# Chandan Singh

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## EDUCATION

### PHD | Statistical Learning
UC Berkeley | Fall 2017-Present

- Minor 1: Comp. Neuroscience
- Minor 2: ML Theory
- 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 Coding
Vision • V4 • Interpulse interval coding
Connectivity
Structural • Functional
Network Learning Models
3d CNNS • Synaptogenesis

## COURSEWORK

### COMPUTATION
Learning Theory
Machine Learning
Structure Learning
Algorithms
Artificial Intelligence
Deep Learning in Vision & Graphics
Neural Network Models
Neurobiology
Theory of Computation
Program & Data Representation
Information Retrieval
Software Dev. I & II

### MATHEMATICS
Statistical Models
Optimization
Probability, Statistics
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 - Present

- Applying statistical learning techniques to model neural data
- Fitting and interpreting neural spiking data with 3D convolutional neural networks

### FACEBOOK | Computer Vision Intern
Summer 2017

- Worked on deep learning for semantic segmentation of satellite imagery
- Developed autoencoders for unsupervised layer-wise pretraining
- Implemented CRFs for segmentation post-processing

### 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 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 • LaTeX
Proficient
C • C++ • R • Android • Mathematica
Familiar
Scala • Javascript • Django

## MACHINE LEARNING

Frameworks
Tensorflow • Scikit-learn • Keras • Mllib • Caffe
Algorithms
CNNs • Graphical Models • 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

### Published/Accepted

- Singh & Levy, 2017: "A consensus layer V pyramidal neuron can sustain interpulse-interval coding" *PLOS One.*
- Morel, Singh, & Levy, 2017: "Linearized synaptic integration at no extra cost" *Journal of Computational Neuroscience*

### Under Review

- Singh, Wang, & Qi, 2017: "A weighted-$\ell_1$, multi-task graphical model with applications to heterogeneous brain connectivity" *AAAI 2018*
- Funke, Tschopp, Grisaitis, Sheridan, Singh, Saalfeld, & Turaga, 2017: "A Deep Structured Learning Approach Towards Automating Connectome Reconstruction from 3D Electron Micrographs" *Neural Information Processing Systems*

### 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

- Levy lab: "Neural computation at the thermal limit"
- Levy lab: "Action potential velocity optimization via biophysical simulation"

# AWARDS

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|---|---|
| UVA Rader Research Award | 2017 |
| Raven Honor Society | 2016-2017 |
| 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 |

# FUNDING AWARDS

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|---|---|
| Graduate Student Researcher Appointment | 2018 |
| EECS Departmental Fellowship | 2017 |
| Vidya Balvantrai Shelat Fund Award | 2016 |
| Rodman Scholar | 2014-2017 |

# OUTSIDE ACTIVITIES

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|---|---|
| APDA, PF Debate | 2010-2017 |
| Indian Student Association | 2014-2017 |
| Madison House Volunteering (Computer Literacy) | 2014-2017 |
| IM Basketball, Soccer | 2015-2017 |
| Chinmaya Mission Volunteering | 2010-2014 |