

# Dhruv Kohli

## Curriculum Vitae

✉ [dhkohli@ucsd.edu](mailto:dhkohli@ucsd.edu)

📄 [dhruvkohli.github.io](https://github.com/dhruvkohli)

[Math.StackExchange Profile](#)

### Education

2018-2020 Master of Science in Computational Science, Mathematics and Engineering.  
**University of California, San Diego**

GPA - NA

2012-2016 Bachelor of Technology in Mathematics and Computing.  
**Indian Institute of Technology, Guwahati**

GPA - 9.06 / 10, Department Rank 2 / 54

### Work Experience

09/2018- Graduate Teaching Assistant, Calculus Based Probability and Statistics  
Present **University of California, San Diego**

- Lead weekly discussions in sections of  $36 \times 4$  students by describing subtle details of core concepts and fielding questions. Graded exams and held office hours for assistance.

06/2016- Software Engineer, Advanced Technology Lab - Multimedia Division

03/2017 **Samsung Research Institute**, Bangalore (India)

- Developed a deep hierarchical network invariant to rotation of objects in the input image with two times better cross-dataset accuracy than conventional CNN on mnist-rot.
- Extensively studied a technique based on contraction mappings to increase the lower bound on the margin in the input space of a non-linear classifier.
- Implemented video temporal segmentation as a core component of video summarization, based on affinity propagation and sequential determinantal point process.

05/2015- Research Intern, Cloud and Information Services Lab Group

07/2015 **Microsoft Research**, Bangalore (India)

- Worked on real-time detection of issues in high-dimensional performance counter time series data with the aim of detecting the time of the issue and the subset of counters which caused the issue.
- Modeled the data using a time-varying gaussian distribution whose mean and covariance had sparse dictionary based representations that were learned automatically, and the sparse codes were constrained to be temporally dependent.
- Other approaches that we explored - clustering of objects on subsets of attributes, switching state space models, GMM, HMM and kalman filter.

05/2014- Software Developer, Google Summer of Code

08/2014 **International Neuroinformatics Coordinating Facility**

- Worked on real-time vectorization of brain atlases. Developed an open source software "mindthegap" that vectorizes bitmaps without introducing gaps or overlaps between adjacent regions. [\[Link\]](#)
- Added services on scalable brain atlas website, enabling researchers to view the region contours of various brain atlases generated by mindthegap. [\[Link\]](#)

## Projects

### 10/2017- Mini-Projects Based on Original Ideas

- 04/2018
- o Devised and implemented a diversity promoting prior based on Determinantal Point Process to promote diversity among filters in a convolutional layer. [\[Code\]](#)
  - o Implemented a layer to compute Mobius transformation of dense layer. [\[Code\]](#)
  - o Fitted Bezier surfaces to digital images to represent them as 2D analog signals. [\[Code\]](#)
  - o Devised and implemented a method to represent fractals acoustically. [\[Code\]](#)

### 08/2015- Thesis: Reasoning, Attention and Memory based Machine Learning Models

04/2016 Advisor: *Prof. Amit Sethi*

Performed a survey on deep learning models for sequence to sequence learning and on RAM based machine learning models with emphasis on Neural Turing Machines and End to End Memory Networks. Implemented the former from scratch in theano. [\[Link\]](#)

### 12/2014- Game Playing Agent using Deep Reinforcement Learning

- 02/2015
- Implemented a deep learning model in caffe that learns to play atari games based on a paper by Google DeepMind. Successfully tested the model on pong and breakout. Learned various concepts in reinforcement learning such as structured markov decision process, value iteration, Q-learning and temporal difference learning.

## Publications

**Dhruv Kohli**, Biplab Ch Das, Viswanath Gopalakrishnan, Kiran Nanjunda Iyer, *Learning Rotation Invariance in Deep Hierarchies using Circular Symmetric Filters*, International Conference on Acoustics, Speech and Signal Processing, 2017 (Accepted). [\[Link\]](#)

**Dhruv Kohli**, Viswanath Gopalakrishnan, Biplab Ch Das *Maximizing Margin Lower Bound in Deep Nonlinear Networks*. [\[Link\]](#)

## Awards and Honors

- 2017 Ranked 18 across country in entrance exam for Master in Statistics organized by Indian Statistical Institute, Kolkata. [\[Link\]](#)
- 2014 Ranked 1 across the country in CUDA Coding Challenge India organized by Nvidia in High Performance Computing Conference. [\[Code\]](#)[\[Link\]](#)
- 2014 Ranked 2 in ML module of Kriti, Intra-College Technical Competition. [\[Link\]](#)
- 2012 Ranked 2076 out of 600,000 students in IIT Joint Entrance Exam.
- 2012 Recommended for KVPY (Kishore Vaigyanik Protsahan Yojana) Fellowship.

## Skills

Prog. Lang. Python, C++, CUDA, MATLAB, R  
ML Libs Keras, Tensorflow  
Others Git, LaTeX

## Relevant Coursework

- U.Graduate Linear Algebra, Complex Analysis, Basic Topology, Statistical Inference, Stochastic Processes, ODE, PDE, Machine Learning, Parallel Computing. [\[Link\]](#)
- Graduate Differential Geometry, Numerical Methods, Convex Analysis and Optimization.