Praneeth Narayanamurthy

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Education

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

Ph.D., Electrical Engineering, Iowa State University, 2016 – 2020 (expected).

Research Interests

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

Work Experience

Research Intern: May 2019 – Aug. 2019, *Stanford Research Institute (SRI International), Princeton*
I worked on analysis of satellite time-series data using classical statistical approaches. In particular, I designed a domain-dependent kernel for Gaussian Processes that can accurately interpolate highly sparse, irregularly sampled time-series data. I also implemented graph-based kernels that perform joint spatio-temporal prediction. We observed that this approach significantly outperperform Recurrent Neural Network, and Neural ODE based methods.

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 Analsyis (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 complete online, provable algorithm for RMC.

I am also working on structured Phase Retrieval, Computer Vision applications such as object tracking and detection in videos, and Neural Networks.

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.

Publications

Journals and Highly Selective Conference Papers

1. Provable Subspace Tracking from Missing Data and Matrix Completion,
   Praneeth Narayanamurthy, *Vahid Daneshpajooh and Namrata Vaswani*

IEEE Transactions on Signal Processing (May. 2019)
(A part of this paper is a finalist for the Best Student Paper Award at SPARS-2019)

2. Phaseless PCA: Phaseless Low Rank Matrix Recovery from Column-wise Phaseless Measurements
   Seyedehsara Nayer, **Praneeth Narayanamurthy**, *and Namrata Vaswani*
   International Conference on Machine Learning (ICML) 2019,
   (Acceptance Rate 22.6%).

3. Nearly Optimal Robust Subspace Tracking,
   Praneeth Naryanamurthy *and Namrata Vaswani*,
   International Conference on Machine Learning (ICML),
   Long talk (Top 8.6% of papers) 2018.

4. Provable Dynamic Robust PCA or Robust Subspace Tracking,
   Praneeth Narayanamurthy *and Namrata Vaswani*,
   IEEE Transactions on Information Theory (March 2019).

5. Robust PCA, Subspace Learning, and Tracking,
   Namrata Vaswani, Thierry Bouwmans, Sajid Javed and **Praneeth Narayanamurthy**,
   IEEE Signal Processing Magazine (July 2018).

6. Static and Dynamic Robust PCA and Matrix Completion: A review,
   Namrata Vaswani, and **Praneeth Narayanamurthy**,
   Proceedings of IEEE (Aug. 2018).

Conference and Workshops

1. Provable Subspace Tracking with Missing Entries,
   Praneeth Narayanamurthy, *Vahid Daneshpajooh, and Namrata Vaswani*,
   IEEE International Symposium on Information Theory (ISIT), 2019.

2. Provable Memory-Efficient Online Robust Matrix Completion,
   Praneeth Narayanamurthy, *Vahid Daneshpajooh, and Namrata Vaswani*,
   IEEE International Conference on Acousitcs Speech and Signal Processing (ICASSP), 2019

3. Provable Dynamic Robust PCA or Robust Subspace Tracking,
   Praneeth Narayanamurthy *and Namrata Vaswani*,
   IEEE International Symposium on Information Theory (ISIT), 2018.

4. Nearly Optimal Robust Subspace Tracking: A Unified Approach,
   Praneeth Narayanamurthy *and Namrata Vaswani*,
   IEEE Data Science Workshop (DSW), 2018.

5. PCA in Sparse Data-Dependent Noise,
   Namrata Vaswani and **Praneeth Narayanamurthy**,
   IEEE International Symposium on Information Theory (ISIT), 2018.

6. A Fast and Memory-Efficient Algorithm for Robust PCA (MERoP),
   Praneeth Narayanamurthy *and Namrata Vaswani*,
   IEEE International Conference on Acousitcs Speech and Signal Processing (ICASSP), 2018

7. Robust PCA and Robust Subspace Tracking: A comparative Evaluation,
   Sajid Javed, **Praneeth Narayanamurthy**, *Namrata Vaswani and Thierry Bouwmans*,
   IEEE Statistical Signal Processing Workshop (SSP), 2018.

8. Finite Sample Guarantees for PCA in non-isotropic and Data-Dependent Noise,
   Namrata Vaswani and **Praneeth Narayanamurthy**,
   `Allerton Conference on Communication, Control, and Computing, 2017`

9. Provably correct Robust Subspace Tracking: A Correlated-PCA-based Approach,
   Brian Lois, Namrata Vaswani and **Praneeth Narayanamurthy**, `NIPS workshop on LHDS, 2016.`

10. Efficient Resampling of speech signals in Shift-Invariant Spaces,
    Gutta Sreedevi, **Praneeth Narayanamurthy**, *and Chandra Sekhar Seelamantula*,
    `IEEE National Conference on Communications (NCC) 2016.`

Honors and Awards

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.

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.

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, Real Analysis, Numerical Analysis-II

Skills

Proficient: MATLAB, LaTeX

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

Beginner: Julia, Scheme, Perl, Bash

Talks

1. *Nearly Optimal Robust Subspace Tracking*
   Dept. Mathematics (Probability, Analysis, and Data Science Seminar), Iowa State University, Ames
   April 2019

2. *MEDRoP: Memory Efficient Dynamic Robust PCA*
   Microsoft Research India, Bangalore
   December 2017

3. *MEDRoP: Memory Efficient Dynamic Robust PCA*
   ECE Department, Indian Institute of Science, Bangalore
   December 2017

Last updated: January 6, 2020