Jithin K. Sreedharan

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Kanpur
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India

Professional Summary

- Machine Learning Researcher with a strong background in statistical modeling, data science, and machine learning, and experience in applying data science techniques to a wide range of domains including health and social sector, computational social science, bioinformatics, and network science.
- Experience in multiple stages of ML solutions — data procurement, feature engineering, algorithm development, passive evaluation, etc.
- Strong applied and theoretical research record leading to publications in selective venues including ICML, SIGKDD, The Web Conference (WWW), SIGMETRICS, Nature Reports, INFOCOM, etc.

Employment

Indian Institute of Technology Kanpur — Kanpur, India
Assistant Professor, Dept. of Computer Science and Engineering — 04/2022 – present

- Research and teaching focusing on machine learning (especially that on graphs), A.I. for Social Good, and general graph mining.

Wadhwani Institute for Artificial Intelligence
Machine Learning Scientist — Mumbai, India · 01/2022 – 04/2022
Los Altos, CA, USA · 10/2020 – 12/2021

- Developed AI for Social Good and Health solutions to help improve the lives of millions. Our collaborators and funders included Google.org, Bill & Melinda Gates Foundation, United States Agency for International Development, Harvard University, WHO, and International Innovation Corps (UChicago).
- Led two teams of Associate ML Scientists and ML engineers on a challenging behavioral prediction problem and a cough-based triaging solution in Tuberculous (TB) infected patients. Nearly 10 million people fell ill with TB in 2019, and 1.4 million died out of it (WHO Report 2020). Adherence to treatment regimens is critical for TB patients since non-adherence can lead to drug-resistant TB and mortality, and the patient continues to be a risk to the community. One of my teams aimed to predict the adherence of TB patients to the treatment regimen with ML techniques. My second team predicted TB cases from the cough signals collected from patients. Our high sensitivity AI-based solution thus acted as a screening solution before doing expensive and time-consuming TB lab tests. Both the solutions are ready to be deployed country-wide in India.

National Science Foundation (NSF) Center for Science of Information
Department of Computer Science, Purdue University — West Lafayette, IN, USA
NSF Postdoctoral Researcher — 01/2017 – 10/2020
Visiting Research Scholar — 04/2016 – 06/2016
Mentors: Prof. Wojciech Szpankowski and Prof. Ananth Grama

- Developed an optimal feature selection algorithm for explainable AI solutions and various approximate solutions for it with reduced time and sample complexity
- Designed and executed research on unsupervised and semi-supervised techniques for graph mining and embedding – recovering temporal information hidden in the dynamic data of social media and biological systems
- Coordinated a team consisting of three senior professors and three postdoctoral researchers, and instituted research collaboration with an interdisciplinary data science team in quantum computing
- Resulted in publications (6 conferences incl. **ICML, The Web Conference (WWW) and SIGKDD**, 3 journal incl. Nature), 4 grant proposals, and 3 open source libraries. Delivered 17 invited research talks (incl. Google Research, Adobe Research, Bell Labs, TU Eindhoven, SUTD Singapore, IISc Bangalore, IIIT - Hyderabad, and IIT Bombay, Delhi, Madras, and Kanpur)

Institut National de Recherche en Informatique et en Automatique (INRIA) and
INRIA-Bell Labs joint lab — Sophia Antipolis and Paris, France

PhD Graduate Researcher, Team MAESTRO (renamed to NEO) 08/2013 – 12/2016
Advisor: Dr. Konstantin Avrachenkov

- Designed and analyzed distributed unsupervised data mining algorithms for graphs to sample, rank and estimate graph properties.
- Developed methods based on reinforcement learning, short random walks, extreme value theory, and spectral graph theory for estimation problems on networked data
- Designed distributed implementation of spectral clustering techniques
- Launched collaborations with researchers from Purdue/CMU (USA), Bell Labs, UFRJ (Brazil), IIT Bombay (India), and IISc Bangalore (India)
- Resulted in publications (5 conferences, 3 journal), and 4 open source libraries. Delivered 3 invited and 4 contributed research talks

Indian Institute of Science Bangalore, India
Performance Analysis Lab, Dept. of Electrical Communication Engineering
Research Associate 09/2010 – 04/2013
Advisor: Prof. Vinod Sharma

- Developed and analyzed sequential hypothesis testing algorithms for distributed quickest detection of data anomalies, with various generalizations from parametric to non-parametric setup
- Tested the devised methods in anomaly detection in wireless sensor networks and spectrum sensing in cognitive radios, with aid from Boeing Inc. and Ministry of Communications and Information Technology, Govt. of India
- Resulted in publications (5 conferences, 1 journal), and 2 open source libraries

Robert Bosch Coimbatore and Bangalore, India
System Engineer, Automotive embedded systems in gasoline engines 08/2007 - 12/2008

- Developed and maintained software for engine control units (ECUs)
- Integrated new device drivers and application software modules into a common platform after rigorous hardware and software testing.

Education

Doctor of Philosophy in Computer Science 08/2013 – 12/2016
Institut National de Recherche en Informatique et en Automatique (INRIA) and INRIA-Bell Labs joint lab Sophia Antipolis and Paris, France
Affiliated university: Université Côte d'Azur (Université Nice Sophia Antipolis), France
Thesis title: *Sampling and Inference in Complex Networks*

Master of Science (Engineering), Dept. of Electrical Communication Engg. 09/2009 – 07/2012
Indian Institute of Science (IISc) Bangalore, India
Thesis title: *Spectrum Sensing in Cognitive Radios using Distributed Sequential Detection*

Bachelor of Technology in Electronics and Communication Engineering 08/2003 – 05/2007
Govt. Model Engineering College - Cochin University of Science and Technology Cochin, India
Main project title: *FPGA Implementation of a Probabilistic Neural Network*

Fellowships, Awards, and Honors

- Offered the full time position of Assistant Professor in Computer Science at Indian Institute of Technology (IIT-K), Kanpur, India, and International Institute of Information Technology Hyderabad (IIIT-H), Hyderabad, India (Declined). Both are well known research institutes and highly sought positions.
- Postdoctoral fellowship from NSF Science and Technology Center for Science of Information
- Postdoctoral fellowship from University of California San Diego Halicioglŭ Data Science Institute (Declined)
- ACM SIGMETRICS/PERFORMANCE travel grant 2016
- **Best M.S. thesis medal** - Prof. F. M. Mowdawalla medal - from Indian Institute of Science, Bangalore, India
- PhD fellowship from INRIA-Bell Labs joint lab for the entire duration of PhD
- Ministry of Human Resources and Development (MHRD), Govt. of India, scholarship for graduate studies

- Offered Scientist-C position at Defence Research and Development Organisation (DRDO), a prestigious public defence research lab under Govt. of India (Declined)

Publications

– *In all the papers, I am either one of the two main contributors or the main contributor.*
– *The asterisk (*) symbol indicates that the paper follows an alphabetical author-list*

1. Sufficiently Informative and Relevant Features: An Information-theoretic and Fourier-based Characterization
   Mohsen Heidari, *Jithin K. Sreedharan*, Gil Shamir, and Wojciech Szpankowski
   To appear in *IEEE Transactions on Information Theory*, 2022
   doi:10.1109/TIT.2022.3169998 `[Journal paper]`

2. Finding Relevant Information via a Discrete Fourier Expansion
   Mohsen Heidari, *Jithin K. Sreedharan*, Gil Shamir, and Wojciech Szpankowski
   *International Conference on Machine Learning (**ICML**), 2021*
   Acceptance rate: 18.46%; supplementary Material
   http://proceedings.mlr.press/v139/heidari21a.html `[Conference proceedings]`

3. Information Sufficiency via Fourier Expansion
   Mohsen Heidari, *Jithin K. Sreedharan*, Gil Shamir, and Wojciech Szpankowski
   IEEE International Symposium on Information Theory (ISIT), 2021 `[Conference proceedings]`
   doi:10.1109/ISIT45174.2021.9517924

4. Temporal Ordered Clustering in Dynamic Networks: Unsupervised and Semi-Supervised Learning Algorithms
   Krzysztof Turowski†, *Jithin K. Sreedharan*†, and Wojciech Szpankowski; †*Equal contribution*
   (a) *IEEE International Symposium on Information Theory (ISIT), 2020*
   doi:10.1109/ISIT44484.2020.9174079 `[Conference proceedings]`
   (b) *IEEE Transactions on Network Science and Engineering*, vol. 8, no. 2, pages 1426-1442, 2021
   doi:10.1109/TNSE.2021.3058376 `[Journal paper]`

5. Revisiting Parameter Estimation in Biological Networks: Influence of Symmetries
   Jithin K. Sreedharan†, Krzysztof Turowski†, and Wojciech Szpankowski; †*Equal contribution*
   (a) *ACM SIGKDD Conference on Knowledge Discovery and Data Mining, 2019* (poster presentation)
   (b) *BioKDD 2019* – in conjunction with SIGKDD (oral presentation)
   https://biokdd.org/biokdd19/regular_track.html `[Workshop proceedings]`
   (c) *IEEE/ACM Transactions on Computational Biology and Bioinformatics*, 2020
   doi:10.1109/TCBB.2020.2980260 `[Journal paper]`

6. Inferring Temporal Information from a Snapshot of a Dynamic Network
   Jithin K. Sreedharan†, Abram Magner†, Ananth Grama, and Wojciech Szpankowski; †*Equal contribution*
   Nature Scientific Reports, 10 pages (and 20 pages supplementary material), 2019
   Technical details with theoretical analysis and proofs are in the *supplementary material*
   doi:10.1038/s41598-019-38912-0 `[Journal paper]`

7. TIMES: Temporal Information Maximally Extracted from Structures
   Abram Magner†, *Jithin K. Sreedharan*†, Ananth Grama, and Wojciech Szpankowski; †*Equal contribution*
   *World Wide Web Conference (**WWW**)*, 2018
   Acceptance rate: 14.8%; selected for oral presentation in the main conference
   doi:10.1145/3178876.3186105 `[Conference proceedings]`

*8. Revisiting Random Walk based Sampling in Networks: Evasion of Burn-in Period and Frequent Regenerations
   Konstantin Avrachenkov, Vivek S. Borkar, Arun Kadavankandy and *Jithin K. Sreedharan*
   Computational Social Networks (Springer International Publishing), 5(1), 19 pages, 2018
   doi:10.1186/s40649-018-0051-0 `[Journal paper]`

*9. Hamiltonian System Approach to Eigenvalue-Eigenvector Problem in Networks
   Konstantin Avrachenkov, Philippe Jacquet and *Jithin K. Sreedharan*
   IEEE International Workshop on Multidimensional (nD) Systems (nDS), 2017
   doi:10.1109/NDS.2017.8070631 `[Workshop proceedings]`

10. Recovery of Vertex Orderings in Dynamic Graphs
Abram Magner, Ananth Grama, *Jithin K. Sreedharan* and Wojciech Szpankowski
IEEE International Symposium on Information Theory (ISIT), 2017
doi:10.1109/ISIT.2017.8006792 [Conference proceedings]

*11. Inference in OSNs via Lightweight Partial Crawls
Konstantin Avrachenkov, Bruno Ribeiro and *Jithin K. Sreedharan*
(a) *SIGMETRICS Performance Evaluation Review*, 44(1), pages 165-177, 2016
doi:10.1145/2964791.2901477 [Journal paper]
(b) *ACM SIGMETRICS/IFIP International Conference on Measurement and Modeling of Computer Science (**SIGMETRICS '16**)*, 2016
Acceptance rate: 13.5%; selected for oral presentation in the main conference.
doi:10.1145/2896377.2901477 [Conference proceedings]

*12. Distributed Spectral Decomposition in Networks by Complex Diffusion and Quantum Random Walk
Konstantin Avrachenkov, Philippe Jacquet and *Jithin K. Sreedharan*
*IEEE International Conference on Computer Communication (**INFOCOM'16**)*, 2016
Acceptance rate: 18.25%; selected for oral presentation in the main conference.
doi:10.1109/INFOCOM.2016.7524376 [Conference proceedings]

*13. Comparison of Random Walk Based Techniques for Estimating Network Averages
Konstantin Avrachenkov, Vivek S. Borkar, Arun Kadavankandy and *Jithin K. Sreedharan*
Springer LNCS, 5th International Conference on Computational Social Networks (CSoNet), vol 9795, pages 27-38, 2016
doi:10.1007/978-3-319-42345-6_3 [Conference proceedings]

*14. Distribution and Dependence of Extremes in Network Sampling Processes
Konstantin Avrachenkov, Natalia M. Markovich and *Jithin K. Sreedharan*
Computational Social Networks (Springer International Publishing), 2(1), 21 pages, 2015
doi:10.1186/s40649-015-0018-3 [Journal paper]

15. Spectrum Sensing using Distributed Sequential Detection via Noisy Reporting MAC
Jithin K. Sreedharan and Vinod Sharma
Signal Processing (Elsevier & EURASIP), vol 106, pages 159-173, 2015
doi:10.1016/j.sigpro.2014.07.009 [Journal paper]

16. Nonparametric Distributed Sequential Detection via Universal Source Coding
Jithin K. Sreedharan and Vinod Sharma
IEEE Information Theory and Applications Workshop (ITA), 2013
doi:10.1109/ITA.2013.6502977 [Workshop proceedings]

17. Spectrum Sensing via Universal Source Coding
Jithin K. Sreedharan and Vinod Sharma
IEEE Global Communications Conference (GLOBECOM), 2012
doi:10.1109/GLOCOM.2012.6503327 [Conference proceedings]

18. Novel Algorithms for Distributed Sequential Hypothesis Testing
K. S. Jithin and Vinod Sharma
IEEE Annual Allerton Conference on Communication, Control, and Computing, 2011
doi:10.1109/Allerton.2011.6120349 [Conference proceedings]

19. A Novel Algorithm for Cooperative Distributed Sequential Spectrum Sensing in Cognitive Radio
Jithin K. Sreedharan and Vinod Sharma
IEEE Wireless Communications and Networking Conference (WCNC), 2011
doi:10.1109/WCNC.2011.5779420 [Conference proceedings]

20. Cooperative Distributed Sequential Spectrum Sensing
K. S. Jithin, Vinod Sharma, and Raghav Gopalarathnam
IEEE National Conference on Communication (NCC), 2011
doi:10.1109/NCC.2011.5734763 [Conference proceedings]

Public presentations

Invited Talks

- Indian Institute of Technology - Kanpur, India, July 2020
- Indian Institute of Technology - Delhi, India, July 2020
- Singapore University of Technology and Design, Singapore, May 2020
- Google, Pittsburgh, USA, March 2020
- Wadhwani AI, Mumbai, India, January 2020
- Google Research, Mountain View, USA, November 2019
- Eindhoven University of Technology (TU/e), Eindhoven, Netherlands, May 2019
- Indian Institute of Science, Bangalore, India, April 2019
- Indian Institute of Technology - Madras, India, April 2019
- Indian Institute of Technology - Bombay, India, April 2019
- International Institute of Information Technology, Hyderabad, India, April 2019
- Indian Institute of Technology - Palakkad, India, April 2019
- Indian Institute of Technology - Roorkee, India, February 2019
- Adobe Research, Bangalore, India, May 2018
- Bell Labs Murray Hill, NJ, USA, June 2017
- Dept. of Computer Science, Purdue University, USA, May 2017
- INRIA-Bell Labs common lab seminar, Paris, France, December 2015
- Bell Labs Future X Days, Paris, France, June 2015
- INRIA-Bell Labs common lab seminar, Paris, France, Jan 2015

Conference/Workshop Talks

- SIGKDD, Anchorage, USA, August 2019
- BioKDD, Anchorage, USA, August 2019
- The Web Conference WWW, Lyon, France, April 2018
- SIGMETRICS, Juan-les-Pins, France, June 2016
- INFOCOM, San Fransisco, USA, April 2016
- IEEE Workshop on Complex Networks and their Applications, Marrakech, Morocco, Nov 2014
- INRIA internal seminar series, Sophia Antipolis, France, April 2014
- WCNC, Cancun, Mexico, March 2011
- National Conference on Communication, Bangalore, India, December 2010

Community Service

- COVID-19 modeling and prediction for Indiana state, U.S.A., and Kerala state, India.
- Reviewer: ICDM, NeurIPS, SIGMETRICS, KDD, ISIT, ISMB/ECCB, Performance Evaluation, ACM Transactions on Modeling and Performance Evaluation of Computing Systems, IEEE Transactions on Information Theory, Algorithmica, ACM/IEEE Transactions on Networking, IEEE Transactions on Systems, Man, and Cybernetics: Systems, Physica A, IEEE Transactions on Network Science and Engineering

Computational Skills

Languages: Python, C++, Matlab, R
Machine learning: PyTorch, TensorFlow, Scikit-learn
Data analytics: Numpy, Pandas, Scipy, Matplotlib, Jupyter Notebook, Gurobi Optimizer