



## education

### phd | computer science

uc berkeley | 2017-present

- research: interpretable ml
- advisor: bin yu
- gpa: 3.95

### bs | computer science & math

university of virginia | 2017

- concentration in statistics
- graduated with high distinction

## skills

### machine learning

frameworks

pytorch • scikit-learn • tensorflow  
keras • mllib • caffe

### languages

experienced

python • java • matlab

proficient

r • c++ • c • mathematica

web/mobile

javascript • django • basics

### general

languages

english • spanish • hindi

software

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

os

linux • mac • windows

## teaching

### berkeley | student instructor

summer 2018

cs 189/289: machine learning

(lectures to class of 80+ students 🐼)

fall 2019

cs 188: artificial intelligence 🐼

## experience

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

fall 2017 - present

- investigated methods to interpret machine-learning models
- created methods to understand and utilize interactions in neural networks
- developed machine-learning algorithms to model medical and biological data

### amazon p. perona research lab | research internship

summer 2020

- will work on interpreting/mitigating bias in computer vision models

### response4life | volunteer data scientist

spring 2020

- worked full-time developing models to predict covid-19 severity for individual counties and hospitals, to help aid the distribution of medical supplies

### pacmed ai | interpretable ml internship

summer 2019

- developed new techniques to interpret machine-learning models for healthcare
- integrated cutting-edge interpretability techniques into medical pipeline

### facebook | computer vision internship

summer 2017

- investigated unsupervised deep learning for segmentation of satellite imagery
- implemented crfs for segmentation post-processing

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

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 research

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 mllib random forest over compute cluster with apache spark

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

fall 2014 - fall 2016

- simulated detailed biophysical neurons to develop models of neural computation
- analyzed energy efficiency, noise, and variability in stochastic neurons

### hhmi scientific computing | comp. neuroscience research

summer 2014

- analyzed backpropagating action potentials via biophysical simulations

### research innovations inc. | web dev + android internship

summer 2013 - spring 2014

- developed web app for task coordination, android app to increase qr code capacity

## coursework

### computation

machine learning  
computer vision  
structure learning  
algorithms  
artificial intelligence  
deep learning  
learning theory  
ai in graphics  
cs theory  
data structures  
software dev. I & II  
possible minds

### 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

## papers




### published/accepted

- singh\*, ha\*, lanusse, boehm, liu & yu 2020: "transformation importance with applications to cosmology" *iclr workshop (spotlight talk)* 
- singh\*, murdoch\*, & yu 2019: "hierarchical interpretations for neural network predictions" *iclr* 
- murdoch\*, singh\*, kumbier, abbasi-asl, & yu 2019: "interpretable machine learning: definitions, methods, and applications" *pnas* 
- 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" *neurips 2017 amlicd workshop* 
- singh & levy 2017: "a consensus layer V pyramidal neuron can sustain interpulse-interval coding" *plos one.*  



### under review

- rieger, singh, murdoch, & yu 2019 "interpretations are useful: penalizing explanations to align neural networks with prior knowledge" 
- devlin, singh, & yu 2019: "disentangled attribution curves for interpreting random forests and boosted trees" 
- singh, ruhe, cina, & tonutti 2019 "sensible local interpretations via class-weight uncertainty and conditional perturbation" 

### selected talks

- singh 2017: "a novel machine-learning algorithm for uncovering brain connections underlying autism" *uva undergraduate research & design symposium*, design category winner 
- 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) 






### selected posters

- singh\*, murdoch\*, & yu 2018: "interpretable machine learning with applications to neuroscience" *utokyo neurcomputing workshop 2019*
- singh\*, murdoch\*, & yu 2018: "hierarchical interpretations for neural network predictions" *berkeley bair workshop fall 2018, iclr 2019* 
- singh, hewitt, & turaga 2015: "optimizing random forest image segmentation for connectomics" *janelia undergraduate scholar poster session* 

## funding awards

pdsoros fellowship finalist	2019
ircn workshop travel award	2019
vidya shelat fund award	2016
rodman scholar	2014-2017

## activities/projects (non-research)

notes, blog, & slides 	2014-2019
covid19 severity prediction 	2020
basis middle school volunteering	2019-2020
bair undergraduate mentoring	2018-2020
hummingbird tracking 	2017-2018
news balancer django app 	2017
java mini-games 	2014-2016

## awards

berkeley grad slam semifinalist	2019
outstanding student instructor award (10%)	2018
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