy with Functional Scalp EEG Recordings and Structural Imaging Data

ANIL PALEPU, ADAM LI, ZACHARY FITZGERALD, KATHERINE HU, JULIA COSTACURTA, JUAN BULACIO, JORGE MARTINEZ-GONZALEZ, SRIDEVI V SARMA

IEEE EMBS - EMBC

Berlin, Germany 2019

### Virtual Cortical Stimulation Mapping of Epilepsy Networks to Localize the Epileptogenic Zone

ADAM LI, SRIDEVI V SARMA, ZACHARY FITZGERALD, JENNIFER HOPP, EMILY JOHNSON, NATHAN CRONE, JUAN BULACIO, JORGE MARTINEZ-GONZALEZ, SARA INATI, KAREEM ZAGHLOUL

IEEE EMBS - EMBC

Berlin, Germany 2019

### Linear Time-Varying Model Characterizes Invasive EEG Signals Generated from Complex Epileptic Networks

ADAM LI, KRISTIN M. GUNNARSDOTTIR, SARA INATI, KAREEM ZAGHLOUL, JOHN GALE, JUAN BULACIO, JORGE MARTINEZ-GONZALEZ, SRIDEVI SARMA

IEEE EMBS - EMBC

Jeju, South Korea 2017

### Fragility in epileptic networks: The epileptogenic zone

ADAM LI, SARA INATI, KAREEM ZAGHLOUL AND SRIDEVI SARMA

American Control Conference

Seattle, WA 2017

### Estimating Unmeasured Invasive EEG Signals Using a Reduced Order Observer

KRISTIN M. GUNNARSDOTTIR, ADAM LI, JUAN BULACIO, JORGE GONZALEZ-MARTINEZ, SRIDEVI V. SARMA

IEEE EMBS - EMBC

Jeju, South Korea 2017

## Honors & Awards

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2020	<b>ARCS Chapter Fellowship</b> , 1 of 3 awardees - Pre-doctoral Fellowship	Washington, DC
2019	<b>Whitaker Conclusion Grant</b> , 1 of 5 teams awarded \$100k - Outreach Fellowship	USA
2017	<b>Chateaubriand STEM Research Fellowship</b> , Pre-doctoral international fellowship	France
2017	<b>Whitaker Research Fellowship</b> , Pre-doctoral international fellowship	France
2017	<b>NSF</b> , Graduate Research Fellowship	USA
2016	<b>NSF</b> , Graduate Research Fellowship - Honorable Mention	USA
2016	<b>Intel Cornell Cup</b> , 1st place	USA
2015	<b>NIH NETI</b> , Graduate training fellowship	Baltimore
2015	<b>Frontiers of Innovation Scholars</b> , undergraduate research fellowship	UCSD
2014	<b>IDEA Center Scholar</b> , undergraduate research fellowship	UCSD
2014	<b>Gordon Fellow</b> , undergraduate leadership award	UCSD
2014	<b>ASAIO Student Design Competition</b> , top 27 in USA	USA
2013	<b>Amgen Scholar</b> , undergraduate research fellowship	UCSD
2013	<b>Gordon Leadership Scholar</b> , undergraduate leadership	UCSD
2012	<b>CalIT Scholar</b> , undergraduate research fellowship	UCSD

## Entrepreneurial Awards

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- 2021 **NSF SBIR Phase I Grant,**
- 2019 **Maryland Innovative Initiative (MII) Grant,**
- 2018 **NSF SBIR Phase I Grant,**
- 2014 **NCIIA E-Team Grant,**
- 2013 **Health and Life Sciences Grant,**
- 2013 **Von Liebig NSF I-Corps Fellow ,**

## Grants

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### NSF Computing Innovation Fellowship Grant (2127309) - Postdoctoral Fellowship

\$150k

January 1, 2022 — January 1, 2024 | Causal Reinforcement Learning with Unknown Causal Structure: An Application to Treatment of Drug-Resistant Epilepsy Patients. Awarded 69 out of 238 ( 28% Rate).

### NSF SBIR Phase-I Grant (2112011) - Co PI

\$256k

May 15, 2021 — April 30, 2022 | Improving Diagnosis of Epilepsy by Applying Network Analytics to Non-Seizure Scalp EEG Data

### Whitaker Phase I Conclusion Grant - Co PI

\$100k

Jan. 2019 — Jan. 2023 | Outreach for Biomedical Science story-telling around the world. 1 of 5 awardee groups.

## Experience

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### Co-Founder and CTO, Neurologic Solutions Corp.

Sep. 2018 — Mar. 2021

- Raised over \$600K non-dilutive funds to-date (Two NSF SBIR Phase I \$225k, Maryland Innovation Initiative \$150k, \$10K JHTV Pitch Competition).
- Filed provisional patents and full patents in the USA, European and Japan markets through collaboration with Johns Hopkins Technology Ventures (JHTV).
- Led product development of software product with team of 3 software engineers for helping clinicians localize the epileptogenic zone in epileptic patients (**AWS** infrastructure with Kubernetes and Flux, **REST API, algorithm development, UX design and data engineering**).
- Led **510k FDA** approval process with a team of 5 engineers, consultants and advisors involving risk analysis, software requirements, design specifications, and user-testing (unit testing, continuous integration, and software documentation).
- Led research of EEG, imaging and clinical datasets to validate machine learning algorithms to inform clinical decision making in epilepsy patient treatment.

### Graduate Research Assistant, Neuromedical Control Systems Lab, Johns Hopkins University

Aug. 2015 — Present

#### Advisor: Dr. Sridevi Sarma

- Coordinated data pipeline of electrophysiological and clinical data of epilepsy patients from 5 hospitals in coordination with clinicians in setting up a HIPAA-compliant server for highly parallelized data analysis, resulting in **Nature Neuroscience publication**.
- Identified and developed signal processing and statistical analysis of clinical multi-modality datasets that resulted in over 400 pull requests merged in open-source packages with up to 1,000's of users (**Git, CI, unit-testing, software design & development**)
- Developed statistical and machine learning models on multivariate time series EEG, clinical and neuroimaging MRI and CT data to analyze different seizure localization models (model building & validation with **scikit-learn/keras/pytorch**, data wrangling with **pandas, numpy**).
- Coordinated open-source discussions on EEG and iEEG data formatting in a 79 international team of researchers on Github (**technical communication of the Brain Imaging Data Structure - BIDS**)
- Coordinated a team of engineers to develop a structure-aware Random Forest algorithm in Python and Cython to perform manifold learning (to be implemented as a PR into **scikit-learn**).

### Visiting Research Scientist, Theoretical Neurosciences Group, Aix-Marseille University

Sep. 2017 — Sep. 2018

#### Advisors: Dr. Viktor Jirsa, Dr. Sridevi Sarma

- Developed a high-throughput parallelized data pipeline for multi-modality 3D brain imaging using **Bash and Snakemake (Python DAG engine)** resulting in robust 3D brain visualizations.
- Designed **nonlinear biophysical models** with **linear dynamical systems analysis** to predict the surgical outcome in epileptic patients resulting in a paper to be submitted to Brain
- Developed a supervised deep learning pipeline using nonlinear computational modeling and a Recurrent-CNN model to perform patient-specific seizure detection (**Python/Keras/Pytorch**)
- Implemented open-source code on *The Virtual Brain* (a Human Brain Project) for generating observational noise, analysis of simulated source signals and scientific demos

## WORK EXPERIENCE

## Co-Founder and CTO, Neurologic Solutions Corp.

Sep. 2018 — Present

- Raised over \$600K to-date (Two NSF SBIR Phase I \$225k, Mayland Innovation Initiative \$150k, \$10K JHTV Pitch Competition).
- Filed provisional patents and full patents in the USA, European and Japan markets through collaboration with Johns Hopkins Technology Ventures (JHTV).
- Led product development of software product with team of 3 software engineers for helping clinicians localize the epileptogenic zone in epileptic patients (AWS infrastructure with Kubernetes and Flux, REST API, algorithm development, UX design and data engineering).
- Led **510k FDA** approval process with a team of 5 engineers, consultants and advisors involving risk analysis, software requirements, design specifications, and user-testing (unit testing, continuous integration, and software documentation).

## Co-Founder, Biometrics Analytics

Jun. 2012 — Sep. 2015

- Researched & developed novel ways to evaluate Parkinson's Disease using biometric sensors and robust data analysis; led team in data acquisition of human data, data analysis and statistical analysis using MATLAB and Python.
- Led data acquisition of clinical data and full-body pose data from the Microsoft Kinect. Performed data analysis using machine learning and image processing algorithms (MATLAB, Python and C++).
- Raised over \$20,000 and obtained an IRB for a pilot clinical human study, resulting in the Gordon Fellowship Award for outstanding engineering leadership (awarded to 3 students/year at UCSD).
- Worked in a team of 4 for the Von Liebig NSF I-Corps Program and the NCI Entrepreneurship Program (15% acceptance rate) for startup incubation.

## Data Processing Intern, West Health Institute 501(C)

Jun. 2014 — Jun. 2015

- Wrote pymongo queries running on an event scheduler (Python, MongoDB) that provided computed features of game play and behavior for the clinical team to analyze behavior during experiments.
- Developed clinical web forms using HTML, CSS, JavaScript, which are then linked to an AWS server running MongoDB with Node.js (git and general version control).
- Built an Android application that created a custom launch screen for the clinical team with Java and XML.
- Researched and recommended technological improvements to data collection that could be incorporated into the analytics group at the institute for the treatment of Autism Spectrum Disorder.

## Project Team Leader, West Health Institute 501(C)

Jun. 2014 — Jun. 2015

- Wrote pymongo queries running on an event scheduler (Python, MongoDB) that provided computed features of game play and behavior for the clinical team to analyze behavior during experiments.
- Developed clinical web forms using HTML, CSS, JavaScript, which are then linked to an AWS server running MongoDB with Node.js (git and general version control).
- Built an Android application that created a custom launch screen for the clinical team with Java and XML.
- Researched and recommended technological improvements to data collection that could be incorporated into the analytics group at the institute for the treatment of Autism Spectrum Disorder.

## Process Development Engineering Intern and College Ambassador, Genentech

Aug. 2010 — Aug. 2011

- Collaborated with Genentech College Programs to improve online engagement by 60%, while coordinating events with directors and human resources that drew in over 200 attendees.
- Implemented a new batch control process using Rockwell Automation and PLCs to automate chromatography purification process (used SQL and Python).

## Teaching

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### Teaching Assistant

Baltimore, MD

NEURODATA DESIGN COURSE (BME 580.638) - DEVELOP OPEN SOURCE CONTRIBUTIONS TO PYTHON SCIENTIFIC COMPUTING LIBRARIES

Sep. 2019 — Jan 2020

### Head Teaching Assistant

Baltimore, MD

SYSTEMS BIOENGINEERING II COURSE (BME 580.424) - 150 STUDENTS AND 6 TAs

Jan. 2019 — May 2019

### Teaching Assistant

La Jolla, CA

DATA STRUCTURES COURSE (CSE 12) - C, C++

Sep. 2014 — May 2015

## Conference Presentations and Posters

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### Neural Fragility of the Intracranial EEG Network Decreases Intraoperatively after Surgical Resection of the Epileptogenic Zone in Children with Epilepsy

Chicago, USA

AMERICAN EPILEPSY SOCIETY

Dec. 2021

ADAM LI, PATRICK MYERS, CHESTER HUYNH, NEBRAS WARSI, KRISTIN M. GUNNARSDOTTIR, SOO KYUNG S. KIM, VIKTOR JIRSA, SRIDEVI V. SARMA AND GEORGE M. IBRAHIM

## Neural Fragility as an EEG Marker of the Seizure Onset Zone

AMERICAN EPILEPSY SOCIETY

PATRICK MYERS, **ADAM LI**, C. HUYNH, Z. FITZGERALD, I. CAJIGAS, D. BRUSKO, J. JAGID, A. CLAUDIO, A. KANNER, J. HOPP, S. CHEN, J. HAAGENSEN, E. JOHNSON, W. ANDERSON, N. CRONE, S. INATI, K. ZAGHLOUL, J. BULACIO, J. GONZALEZ-MARTINEZ, S. V. SARMA

Chicago, USA

Dec. 2021

## Automated classification of stereo-EEG contacts in white matter versus gray matter using recorded activity

IEEE ENGINEERING IN MEDICINE AND BIOLOGY

**ADAM LI**, PATRICK GREENE, JORGE MARTINEZ-GONZALEZ, SRIDEVI SARMA

Montreal, Canada (virtual)

Jul. 2020

## Towards Automatic Localization and Anatomical Labeling of Intracranial Depth Electrodes in Brain Images

IEEE ENGINEERING IN MEDICINE AND BIOLOGY

**ADAM LI**, CHESTER HUYNH, JORGE MARTINEZ-GONZALEZ, SRIDEVI SARMA

Montreal, Canada (virtual)

Jul. 2020

## Semi-Automatic SEEG Localization and Interactive Neuroimage Visualization in Epilepsy Patients

ORGANIZATION FOR HUMAN BRAIN MAPPING

**ADAM LI**, CHESTER HUYNH, CHRISTOPHER COOGAN, SRIDEVI SARMA

Montreal, Canada

June 23 - July 3, 2020

## MNE-BIDS: MNE-Python + BIDS = easy dataset interaction (Version 1.0.1)

ORGANIZATION FOR HUMAN BRAIN MAPPING

STEFAN APPELHOFF, **ADAM LI**, ET AL. - 10.5281/ZENODO.3891836

Montreal, Canada

June 23 - July 3, 2020

## Identification of the Epileptogenic Zone from Intracranial Electrocorticography with a Novel Network Fragility Algorithm in Patients with Temporal-Lobe Epilepsy

AANS

IAHN CAJIGAS, DAMIAN BRUSKO, ANGEL CLAUDIO, **ADAM LI**, SRIDEVI SARMA, ANDRES KANNER, JONATHAN JAGID

Virtual

Jun. 2020

## Application of A Network Fragility Algorithm for the Identification of the Epileptogenic Zone from Intracranial Electrocorticography in Patients with Temporal-Lobe Epilepsy

AMERICAN EPILEPSY SOCIETY

**ADAM LI**, IAHN CAJIGAS, DAMIAN BRUSKO, ANGEL CLAUDIO, ANDRES KANNER, JONATHAN JAGID, SRIDEVI SARMA

Baltimore, MD

Nov. 2019

## Using personalized brain models to augment datasets for deep learning

WORKSHOP ON MACHINE LEARNING AND COMPUTER VISION

**ADAM LI**, SRIDEVI SARMA, VIKTOR JIRSA

Janelia, HHMI, USA

Apr. 2019

## Integrating Large Brain Networks and Network Analysis to Understand The Epileptogenic Zone

ORGANIZATION FOR COMPUTATIONAL NEUROSCIENCE

**ADAM LI**, MARMADUKE WOODMAN, SRIDEVI SARMA, VIKTOR JIRSA

Seattle, WA

Jul. 2018

## Integrating Large Brain Networks and Network Analysis to Understand The Epileptogenic Zone

ADVANCED COURSE ON DATA SCIENCE & MACHINE LEARNING

**ADAM LI**, SRIDEVI SARMA, VIKTOR JIRSA

Tuscany, Italy

Jul. 2018

## T101. Use of a quantitative algorithm to help predict seizure lateralization in a patient with bitemporal epilepsy and responsive nerve stimulation

CLINICAL NEUROPHYSIOLOGY

JENNIFER J. HAAGENSEN, STEPHANIE CHEN, JENNIFER L. HOPP, **ADAM LI**, SRIDEVI SARMA

Seattle, WA

2018

## Open Source Software

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### MNE-Connectivity | <https://github.com/mne-tools/mne-connectivity>

DEVELOPER - (CONNECTIVITY ANALYSIS FOR NEURAL DATA)

Google Summer of Code 2021

2021 — Present

## **Stereotactic EEG Kit (SEEK) | <https://github.com/ncsl/seek>**

DEVELOPER - (DATA PIPELINE FOR NEUROIMAGING DATA)

2019 — Present

## **MNE-HFO | <https://github.com/adam2392/mne-hfo>**

DEVELOPER - (HIGH-FREQUENCY OSCILLATIONS IN PYTHON)

2020 — Present

## **BIDS | <https://github.com/bids-standard/bids-specification>**

ELECTROPHYSIOLOGY TEAM MEMBER - (OPEN-ACCESS SCIENTIFIC DATA)

2019 — Present

## **MNE-Python | <https://github.com/mne-tools/mne-python>**

CONTRIBUTOR - ELECTROPHYSIOLOGICAL DATA ANALYSIS

2019 — Present

## **MNE-BIDS | <https://github.com/mne-tools/mne-bids>**

CONTRIBUTOR - BIDS IO FOR MEG/EEG/IEEG

2019 — Present

## **pybids | <https://github.com/https://github.com/bids-standard/pybids>**

CONTRIBUTOR - QUERYING OF BIDS DATASETS

2019 — Present

## **bids-validator | <https://github.com/https://github.com/bids-standard/bids-validator>**

CONTRIBUTOR - VALIDATION OF BIDS DATASETS

2019 — Present

## **pyDMD | <https://github.com/mathLab/PyDMD>**

CONTRIBUTOR - DYNAMIC MODE DECOMPOSITION

2019 — Present

## **The Virtual Brain (TVB) | <https://github.com/the-virtual-brain/tvb-root>**

CONTRIBUTOR - COMPUTATIONAL NEUROSCIENCE PLATFORM

2017 — 2018

## **Leadership and Volunteer Work**

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### **EverydayBME - Co-Founder**

2019 — Present | Worldwide

DESIGN AND AGGREGATE DIGITAL STORYBOOKS OF BIOMEDICAL SCIENCE (RESEARCHERS, STUDENTS, ETC.) OVER THE WORLD.

WORKED WITH BMESDIVERSITY AND WHITAKER FOUNDATION TO HIGHLIGHT UNDER-REPRESENTED GROUPS IN STEM.

### **AAMPLIFY 501(C) - Director of Leadership**

2017 — Present | San Francisco, CA

PLANNED AND IMPLEMENT A SUMMER LEADERSHIP AND ADVOCACY PROGRAM FOR UNDER-SERVED AAPI YOUTH. ALSO INVOLVED IN

RAISING OVER \$5000 AS A NON PROFIT ORGANIZATION.

### **Engineering & Medicine Exchange - Co-Founder**

2016 — 2017 | JHU

PLAN EVENTS FOR COLLABORATIONS BETWEEN ENGINEERING, MEDICINE AND PUBLIC HEALTH. ARDUINO WORKSHOP, MACHINE

LEARNING IN HEALTHCARE WORKSHOP, AND ELECTRONIC HEALTH RECORDS FOR ENGINEERING WORKSHOP.

### **Yale School of Management Pre-MBA Program - Global Pre-MBA Leadership Program**

2014 | Yale

PLACED 3RD IN AUDUBON BUSINESS CONCEPT PITCH PLAN, AND 2ND IN AUDIENCE CHOICE AWARD.

### **BME PhD Council - Social Chair**

2016 — 2017 | JHU

COORDINATE AND PLAN EVENTS FOR INCREASING COLLABORATION WITHIN DEPARTMENT.

### **Alpha Kappa Psi - Class President**

2012 — 2014 | UCSD

LED CLASS OF 16 INDIVIDUALS.

## **Mentoring**

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### **Anil Palepu**

MIT PHD

2015-2017

### **Chester Huynh**

MICROSOFT SOFTWARE ENGINEERING

2018-2021

### **Patrick Myers**

DIRECTOR OF PRODUCT DEVELOPMENT

2019-2022

## **Academic Service**

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## Network Neuroscience

REVIEWER

2022

## NeuroImage

REVIEWER

2021-2022

## IEEE Engineering in Medicine and Biology

REVIEWER

2020

## <https://github.com/ncsl>

LAB GIT MANAGER

2017 — Present

## Skills

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**Programming** Bash, Python, MATLAB, Scikit-learn, Pandas, Numpy, Keras, Pytorch, Cython

**Misc.** Open-source, Git, Software Design and Engineering, Software Quality Control, Software Testing