



## education

### phd | machine learning

uc berkeley | '17-present

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

### ms | data science

uc berkeley | '17-present

- research: statistical biology

### bs | computer science & math

university of virginia | '14-'17

- double major
- concentration in statistics
- graduated with high distinction

## skills

### machine learning

pytorch • scikit-learn • tensorflow  
aws ec2 • s3 • sagemaker  
keras • mllib • caffe2

### languages

experienced

python • java • matlab

proficient

r • c/c++ • web basics

human languages

english • spanish • hindi

## awards

berkeley grad slam semifinalist '19

outstanding teaching award '18

uva rader research award '17

uva undergrad symposium winner '17

raven honor society '16-'17

icpc regional qualification '14-'16

1st place microsoft code jam '16

3rd place google games uva '17

2nd place apt puzzle competition '17

intermediate honors '16

dean's list '14-'17

### funding awards

pdsoros fellowship finalist '19

ircn workshop travel award '19

vidya shelat fund award '16

rodman scholarship '14-'17

## experience

### berkeley | ml research (bin yu lab ☺)

fall '17 - present

- developed interpretation methods for machine-learning models (e.g. neural nets)
- created interpretable models in medicine, biology, and computer vision

### amazon | research internship (pietro perona lab ☺)

summer '20

- testing for bias with causal matching using GANs
- interpreting semantic directions for generative models

### response4life | volunteer data scientist

spring '20

- helped develop, integrate, and deploy models to forecast covid-19 severity

### pacmed ai | interpretable ml internship

summer '19

- developed techniques to interpret machine-learning models for healthcare
- integrated interpretability techniques for predicting icu re-admission

### facebook | computer vision internship

summer '17

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

### uva | ml research (yanjun qi lab ☺)

fall '16 - spring '17

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

### hhmi | ml research (srini turaga lab ☺)

summer '15, winter '15, summer '16

- extended cnns and watershed algorithms for neural image segmentation
- implemented distributed random forests for image segmentation

### uva | comp. neuroscience research (william levy lab ☺)

fall '14 - fall '16

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

### hhmi scientific computing | comp. neuroscience research

summer '14

- analyzed backpropagating action potentials via biophysical simulations

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

summer '13 - spring '14

- developed web/mobile app for task coordination with 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  
information retrieval  
computer architecture

### 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

### interpretability

- interpretations are useful: penalizing explanations to align neural networks with prior knowledge: rieger, singh, murdoch, & yu, *icml 2020*
- transformation importance with applications to cosmology: singh\*, ha\*, lanusse, boehm, liu & yu, *iclr 2020 workshop (spotlight talk)*
- hierarchical interpretations for neural network predictions: singh\*, murdoch\*, & yu, *iclr 2019*
- interpretable machine learning: definitions, methods, and applications: murdoch\*, singh\*, kumbier, abbasi-asl, & yu, *pnas 2019*
- disentangled attribution curves for interpreting random forests and boosted trees: devlin, singh, & yu *arXiv 2019*

### interpretable data science projects

- curating a covid-19 data repository and forecasting county-level death counts in the united states: altieri et al. *harvard data science review 2020*
- benchmarking bias in facial recognition via matching using neural networks *in prep*
- an interpretable clinical-decision rule for intra-abdominal injury *in prep*
- predicting successful clathrin-coated pits in clathrin-mediated endocytosis via auxilin *in prep*

### statistical neuroscience

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

### other

- revisiting complexity and the bias-variance tradeoff: dwivedi\*, singh\*, yu, & wainwright *arXiv 2020*

### selected talks

- interpreting ml models: *uc berkeley bair seminar, 2020*
- uncovering brain connections underlying autism via graphical models: *tom tom founder's machine learning conference, 2017*

## teaching

### berkeley | student instructor

summer 2018

cs 189/289: machine learning  
(lectures to class of 80+ students )

fall 2019

cs 188: artificial intelligence

## projects / activities

notes, blog, & slides

imodels package

covid-19 forecasting

hummingbird tracking

news balancer django app

madison house volunteering

java mini-games

'14-'20

'18-

'20

'18

'17

'15-'16

'14-'16

## academic service

neurips ml4h reviewer '20

basis education volunteering '19-'20

bair undergrad mentoring '18-'20