Praneeth Narayanamurthy

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Education

Ph.D., Electrical Engineering, Iowa State University, 2016 – 2021 (expected).
Thesis: *Efficient Algorithms for Provable Subspace Learning and Tracking.*

B.Tech., Electrical and Electronics Engineering, National Institute of Technology Karnataka, 2014.
Thesis: *Estimation of Lightning Parameters using Genetic Algorithms.*

Research Interests

Machine Learning, Signal Processing, Matrix Factorization, Time-Series Analysis, Optimization

Work Experience

Research Assistant: Jan. 2016 – Present, *Iowa State University, Ames.*
I design and analyze provable, online algorithms for matrix factorization problems. Specifically, I have worked on Robust Principal Component Analysis (RPCA), Matrix Completion (MC) and Robust Matrix Completion (RMC) algorithms. In our work we show that by exploiting mild statistical properties of time-series data, we are able to (i) obtain increased "robustness" for RPCA, (ii) complete matrices whose set of missing entries are not probabilistic in nature for MC, and (iii) provide the first completely online, provable algorithm for RMC. I have also published papers on structured Phase Retrieval. I currently work on Neural Network compression, Federated Learning and Stochastic Linear Bandits.

Research Intern: May 2019 – August 2019, *Stanford Research Institute (SRI International), Princeton*
I worked on analysis of satellite time-series data using Gaussian Process regression. I designed a domain-dependent graph-based kernel to perform joint spatio-temporal forecasting from sparse and irregularly sampled data. We observed that this approach outperforms modern Recurrent Neural Network, and Neural ODE based methods.

Project Assistant: July 2014 – Dec. 2015, *Indian Institute of Science, Bangalore.*
I was part of the Indian Government project of developing Text-to-Speech systems for 11 regional Indian Languages. Specifically, I worked on (i) developing post-processing algorithms to enhance the naturalness of synthesized speech; and (ii) studying resampling techniques to reduce time and space complexity for low-footprint devices.

Selected Publications

Google Scholar Metrics (Sept. 2020): Citations=292, h-index=8, i10-index=7

1. **Praneeth Narayanamurthy**, Vahid Daneshpajooh and Namrata Vaswani, *Provable Subspace Tracking from Missing Data and Matrix Completion*, `IEEE Transactions on Signal Processing (May. 2019)`
   (A part of this paper was a finalist for the Best Student Paper Award at SPARS-2019)
2. Seyedehsara Nayer, **Praneeth Narayanamurthy**, and Namrata Vaswani, *Phaseless PCA: Phaseless Low Rank Matrix Recovery from Column-wise Phaseless Measurements*, `International Conference on Machine Learning (ICML) 2019`, (Acceptance Rate 22.6%),
   Long version in `IEEE Transactions on Information Theory, Mar. 2020`
3. **Praneeth Naryanamurthy** and Namrata Vaswani, *Nearly Optimal Robust Subspace Tracking*, `International Conference on Machine Learning (ICML) 2018`, Long talk (Top 8.6% of papers)
   Long version in `IEEE Journal on Selected Areas in Information Theory, Dec. 2020.`

4. **Praneeth Narayanamurthy** and Namrata Vaswani, *Provable Dynamic Robust PCA or Robust Subspace Tracking*, `IEEE Transactions on Information Theory (March 2019)`.
5. Namrata Vaswani, Thierry Bouwmans, Sajid Javed and **Praneeth Narayanamurthy**, *Robust PCA, Subspace Learning, and Tracking*, `IEEE Signal Processing Magazine (July 2018)`.
6. Namrata Vaswani, and **Praneeth Narayanamurthy**, *Static and Dynamic Robust PCA and Matrix Completion: A review*, `Proceedings of IEEE (Aug. 2018)`.
7. **Praneeth Naryanamurthy**, *Namrata Vaswani, and Aditya Ramamoorty*, *Federated Over-the-Air Subspace Learning from Incomplete Data*, `manuscript` (Feb. 2020).

Honors and Awards

Top Reviewer Award, ICML 2020.

Research Excellence Award, Iowa State University, 2019.

Finalist of Best Student Paper Award, SPARS, 2019.

Recepient of ICML travel grant – 2018, 2019.

Finalist of (Indian) National GE Edison Challenge – 2013.

Indian National Mathematical Olympiad Awardee – 2009.

National Certificate of Excellence for securing 100% grade in Mathematics and Sanskrit – 2008.

Skills

Proficient: MATLAB, LaTeX

Intermediate: Python (NumPy, Pandas, Tensorflow, Keras, PyTorch), C++, Git

Beginner: Julia, Scheme, Perl, Bash

Professional Service

I review articles for IEEE Transactions on Signal Processing, IEEE Transactions on Networking, IEEE Journal of Selected Topics in Signal Processing, IEEE Signal Processing and Wireless Communications, ICML, NeurIPS...

Graduate Courses

Electrical Engineering: Probability and Random Processes, Convex Optimization, Detection and Estimation Theory, Principles of Data Science, Deep Machine Learning, Statistical Machine Learning

Computer Science: Design and Analysis of Algorithms, Machine Learning

Mathematics: Linear Algebra, Numerical Analysis-II, Real Analysis

Talks

1. *Nearly Optimal Robust Subspace Tracking*
   Dept. Mathematics, Iowa State University, Ames (April 2019)
   Microsoft Research India, Bangalore (Dec 2017)
   ECE Department, Indian Institute of Science, Bangalore (Dec 2017)