Suriya Gunasekar

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Current position

2016–Present **Research Assistant Professor.**
Toyota Technological Institute at Chicago, USA.
Mentor: Nathan Srebro.
Primary research topics: (a) *implicit* inductive bias from optimization in learning and (b) supervised learning of *non–discriminatory* predictors in the context of algorithmic fairness.

Education

2010–2016 **MS—PhD in Electrical and Computer Engineering.**
The University of Texas at Austin, USA.
Advisor: Prof. Joydeep Ghosh.
PhD Thesis: Mining Structured Matrices in High Dimensions

2006–2010 **B. Tech in Electronics and Communication Engineering.**
National Institute of Technology, Warangal, India.

Grants and select scholarships

2018 Research personnel on NSF medium grant on "Understanding and Improving Optimization for Deep and Recurrent Networks".

2006-2010 Institute Merit Scholarship from NIT Warangal for four academic years 2006–2010 (awarded annually to top 10% of the meritorious students at the institute).

2009 INSA-IASc-NASI Summer Research Fellowship from Indian National Science Academy (awarded based on selection of short term research proposals).

Teaching

2018 **Co-instructor.** *Introduction to Machine Learning Summer School* jointly organized by TTI Chicago and CCAM at University of Chicago as part of NSF RTG. Co-taught with Karl Stratos.
- Two week intensive course on introduction to machine learning aimed at graduate students from non-CS departments and senior undergraduates from CS departments.
- Teaching material available at http://www.ttic.edu/intromlss2018.

2017–2018 **Guest lectures at TTI Chicago and TTI Japan** on *Introduction to Machine Learning*.
Total of 8 lectures during Fall '16, Sp. '17, and Sp. '18. (Instructor: Greg Shaknarovich).

2006–2010 **Teaching Assistant, UT Austin.**
Data Mining, Sp. '13 (Instructor: Dr. Joydeep Ghosh).
Digital Logic Design, Fall '10–Fall '11 (Instructors: Dr. Adnan Aziz, Dr. Lizy John).

Publications

Peer-reviewed full length conference publications

1. Implicit bias of gradient descent on linear convolutional networks. S. Gunasekar, J. Lee, D. Soudry, N. Srebro. *In 32nd Conference on Neural Information Processing Systems (NIPS) 2018 [to appear].*

2. On preserving non–discrimination when combining expert advice. A. Blum, S. Gunasekar, T. Lykouris, N. Srebro. *In 32nd Conference on Neural Information Processing Systems (NIPS) 2018 [to appear].*
3. Characterizing implicit bias in terms of optimization geometry. S. Gunasekar, J. Lee, D. Soudry, N. Srebro. *In 35th International Conference on Machine Learning (ICML) 2018.*
4. Implicit regularization in matrix factorization. S. Gunasekar, B. Woodworth, S. Bhojanapalli, B. Neyshabur, N. Srebro. *In 31st Conference on Neural Information Processing Systems (NIPS) 2017.*
5. Learning non–discriminatory predictors. B. Woodworth, S. Gunasekar, M. Ohannessian, N. Srebro. *In 30th Conference on Learning Theory (COLT) 2017.*
6. Preference completion from partial rankings. S. Gunasekar, O. Koyejo, J. Ghosh. *In 30th Conference on Neural Information Processing Systems (NIPS) 2016.*
7. Identifiable phenotyping using constrained non–negative matrix factorization. S. Joshi, S. Gunasekar, D. Sontag, J. Ghosh. *In 1st Machine Learning for Healthcare Conference (MLHC) 2016.*
8. Unified view of matrix completion under general structural constraints. S. Gunasekar, A. Banerjee, J. Ghosh. *In 29th Conference on Neural Information Processing Systems (NIPS) 2015.*
9. Consistent collective matrix completion under joint low rank structure. S. Gunasekar, M. Yamada, D. Yin, Y. Chang. *In 18th International Conference on Artificial Intelligence and Statistics (AISTATS) 2015.*
10. Face detection on distorted images using perceptual quality–aware features. S. Gunasekar, J. Ghosh, A. Bovik. *In 14th IS&T/SPIE Human Vision and Electronic Imaging Conference 2014.*
11. Exponential family matrix completion under structural constraints. S. Gunasekar, P. Ravikumar, J. Ghosh. *In 31st International Conference on Machine Learning (ICML) 2014.*
12. Noisy matrix completion using alternating minimization. S. Gunasekar, A. Acharya, N. Gaur, J. Ghosh. *In Machine Learning and Knowledge Discovery in Databases (ECML/PKDD) 2013.*
13. Review quality aware collaborative filtering. S. Raghavan, S. Gunasekar, J. Ghosh. *In 6th ACM Conference on Recommender Systems (RecSys) 2012.*

Journal publications

14. The implicit bias of gradient descent on separable data. D. Soudry, E. Hoffer, M. S. Nacson, S. Gunasekar, N. Srebro. *In Journal of Machine Learning Research 2018 [to appear].*
15. Face detection on distorted images augmented by perceptual quality–aware features. S. Gunasekar, J. Ghosh, A. Bovik. *In IEEE Transactions on Information Forensics and Security 2014.*

Preprints/Theses

16. Convergence of gradient descent on separable data. M. S. Nacson, J. Lee, S. Gunasekar, P. Savarese, N. Srebro, D. Soudry. *In Arxiv 2018.*
17. Phenotyping using structured collective matrix factorization of multi-source EHR data. S. Gunasekar, J. Ho, J. Ghosh, S. Kreml, A. N. Kho, J. C. Denny, B. A. Malin, J. Sun. *In Arxiv 2016.*

Dissertation — Mining structured matrices in high dimensions.
Advised by Prof. Joydeep Ghosh. *In UT Electronic Theses and Dissertations, 2016.*

Master's Report — A survey on using side information in recommendation systems.
Advised by Prof. Joydeep Ghosh. *In UT Electronic Theses and Dissertations, 2012.*

Invited Talks

2018 *Implicit Bias of Optimization in Learning* at
- INFORMS Annual Meeting,
- CAM Seminar, Cornell University,
- International Symposium on Mathematical Programming (ISMP),
- Microsoft Research, Redmond.

2018 *Optimization Geometry and Implicit Regularization* at SILO Seminar, UW Madison.

2017 *Implicit Regularization in Matrix Factorization* at
- Statistics colloquium, Indiana University Bloomington,
- RIKEN–AIP, Japan,
- Information Theory and Applications (ITA) workshop.

2017 *Regularization in non-convex Optimization* at CSL/SINE Seminar, UIUC.

2016 *Mining Structured Matrices in High Dimensions* at
- Toyota Technological Institute, Chicago,
- Google Research, New York.

Professional activities

Organization/Committees

2018 **Organizing committee member** for the 2*nd Midwest Machine Learning Symposium (MMLS)*. Website: http://midwest-ml.org/2018/

2018 **Organizer and co-instructor** for the *Introduction to Machine Learning Summer School* jointly organized by TTIC and CCAM at UChicago. Website: http://ttic.edu/intromlss2018

2018 **Committee member** on drafting of the *Policy on Discrimination, Harassment, and Abusive Behavior at TTIC*.

2016-Present **Organizer** for *Machine Learning Seminar Series at TTIC*. Website: http://www.ttic.edu/mls/.

Journal reviewing

Journal of Machine Learning Research, IEEE Transactions on Knowledge and Data Engineering, IEEE Signal Processing Letters, IEEE Transactions on Signal Processing, IEEE Transactions on Image Processing, Journal of Neurocomputing.

Conference reviewing

International conference on machine learning (ICML), Neural Information processing systems (NIPS), International Conference on Learning Representations (ICLR), Uncertainty in Artificial Intelligence (UAI), Conference on Learning Theory (COLT), Algorithmic Learning Theory (ALT), Conference on Data Sciences (CODS).

Past employment

2010–2016 **Graduate Research Assistant.** The University of Texas Austin, USA.
Worked on (sub) problems within multiple NSF funded projects.
Supervisors: Dr. Joydeep Ghosh and Dr. Alan C. Bovik.
- Listwise ranking in high dimensions using retargeting of preference feedback.
- Interpretable phenotype extraction from patient electronic health records (EHRs).
- Statistical estimators for matrix completion under generalized assumptions.
- Robust face detection models using image quality indicative features.

Summer '14 **Research Intern.** Yahoo Labs, Sunnyvale, USA.
Worked on theoretical analysis and application of collective matrix completion.

Summer '12 **Research Intern.** SRI Labs, Princeton, USA.
Worked on personalized photo recommender system that combines image content with user feedback. The system was evaluated on a dataset curated from Flickr.

Summer '11 **Software Intern.** Apple Inc., Cupertino, USA.
Worked with a hardware–testing team on establishing data collection set up using SQL and developing prototypes for preliminary data analysis.

References

1. **Joydeep Ghosh**, Professor, Department of ECE, Univeristy of Texas at Austin. ghosh@ece.utexas.edu
2. **Nathan Srebro**, Professor, Toyota Technological Institute at Chicago. nati@ttic.edu
3. **Avrim Blum**, Professor and Chief Academic Officer, Toyota Technological Institute at Chicago. avrim@ttic.edu
4. **Robert Nowak**, Professor, Department of ECE, University of Wisconsin, Madison. rdnowak@wisc.edu