



## education

### phd | computer science

uc berkeley | 2017-present

- research: interpretable ml, computational neuroscience
- advisor: bin yu
- collaborators: jack gallant

### bs | computer science & math

university of virginia | 2017

- concentration in statistics
- graduated with high distinction

## coursework

### computation

machine learning  
computer vision  
structure learning  
algorithms  
artificial intelligence  
deep learning  
learning theory  
deep learning in graphics  
theory of computation  
data structures  
software dev. I & II

### stat/math

statistical models  
probability  
statistics  
optimization  
linear algebra  
info theory  
real analysis  
linear models  
stochastic processes  
chaos theory I & II  
multivariate calculus  
discrete mathematics  
differential equations  
abstract algebra

### neuroscience

neural coding  
neural network models  
neurobiology  
visual neuroscience  
cognitive science

## experience

### berkeley b. yu research lab | ml researcher

fall 2017 - present

- investigated methods to interpret deep learning models
- developed machine-learning algorithms to model neural data
- developed statistical methods to learn from small data

### facebook | computer vision intern

summer 2017

- improved deep learning models for semantic segmentation of satellite imagery
- investigated autoencoders for unsupervised layer-wise pretraining
- implemented crfs for segmentation post-processing

### uva y. qi research lab | ml researcher

fall 2016 - spring 2017

- developed novel weighted- $\ell_1$ , multi-task gaussian graphical model
- analyzed large-scale functional brain connectivity with graphical models

### hhmi s. turaga research lab | ml researcher

summer 2015, winter 2015, summer 2016

- extended novel watershed algorithms for neural image segmentation
- contributed to development of novel 3d unet cnn architecture with malis loss
- distributed ml lib random forest over compute cluster with apache spark

### uva w. levy research lab | comp. neuroscience researcher

fall 2014 - fall 2016

- simulated detailed biophysical neurons to understand neural computation
- simulated stochastic gating of sodium channels to analyze noise, variability, and mutual information
- analyzed energy efficiency of neural computation

### hhmi scientific computing | research intern

summer 2014

- examined effects of back-propagating action potentials by simulating intracellular neural firing with detailed biophysical models
- simulated extracellular recording from neurons and measured noise
- made detailed visualizations of action potential firing

### research innovations inc. | web dev / android intern

summer 2013 - spring 2014

- developed web application to simultaneously coordinate different tasks
- developed android app to increase data storage capacity of qr codes



## teaching

### berkeley | student instructor summer 2018

- cs 189/289: machine learning
- weekly lectures to class of 80+ students

## skills

### languages

experienced

python • java • matlab

proficient

r • c++ • c • mathematica

### machine learning

frameworks

pytorch • tensorflow • scikit-learn

keras • mllib • caffe

algorithms

cnns • graphical models • rfs

### general

languages

english • spanish • hindi

software

L<sup>A</sup>T<sub>E</sub>X • photoshop • NEURON

os

linux • mac • windows

ides

jupyter • intellij • eclipse • vim

collaboration

slack • github • markdown

### web/mobile

languages

basic languages • javascript • django

android • jekyll • mapping apis

design

activity lifecycle • ui design • graphics

## projects (non-research)

hummingbird tracking with opencv

news balancer django app

notes, blog, & slides

## papers / posters

### published/accepted

- funke, tschopp, grisaitis, sheridan, singh, saalfeld, & turaga, 2018: "large scale image segmentation with structured-loss-based deep learning for connectome reconstruction" *tpami*
- morel, singh, & levy, 2018: "linearized synaptic integration at no extra cost" *journal of computational neuroscience*
- singh, wang, & qi, 2017: "a weighted- $\ell_1$ , multi-task graphical model with applications to heterogeneous brain connectivity" *nips 2017 amlicd workshop*
- singh & levy, 2017: "a consensus layer V pyramidal neuron can sustain interpulse-interval coding" *plos one*.

### under review

- singh, murdoch, & yu, 2018: "hierarchical interpretations for neural network predictions"
- levy lab: "neural computation at the thermal limit"

### in preparation

- yu lab: "interpretable machine learning: bridging methods and applications"

### posters / talks

- singh, 2017: "a novel machine-learning algorithm for uncovering brain connections underlying autism" *uva 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" *uva 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*

## awards

uva rader research award	2017
uva undergraduate research symposium winner	2017
raven honor society	2016-2017
icpc regional qualification	2014-2016
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

## funding awards

bair graduate student researcher appointment	2018
eecs departmental fellowship	2017
vidya balvantrai shelat fund award	2016
rodman scholar	2014-2017

## outside activities

im basketball, soccer, frisbee	2015-2018
apda, pf debate	2010-2017
indian student association	2014-2017
madison house volunteering (computer literacy)	2014-2017
chinmaya mission volunteering	2010-2014

