Shashanka Ubaru

CONTACT INFORMATION
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OBJECTIVE

A summer research internship at Berkeley labs involving machine learning.

EDUCATION

University of Minnesota, Minneapolis, MN, USA

Ph.D., Computer Science — *Expected:* Summer 2018

- Advisor: Yousef Saad
- CGPA: 3.83/4.0

M.S., Computer Science — October 2015

- Project: *Low rank approximation using error correcting codes*
- Advisor: Yousef Saad. CGPA: 3.66/4.0

M.S., Electrical Engineering — November 2014

- Thesis:*Randomized techniques for matrix decomposition and estimating the approximate matrix ranks*
- Advisors: Yousef Saad and Arya Mazumdar
- CGPA: 3.81/4.0

M.S. Ramaiah Institute of Technology, Bangalore, India

B.Eng., Electronics and Communication — May 2012

- Final Project: *RADARS: Determining Doppler, Ranging and Imaging*
- CGPA: 9.63/10.0 (Top 5% of graduating class)

SKILLS

Programming: C, C++, Matlab, Python, LaTeX, Basic web programming, Verilog HDL.
Operating Systems: Linux and Windows.
Topics: Machine learning, numerical linear algebra, approximation theory and algorithms, eigenvalue problems, error correcting codes, group testing, compressed sensing, dictionary learning.

EXPERIENCE

University of Minnesota, Minneapolis, MN, USA

Research Assistant, Department of Computer Science — September 2013 to present

- Advisor: Yousef Saad
- *Low rank approximation using error correcting coding matrices*
  Proposed the use of error correcting coding matrices for randomized sampling in solving low rank approximation and least squares regression problems.
- *Fast methods for estimation of approximate matrix ranks*
  Proposed four different methods for the estimation of approximate matrix ranks, based on the ideas of polynomial filtering and spectral densities.
- *Material Informatics: Learning from materials data*
  Demonstrated the use of different machine learning techniques for exploring data from materials science.
- *Scaled gradients and Aitken's acceleration for low rank matrix completion*
  Proposed a scaled metric for low rank matrix completion problem. Aitken's acceleration was introduced for improved convergence (Unpublished work).

Seagate Technology, Shakopee, MN, USA

Signal Processing Intern — May 2013 to August 2013

- Supervisors: Michael Link and Jason Jury
- *Channel-simulation model parameters using LLR optimization*
  Estimated the accuracy limits and the correlation of the estimated read channel simulation model using surface response regression, Cramer Rao lower bound and Fisher matrices.
- *Media noise modeling using AIC and the covariance matrices*
  Determined the optimal bandwidth of banded covariance (MA model) and inverse covariance (AR model) matrices of media noise in read channels using information criteria.

Raman Research Institute, Bangalore, India

Visiting Research Student Program (VSP) June 2011 to August 2012

- Advisor: T.N Ruckmongathan
- *Displaying gray scales by cross pairing select and data voltages in multi-line addressed LCD* Proposed a new addressing technique to display gray scales in passive LCDs.
- *Bit Slice addressing and MicroPWM:* Addressing techniques for Digital Micromirror Device. Programmed DLP XGA chipset using C++ to implement the techniques. Image processing and simulations using Matlab.
- *An LCD prototype to demonstrate addressing techniques using weighted orthogonal matrices.* Programmed a CPLD chip using Verilog HDL for implementation.

PUBLICATIONS

1. **S. Ubaru**, A. Mazumdar, and Y. Saad. "Low rank approximation using error correcting coding matrices". In Proceedings of 32nd International Conference on Machine Learning, pp 702–710, 2015.
2. **S. Ubaru** and T.N. Ruckmongathan. "Displaying gray scales by cross pairing select and data voltages in multi-line addressed LCD" IEEE, Journal of Display Technology, vol 8, no. 11, pp 669–677, November, 2012.
3. **S. Ubaru**, Y. Saad, and A.-K. Seghoune, "Fast estimation of approximate matrix ranks using spectral densities", Under review, 2015.
4. **S. Ubaru**, A. Mazumdar, and Y. Saad. "Low rank approximation and decomposition of large matrices using error correcting codes", Under review, 2015.
5. **S. Ubaru** and Y. Saad, "Fast Methods for Estimating the Numerical Rank of Large Matrices", Submitted, 2015.
6. **S. Ubaru**, A. Mazumdar, and A. Barg. "Group testing schemes from low-weight codewords of BCH codes", Submitted, 2016.
7. Y. Saad, **S. Ubaru**, and D. Woodruff. "Fast Estimation of the Nuclear Norm of a Matrix", Submitted, 2016.
8. **S. Ubaru**, A.-K. Seghoune, and Y. Saad. "Improving the Incoherence of a Learned Dictionary via Rank Shrinkage", Submitted, 2016.
9. **S. Ubaru**, Y. Saad, and J. Chelikowski, "Materials Informatics: Learning from Materials Data", To be submitted.

PRESENTATION

Low rank approximation using error correcting coding matrices.
International Conference on Machine Learning (ICML), Lille, France, July 2015.
Awards: *ICML Travel Scholarship* and *CS Department Travel Award.*

GRADUATE COURSES

Random matrices and high dimensional statistics, Sparse matrix computations, Optimization theory, Machine learning, Methods of applied mathematics, Computational aspects of matrix theory, Advanced algorithms and data-structures, Pattern recognition, Data compression, Adaptive digital signal processing, Detection and estimation theory, Digital communications, Probability and stochastic processes, Operating systems.

RELATED COURSE PROJECTS

- *Matrix Completion:* Comparison of various Nuclear Norm and fixed rank methods. Implemented and compared the performances of six different matrix completion methods on different datasets.
- *Multi-label scene classification.* Implemented and compared the performances of different multi-label classification techniques for scene dataset.
- *Stock data prediction using machine learning algorithms.* Implemented five regression techniques for prediction of stock data trend and compared their performances on different stock data.

ACTIVITIES

- *MOKSHA: Intelligent Autonomous Ground Vehicle.* Designed an autonomous vehicle with lane and obstacle detection, and GPS navigation capabilities. Presented at the 19th Annual Intelligent Ground Vehicle Competition, Michigan USA (Held on 4th June 2011). Programmed in Visual C++. Data communication between motor controller, GPS, SONARs and camera.
- *MSRIT ROBONXG-2012* - Chief student organizer.
  Organized a week long robotics festival which included talks, workshops and competitions.