



## EDUCATION

### PHD | STATISTICAL LEARNING

UC Berkeley | Begins Fall 2017

- Minor 1: ML Theory
- Minor 2: Comp. Neuroscience
- Co-advised by Bin Yu & Jack Gallant

### BS | COMPUTER SCIENCE & MATH

University of Virginia | May 2017

- Conc. in Probability/Statistics
- Graduated with high distinction

## RESEARCH INTERESTS

### Neural Decoding

fMRI data • Visual cortex

### Connectomics

Structural • Functional connectivity

### Computational Learning Models

Sparse coding • Synaptogenesis

### Theoretical Neuroscience

Interpulse interval coding • AP velocity

## COURSEWORK

### COMPUTATION

Learning Theory

Machine Learning

Structure Learning

Algorithms

Artificial Intelligence

Deep Learning in Vision & Graphics

Neural Network Models

Neurobiology

Information Retrieval

Theory of Computation

Program & Data Representation

Software Dev. I & II

Computer Architecture & OS

### MATHEMATICS

Statistics

Probability

Linear Algebra

Real Analysis

Linear Models

Stochastic Processes

Chaos Theory I & II

Multivariate Calculus

Discrete Mathematics

Differential Equations

Abstract Algebra

## EXPERIENCE

### BERKELEY B. YU RESEARCH LAB | AI RESEARCHER

Fall 2017 - Spring 2021

- Applying statistical learning techniques to model neural data

### FACEBOOK | AI RESEARCH INTERN

Summer 2017

- Working on computer vision team on applied machine learning (AML) team

### UVA Y. QI RESEARCH LAB | ML RESEARCHER

Fall 2016 - Spring 2017

- Contributed to development of novel weighted- $\ell_1$ , multi-task Gaussian graphical models
- Developed learning for sparse graphical models across several tasks
- Applied novel graphical models to functional brain connectivity

### HHMI S.TURAGA RESEARCH LAB | ML RESEARCHER

Summer 2015, Winter 2015, Summer 2016

- Implemented and extended novel watershed algorithms for neural image segmentation performance evaluation
- Contributed to GPU CNN implementation using fork of Caffe with malis training objective
- Set up distributed mllib implementation to run in parallel on compute cluster using Apache Spark

### UVA W.LEVY RESEARCH LAB | COMPUTATIONAL NEUROSCIENCE RESEARCHER

Jan 2015 - Fall 2016

- Simulated stochastic neurons to determine mutual information, variability, energy efficiency, and threshold
- Visualized and analyzed data in Matlab, Python, calculated mutual information in Mathematica
- Simulated stochastic gating of sodium channels via NEURON software
- Performed background research to determine parameters for simulation

### HHMI SCIENTIFIC COMPUTING | RESEARCH INTERN

Summer 2014

- Simulated extracellular neural recordings via Neurocube Matlab scripts
- Simulated intracellular neural firing via NEURON software package
- Visualized action potential firing in Matlab

### RESEARCH INNOVATIONS INC. | WEB DEV / ANDROID RESEARCH INTERN

Summer 2013 - Spring 2014

- Developed web application to simultaneously coordinate different tasks between multiple users
- Developed Android app to increase data storage capacity of QR Codes

## SKILLS

### LANGUAGES

Experienced

Java • Python • Matlab •  $\text{\LaTeX}$

Proficient

C • C++ • R • Android • Mathematica

Familiar

Scala • Javascript • Django

### MACHINE LEARNING

Frameworks

Scikit-learn • Keras • Mllib

Algorithms

Graphical Models • CNNs • RFs

Problems

Image Segmentation • Functional Connectivity

### GENERAL

Software

Photoshop • NEURON

OS

Linux • Mac • Windows

IDEs

IntelliJ • PyCharm • Eclipse • Vim

Collaboration

Slack • Github • Markdown

Languages

English • Spanish • Hindi

### ANDROID

Activity Lifecycle • UI Design • Graphics

### WEB

Basic Languages • Django • Mapping APIs

## PAPERS / POSTERS

### Under Review

- Singh, Wang, & Qi, 2017: "A weighted- $\ell_1$ , multi-task graphical model with applications to heterogeneous brain connectivity" *Neural Information Processing Systems*
- Singh & Levy, 2017: "Complexity leads to simplicity: A consensus layer V pyramidal neuron can sustain inter-pulse-interval coding" *PLOS One*. <http://arxiv.org/abs/1609.08213>
- Morel, Singh, & Levy, 2017: "Linearized synaptic integration at no extra cost" *Journal of Computational Neuroscience*

### Posters / Talks

- Singh, 2017: "A novel machine-learning algorithm for uncovering brain connections underlying autism" *University of Virginia Undergraduate Research & Design Symposium, Winner in Design Category*
- Singh, 2017: "Uncovering brain connections underlying autism via graphical models" *Tom Tom Founder's Machine Learning Conference*
- Singh, 2017: "Complexity leads to simplicity: Investigating neural linearization via biophysical simulations" *University of Virginia Undergraduate Research & Design Symposium, Semifinalist in Research Category (1 of 6 undergraduates)*
- Singh, Hewitt, & Turaga, 2015: "Optimizing random forest image segmentation for connectomics" *Janelia Undergraduate Scholar Poster Session*

### In Preparation

- Turaga lab: "Convolutional neural networks for pixelwise connectome classification"
- Levy lab: "Neural computation at the thermal limit"
- Levy lab: "Characterizing stochastic threshold: neural computation meets biophysical simulations"
- Levy lab: "Adaptive synaptogenesis with competitive learning"

## AWARDS

Rodman Scholar	2014-2017
UVA Rader Research Award	2017
Raven Honor Society	2016-2017
Vidya Balvantrai Shelat Fund Award	2016
ICPC Regional Qualification	2014, 2015, 2016
1st Place Microsoft Code Competition	2016
3rd Place Google Games UVA	2017
2nd Place APT Puzzle Competition	2017
Intermediate Honors	2016
Dean's List	2014-2017

## OUTSIDE ACTIVITIES

APDA, PF Debate	2010-Present
Indian Student Association	2014-Present
Madison House Volunteering (Computer Literacy)	2014-Present
IM Basketball, Soccer	2015-Present
Chinmaya Mission Volunteering	2010-2014