Praneeth Narayanamurthy

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Education

Ph.D. in Electrical Engineering,
Iowa State University, 2016 – 2021.
Thesis: *Provable and Efficient Algorithms for Robust Subspace Learning and Tracking.*
Advisor: *Prof. Namrata Vaswani*

B.Tech. in Electrical and Electronics Engineering,
National Institute of Technology Karnataka, 2014.
Thesis: *Estimation of Lightning Parameters using Genetic Algorithms.*
Advisor: *Prof. Gururaj S. Punekar*

Research Experience

Vertex Postdoctoral Researcher: Sept 2021 – Present **University of Southern California**
Advisor: Prof. Urbashi Mitra
I work on designing active sampling schemes for problems such as Source Localization and derivative-free function optimization. This draws on theory and techniques from active learning, bayesian statistics, and multi-armed Bandit literature.

Research Assistant: Jan. 2016 – July 2021 **Iowa State University**
Advisor: Prof. Namrata Vaswani
I designed and analyzed 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 showed 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 and Federated Learning.

Research Intern: May 2019 – Aug. 2019 **Stanford Research Institute (SRI International)**
Mentor: Dr. Yi Yao and Dr. Ajay Divakaran
I worked on analysis of satellite time-series data using Gaussian Process regression. I designed a domain-dependent graph-based kernel to perform joint spatiotemporal forecasting from extremely sparse and irregularly sampled data. We observed that our approach outperforms Recurrent Neural Network- and Neural ODE- based methods.

Project Assistant: July 2014 – Dec. 2015. **Indian Institute of Science**
Advisor: Prof. Chandra Sekhar Seelamantula
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.

Honors and Awards

Top Reviewer Award, ICML – 2020.

Research Excellence Award, Iowa State University – 2019.

Finalist of Best Student Paper Award, SPARS – 2019.

Recipient of ICML travel grant – 2018, 2019.

Finalist of National GE Edison Challenge – 2013.

Indian National Mathematical Olympiad Awardee – 2009.

Publications

Google Scholar Metrics (Nov. 2021): Citations – 408, h-index – 9, i10-index – 9

Pre-Prints

1. **Praneeth Naryanamurthy**, *Namrata Vaswani, and Aditya Ramamoorty*, Federated Over-the-Air Subspace Tracking from Incomplete and Corrupted Data, `manuscript` (submitted to IEEE Transactions on Signal Processing, 2021).

Journal Articles

1. **Praneeth Narayanamurthy** and Namrata Vaswani, *Fast Robust Subspace Tracking via PCA in Sparse Data-Dependent Noise*, to appear in IEEE Journal of Selected Areas in Information Theory (Dec. 2020).

2. Seyedehsara Nayer, **Praneeth Narayanamurthy**, and Namrata Vaswani, *Provable Low-Rank Phase Retrieval and Compressive PCA*, IEEE Transactions on Information Theory (Feb. 2020)

3. **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)

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).

Conference Papers

1. **Praneeth Narayanamurthy**, Namrata Vaswani, and Aditya Ramamoorthy, *Federated Over-Air Robust Subspace Tracking from Missing Data*, International Conference on Acoustics Speech and Signal processing (ICASSP), 2022.

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%).

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

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

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

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

7. **Praneeth Narayanamurthy** and Namrata Vaswani, *Nearly Optimal Robust Subspace Tracking: A Unified Approach*, IEEE Data Science Workshop (DSW), 2018.
8. Namrata Vaswani and **Praneeth Narayanamurthy**, *PCA in Sparse Data-Dependent Noise*, IEEE International Symposium on Information Theory (ISIT), 2018.
9. **Praneeth Narayanamurthy** and Namrata Vaswani, *A Fast and Memory-Efficient Algorithm for Robust PCA (MERoP)*, IEEE International Conference on Acousitcs Speech and Signal Processing (ICASSP), 2018.
10. *Sajid Javed,* **Praneeth Narayanamurthy**, *Namrata Vaswani and Thierry Bouwmans*, *Robust PCA and Robust Subspace Tracking: A comparative Evaluation*, IEEE Statistical Signal Processing Workshop (SSP), 2018.
11. *Namrata Vaswani and* **Praneeth Narayanamurthy**, *Finite Sample Guarantees for PCA in non-isotropic and Data-Dependent Noise*, Allerton Conference on Communication, Control, and Computing, 2017.
12. *Brian Lois, Namrata Vaswani and* **Praneeth Narayanamurthy**, *Provably correct Robust Subspace Tracking: A Correlated-PCA-based Approach*, NIPS workshop on Learning in High-Dimensions with Structure, 2016.
13. Gutta Sreedevi, **Praneeth Narayanamurthy**, and Chandra Sekhar Seelamantula, *Efficient Resampling of speech signals in Shift-Invariant Spaces*, IEEE National Conference on Communications (NCC) 2016.
14. **Praneeth Narayanamurthy** and Chandra Sekhar Seelamantula, *Dictionary-Learning based Post-Filter for HMM-based Speech Synthesis*, IEEE Region 10 Conference (TENCON) 2015.

Theses

1. **Praneeth Narayanamurthy**, *Provable and Efficient Algorithms for Robust Subspace Learning and Tracking*, Ph.D. Thesis, Iowa State University, 2021.
2. **Praneeth Narayanamurthy**, *Estimation of Steep-Fronted and Full-Wave Lightning Channel-Base-Current function Parameters using Genetic Algorithm*,
B.Tech. Thesis, National Institute of Technology Surathkal, 2014.

Teaching

Spring 2021**.** TA for Probabilistic Methods for Electrical Engineers (EE322): Duties include fortnightly recitation sessions, assistance in creating homeworks, quizzes; and holding office hours for clearing doubts and supplementary instruction. ($\approx$ 80 students)

Spring 2021**.** TA for Machine Learning: A Signal Processing Perspective (EE425): Duties include weekly recitation sessions focused on introducing Python, NumPy, Pandas..., assistance in creating homeworks; and holding office hours for clearing doubts and supplementary instruction. ($\approx$ 15 students)

Fall 2020**.** TA for Probabilistic Methods for Electrical Engineers (EE322): Same duties as above. ($\approx$ 40 students)

Fall 2020**.** A volunteer in the CyMath program: Duties included teaching mathematics for 3rd-grade students from Moulton Elementary School, Des Moines.

Professional Service

I review articles for IEEE Transactions on Signal Processing, IEEE Transactions on Image Processing, IEEE Transactions on Networking, IEEE Journal of Selected Topics in Signal Processing, EURASIP journal on Advances in Signal Processing, IEEE Signal Processing and Wireless Communications, Journal of Machine Learning Research, ICML (2020, 2021), NeurIPS (2020, 2021), AISTATS (2020, 2021), ...

Talks

1. *Federated Over-Air Subspace Learning and Tracking*
   Dept. of Computer Science, Missouri University of Science and Technology (Nov. 2021)

2. *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)

Graduate Coursework

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 (PyTorch, Tensorflow, Keras), C++, Git

Beginner: Julia, Scheme, Perl, Bash

Last updated: January 24, 2022