Rohan A. Varma
Curriculum Vitae

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Education

2014–2019	**Doctor of Philosophy (Ph.D)**, *Department of Electrical and Computer Engineering, Carnegie Mellon University, Pittsburgh, PA.* Thesis: Exploiting Structure In Data - Signal Processing on Graphs
2014–2016	**Master of Science (M.Sc)** , *Department of Electrical and Computer Engineering, Carnegie Mellon University, Pittsburgh, PA.*
2010–2014	**Bachelor of Science (B.Sc)**, *Department of Electrical Engineering and Computer Science, University of California, Berkeley,CA.*
2010–2014	**Bachelor of Arts (B.A)**, *Department of Economics and Department of Statistics, University of California, Berkeley,CA.*

Research

I am broadly interested in machine (deep) learning, signal processing and interdisciplinary work drawing from tools in statistics and optimization. I am particularly interested in areas like semi-supervised learning, self-supervised learning, transfer learning, computer vision and perception. My thesis revolves around graph signal processing, graph-augmented machine learning and the semi-supervised and active sampling and reconstruction of graph-structured data.

Experience

Industry

May 2018 – August 2018	**Research Intern**, *Microsoft Research*. Worked on incorporating syntactic and semantic information in co-word and graph embeddings.
May 2013 – August 2013	**Engineering Intern**, *Apple*. Worked on the signal integrity team for the next generation of Apple devices.
May 2012 – August 2012	**Engineering Intern**, *Samsung Electronics*. Worked on an application that enabled people to view their activity using accelerometer, gyroscope, GPS data for the mobile sensors team.
May 2011 - August 2011	**Software Engineering Intern**, *Lawrence Berkeley National Laboratory*. Designed and helped implement IBECS (Integrated Building Environmental Communications System), an integrated building equipment communications network using embedded device networks to control sensors and actuators.

Research

September 2013 – May 2014	**Research Associate**, *Wireless Foundations, U.C. Berkeley*. Extended an existing framework for low-rate sampling and efficient recovery of spectrally sparse signals (FFAST) with Prof. Kannan Ramchandran
September 2012 – May 2013	**Research Associate**, *U.C. Berkeley Wireless Research Center*. Worked on capacitive multi-dimensional imaging for high resolution depth-direction imaging with Prof. Ali Niknejad
January 2012 – January 2013	**Research Associate**, *U.C. Berkeley Wireless Research Center*. Worked on a lossless data compression block for neural signals on a Brain-Machine Interface with Prof. Jan Rabaey

January 2011 – January 2012	**Research Associate**, *Lawrence Berkeley National Laboratories*. Nano-Fabricated Arrays of Superconductor Quantum Interference Devices and Transport Studies of Thin Film Manganite/Multiferroic Field Effect Devices. Designed experiments on array geometries at low temperatures to demonstrate reversible control of exchange bias and gain insight into their use as a low noise amplifier.

Technical Skills

- Programming experience in `Java, Python, MATLAB, C, C++, Julia, R, Haskell, and JavaScript`.
- Experience with the `TensorFlow, PyTorch, CUDA, Hive, Spark and MapReduce` platforms.

Relevant Publications

Journal

- **Varma, R.**, Chen, S., Singh, A. and Kovačević, J. (2019). *Active Sampling for Non-Smooth Signals on Graphs.* IEEE Transactions on Signal Processing. (in preparation).
- **Varma, R.**, and Kovačević, J. (2019). *Uncertainty Principles and Towards a Balian-Low Theorem on Graphs.* IEEE Transactions on Signal Processing. (in preparation).
- Chen, S., **Varma, R.**, Duan C., Lee H. and Kovačević, J. (2019). *A Graph Perspective of Signal Sampling and Recovery.* IEEE Signal Processing Magazine Special Issue on Graph Signal Processing: Foundations and Emerging Directions. (submitted)
- **Varma, R.**, Lee, H., Chi, Y. and Kovačević, J. (2019). *Vector-Valued Graph Trend Filtering with Non-Convex Penalties* arXiv:1905.12692. IEEE Transactions of Signal Processing.
- **Varma, R.**, Chen, S., Singh, A. and Kovačević, J. (2018). *Signal Representations on Graphs: Tools and Applications.* a12.05406.
- Chen, S., **Varma, R.**, Singh, A., and Kovačević, J. (2016). *Signal Recovery on Graphs: Fundamental Limits of Sampling Strategies.* IEEE Transactions on Signal and Information Processing over Networks
- Chen, S., **Varma, R.**, Sandryhaila, A., and Kovačević, J. (2016). *Discrete Signal Processing on Graphs: Sampling Theory.* IEEE Transactions on Signal Processing. (**IEEE SPS Young Author Best Paper Award**)

Conference

- **Varma, R.**. and Kovačević, J. (2019). *Passive and Active Sampling for Piecewise Smooth Graph Signals.* 13th International Conference on Sampling Theory and Applications
- **Varma, R.** and Kovačević, J. (2019). *Random Sampling for Bandlimited Signals on Product Graphs.* 13th International Conference on Sampling Theory and Applications
- **Varma, R.**, Lee, H., Chi, Y. and Kovačević, J. (2019). *Improving Graph Trend Filtering with Non-Convex Penalties* IEEE International Conference on Acoustics, Speech and Signal Processing
- **Varma, R.**, and Kovačević, J. (2019). *Smooth Signal Recovery on Product Graphs* IEEE International Conference on Acoustics, Speech and Signal Processing
- **Varma, R.**. and Kovačević, J. (2018). *Efficient Sampling on Product Graphs.* 6th IEEE Global Conference on Signal and Information Processing
- Mangia, M., Pareschi, F., **Varma, R.**, Rovatti, R., Kovačević, J., Setti, G. (2018). *Rakeness-based Compressed Sensing of Multiple-Graph Signals for IoT Applications.* IEEE Transactions on Circuits and Systems II: Express Briefs.
- **Varma, R.**, Chen, S., and Kovačević, J. (2017). *Graph Topology Learning from Signals: Regular vs Irregular structures.* IEEE Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP).
- **Varma, R.**, Chen, S., and Kovačević, J. (2016) *Representations for Localized Signals on Graphs.* IEEE Asilomar Conference on Signals, Systems and Computers.

○ Chen, S., **Varma, R.**, Singh, A., and Kovačević, J. (2016). *Representations of Piecewise Smooth Signals on Graphs.* IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP).

○ **Varma, R.**, Chen, S., and Kovačević, J. (2015). *Spectrum-Blind Signal Recovery on Graphs.* IEEE Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP).

Relevant Talks

○ 13th International Conference on Sampling Theory and Applications, Bordeaux, France.
○ IEEE International Conference on Acoustics, Speech and Signal Processing 2019, London, UK.
○ IEEE Global Conference on Signal and Information Processing 2018, Monterey, CA.
○ Asilomar Conference on Signals, Systems, and Computers 2016,2018.
○ IEEE Computational Advances in Multi-Sensor Adaptive Processing 2015, 2017.
○ Graph Signal Processing Workshop 2015, 2016, 2017, 2018.

Relevant Coursework

○ Machine Learning and Statistical Learning Theory
○ Deep Learning and Neural Networks
○ Convex Optimization
○ Probabilistic Graphical Models
○ Computer Vision
○ Sparse Optimization and Compressed Sensing
○ Probability Theory and Stochastic Processes
○ Game Theory
○ Information Theory
○ Parallel Programming and Computer Architecture
○ Multimedia Databases and Data Mining
○ Game Theory

Teaching

○ Spring 2019, Teaching Assistant, *Convex Optimization (18-660)*
○ Fall 2018, Teaching Assistant, *Introduction to Machine Learning (18-661)*
○ Spring 2017, Teaching Assistant, *Special Topics in Signal Processing: Sparsity, Structure and Inference (18-898G)*
○ Spring 2016, Teaching Assistant, *Fundamentals of Signal Processing (18-491)*

Awards

○ IEEE Signal Processing Society Young Author Best Paper Award
○ Carnegie Institute of Technology Dean's Tuition Fellowship.
○ Ranker in Euclid Canadian International Mathematics Competition 2010

Leadership and Service

○ Journal: IEEE Transactions in Signal Processing reviewer from 2016 - present.
○ Conference: ICASSP, GlobalSIP, CAMSAP, SAMPTA reviewer from 2015 - present.
○ Member, Honor Society Eta Kappa Nu.
○ IEEE Student Member.

Languages

Fluent   English, French, Hindi and Malayalam.

Working Fluency   German and Arabic.

Relevant Projects

May 2016   **Variational Inference for Gamma-Process Corrosion Models**, *Carnegie Mellon University*.
Developed a variational inference based framework using a hierarchical Bayesian model to determine and predict corrosion defects in oil pipelines.

May 2015   **Using Multi-Task Learning to Predict Signaling and Regulatory Pathways**, *Carnegie Mellon University*.
Developed a machine learning framework using multi-task learning for predicting signaling and regulatory pathways in cancer cells that employs greedy optimization-based algorithms

October 2013   **Data Compression using Error Correcting Codes**.
Explored lossless data compression using error correcting codes. Specifically implemented and analyzed an approach to universal noiseless variable-length lossless compression based on the concatenation of the Burrows-Wheeler block sorting transform with Fountain Codes that allowed linear encoding and decoding times.

October 2013   **Network Coding and Multi-Commodity Flow**, *UC Berkeley*.
Studied Network Coding compared with Multicommodity Flow for the k-pairs Communication Problem as part of project for graduate algorithms class. Specifically analyzed maximum achievable rate in the information flow formulation as opposed to the multicommodity flow formulation for both directed acyclic graphs as well as more general undirected graphs.

July 2012   **Facebook Search Engine**, *Greylock Hackathon*.
Created a Facebook search engine that indexes one's Facebook data and allows us to intelligently search Facebook data and apply a variety filters. Specifically worked on an image retrieval system using collaborative filtering.

September 2012   **Face Recognition Platform**, *Yahoo Hackathon*.
Used digital image processing and novel machine learning techniques to create a robust face recognition platform. Won first place.