



education

phd | computer science

uc berkeley | 2017-present

- research: interpretable ml
- advisor: bin yu
- gpa: 3.94

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^AT_EX • 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 scientist intern

summer 2020

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

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

- 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 research

fall 2016 – spring 2017

- developed novel weighted- ℓ_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 | research internship

summer 2014

- analyzed backpropagating action potentials via biophysical simulations
- simulated extracellular recording from neurons and measured noise

research innovations inc. | web dev + android internship

summer 2013 - spring 2014

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



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- ℓ_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
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