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Sreelekha Guggilam

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Education

University at Buffalo, The State University of New York — Buffalo, NY
Ph.D. in Computational Data Science (CDSE), GPA: 4.00/4.00 — Aug 2017 - Feb 2022

- Mentors: Dr. Abani Patra, Dr. Varun Chandola
- Thesis: "Anomaly Detection in Streaming Time-series Database"

University at Buffalo, The State University of New York — Buffalo, NY
Masters in Civil Engineering (Transportation Statistics), GPA: 4.00/4.00 — Aug 2016 - Sept 2017

University at Buffalo and Roswell Park Cancer Institute (RPCI) — Buffalo, NY
Masters in Biostatistics-Bioinformatics, GPA: 3.77/4.00 — Aug 2014 - Sept 2015

- Mentors: Dr. Song Liu, Dr. Jianmin Wang, Dr. Yao Song
- Thesis: "Statistical Assessment of TCGA Ovarian Cancer Sequencing Dataset for Prognostic Utility"

Indian Statistical Institute (ISI) — Bangalore, India
Bachelors in Mathematics (B.Math), First Class Honors — Jul 2011 - May 2014

Technical Skills

Research Focus: Anomaly detection, Large Deviations Theory, Bayesian Non-parametric Models, Mixture Models, Extreme Value Theory, Multivariate Time Series Databases, Streaming Data, High-Dimensional Streams, Open Set Classification, Unsupervised Learning, Life Long Learning Neural Networks, Quantum Computing
Languages: Python, C/C++, SAS, R, SQL, Matlab, Limdep
Tools/Frameworks: Pandas, Numpy, Scipy, SkLearns, Pytorch, TensorFlow, Teradata, NVIDIA Rapids

Professional Experience

Oak Ridge National Lab — Mar 2022 - Present
Research and Development Associate Staff in Machine Learning
National Security Sciences Directorate, Geo-spatial Science and Human Dynamics Division
Focus of study: Human mobility and pattern of life, disease outbreak prediction, EM signals analysis, time-series databases, anomaly detection, spatio-temporal analysis, quantum computing

University at Buffalo — Sept 2019 - Feb 2022
Research Assistant - Anomaly Detection in Streaming High-Dimensional Time Series Database
Institute of Computational Data Science and Department of Computer Science & Engineering
Mentors: Dr. Abani Patra (UB ACM2E Lab, Tufts University), Dr. Varun Chandola (UB Data Science Research Group)
Solved outstanding problems in anomaly detection in evolving data. Among the pioneers in using extreme value theory and large deviations theory to study multivariate anomalies.

1. Integrated Clustering and Anomaly Detection (INCAD):
   - Conceptualized and published an integrated clustering and anomaly detection algorithm (INCAD) for non-parametric, unsupervised anomaly detection in streaming data using extreme value theory
   - Formulated the mathematical framework for extending univariate Generalized Pareto Distribution for high dimensional data
2. Large Deviations Anomaly Detection (LAD):
   - Designed a large deviations theory inspired fast anomaly detection model (LAD) in high-dimensional multivariate time-series database
   - Investigated the impact of local and global policy implementation on COVID-19 trends using LAD
3. LAD Inspired Iterative Training (LIIT):
   - Developed novel low shot training inspired fast training algorithm for artificial neural networks using LAD.

Institute of Computational Data Science, University at Buffalo Sept 2017 - Sept 2019
Teaching Assistant
Mentored students and fulfilled responsibilities as a Head TA for graduate courses: Programming and Database Fundamentals for Data Scientists (EAS 503), Introduction to Probability Theory for Data Science (EAS 502), Applications of Data Science: Industry Overview (EAS 504) and Data Science Project (EAS 560).

American Express, World Financial Center NY, USA Nov 2015 - Jun 2016
Risk Manager - Global Corporate Portfolios Risk And Data Analytics for Corporate Credit Portfolios

1. Quantified the change in spending trends in cross-sold clients prior to and post the on-boarding process.
2. Developed and improved risk margins for corporate clients in Global Corporate Payments.
3. Responsible for identifying and monitoring trends in risk-based industries and states to enable risk control actions on the portfolios.

Roswell Park Cancer Institute (RCPI), University at Buffalo (SUNY) Feb 2015 - Sept 2015
Graduate Thesis - Statistical Assessment of TCGA Ovarian Cancer Sequencing Dataset for Prognostic Utility
Mentors: Dr. Song Liu, Dr. Jianmin Wang, Dr. Yao Song (SUNY Buffalo, RPCI)

1. Modeled the hazard rates and survival post ovarian cancer in the TCGA dataset using binary predictors in R.
2. Evaluated the credibility of the TCGA data to study various cancer risk factors and related survival outcomes.
3. Validated the results deduced from the TCGA data with SEER (standard) data results.

Publications

[1] **S. Guggilam**, V. Chandola, and A. Patra, "Large deviations for accelerating neural networks training", *arXiv preprint arXiv:2303.00954*, 2023.

[2] S. Gaikwad, S. Iyer, D. Lunga, T. Yabe, X. Liang, B. Ananthabhotla, N. Behari, **S. Guggilam**, and G. Chi, "Data-driven humanitarian mapping and policymaking: Toward planetary-scale resilience, equity, and sustainability", in *Proceedings of the 28th ACM SIGKDD Conference on Knowledge Discovery and Data Mining*, 2022, pp. 4872–4873.

[3] **S. Guggilam**, "Non-parametric probabilistic anomaly detection in evolving data: Applications to time series", Ph.D. dissertation, State University of New York at Buffalo, 2022.

[4] **S. Guggilam**, V. Chandola, and A. Patra, "Tracking clusters and anomalies in evolving data streams", *Statistical Analysis and Data Mining: The ASA Data Science Journal*, vol. 15, no. 2, pp. 156–178, 2022.

[5] **S. Guggilam**, V. Chandola, and A. K. Patra, "Classifying anomalous members in a collection of multivariate time series data using large deviations principle: An application to covid-19 data", in *Computational Science–ICCS 2022: 22nd International Conference, London, UK, June 21–23, 2022, Proceedings, Part I*, Springer International Publishing Cham, 2022, pp. 133–149.

[6] **S. Guggilam**, V. Tombs, D. Lu, and A. Patra, "Ai/ml assurance: Applications in geospatial sciences ii poster", in *Fall Meeting 2022*, AGU, 2022.

[7] **S. Guggilam**, V. Chandola, and A. Patra, "Anomaly detection for high-dimensional data using large deviations principle", *arXiv preprint arXiv:2109.13698*, 2021.

[8] **S. Guggilam**, S. Zaidi, V. Chandola, and A. Patra, "Bayesian anomaly detection using extreme value theory", *arXiv preprint arXiv:1905.12150*, 2019.

[9] **S. Guggilam**, S. M. A. Zaidi, V. Chandola, and A. K. Patra, "Integrated clustering and anomaly detection (incad) for streaming data", in *Computational Science–ICCS 2019: 19th International Conference, Faro, Portugal, June 12–14, 2019, Proceedings, Part IV 19*, Springer International Publishing, 2019, pp. 45–59.

[10] **S. Guggilam**, *Statistical Assessment of TCGA Ovarian Cancer Sequencing Dataset for Prognostic Utility*. State University of New York at Buffalo, 2015.

Grant Support

- **ORNL Early Career Development Research Award**: Awarded $0.30*M* for 2 Years.
  Title: Quantum Variational Inference for Anomaly Detection in Spatiotemporal Data
  Role: PI (Share - 100%)
  Team: Sreelekha Guggilam
  Duration: Mar, 2023 to Feb, 2025.
- **ORNL Laboratory Directors R&D SEED Funds**: Awarded $0.19*M* for 2 Years.
  Title: Artificial INtelligence Models for Land Cover Forecasting
  Role: Contributor (Share - 3%)
  Team: Christa Brelsford (PI), Philipe Ambrozio Dias (Co-PI), Soumendra Bhnaja (Contributor), Ethan Coon (Contributor), Dalton Lunga (Contributor)
  Duration: Feb, 2023 to Jan, 2025.
- **ORNL Laboratory Directors R&D Funds**: Awarded $0.93*M* for 2 Years.
  Title: Environmental Anomaly Detection for Biopreparedness
  Role: Co-Principal Investigator (Share - 25%)
  Team: Assaf Anyamba (PI), Heidi Tubbs (Co-PI)
  Duration: Feb, 2023 to Jan, 2025.
- **ORNL Laboratory Directors R&D Funds**: Awarded $0.78*M* for 2 Years.
  Title: Pattern of Life for Nuclear Non-proliferation
  Role: Co-Principal Investigator (Share - 22%)
  Team: Debraj De (PI)
  Duration: October, 2022 to September, 2024.

Awards and Scholarships

- Top Downloaded Author in Wiley Journal of Statistical Analysis and Data MIning 2023
- Oak Ridge National Lab Early Career LDRD Competition Winner 2023
- Runner up: STEM for Everyone: Women in STEM Cooperative (WiSC) 2021
- Travel Support: UB Navigate Project for women in STEM 2018
- Travel Support: SAMSI for the workshop on Model Uncertainty: Mathematical and Statistical (MUMS) 2018
- Travel Support: SAMSI for the workshop on Precision Medicine (PMED) 2018
- Honors degree in Mathematics from Indian Statistical Institute 2014
- Full student scholarship (merit-based) throughout the completion of the degree at Indian Statistical Institute 2011–2014

Organising Committees

- AGU 2023 Fall Meeting Session on IN021-I. Earth System Digital Twins: Prototypes and Federations 2023
- AGU 2022 Fall Meeting Session on AI/ML Assurance: Applications in Geospatial Science 2022
- KDD Workshop on Data-driven Humanitarian Mapping 2022
- CDSE Days, Institute of Computational Data Science, SUNY Buffalo 2019
- CDSE Days, Institute of Computational Data Science, SUNY Buffalo 2018

Referee Service

- Data Mining and Knowledge Discovery
- Information Systems
- Journal of Computational Science
- Journal of Hydrology
- IEEE Geoscience and Remote Sensing Letters
- Frontiers in Earth
- Information Sciences

Panelist

- Judge for SCUDEM VII 2022 - Modeling with Differential Equations
- Albert Einstein Distinguished Educator Fellowship (AEF) Program 2022
- Judge for the IGNITE Talks 2023

Workshops and Conferences Talks

- AGU Fall Workshop 2022 2022
- International Conference on Computational Science (ICCS) 2022
- SIAM Stochastic Numerics and Statistical Learning: Theory and Applications Workshop KAUST 2022
- American Statistical Association UP-STAT Conference Buffalo NY 2022
- CDSE Days, Institute of Computational Data Science, SUNY Buffalo, NY. 2022
- CDSE Days, Institute of Computational Data Science, SUNY Buffalo, NY. 2021
- International Conference on Computational Science (ICCS) 2019
- CDSE Days, Institute of Computational Data Science, SUNY Buffalo, NY. 2019
- CDSE Days, Institute of Computational Data Science, SUNY Buffalo, NY. 2018
- National Program on Differential Equations (NPDE) Workshop in IIT Madras 2013

Training and Workshops

- Knowledge and Data Discovery 2023
- Knowledge and Data Discovery 2022
- UB Navigate Project 2018
- Statistical and Applied Mathematical Science Institute (SAMSI) for the workshop on Model Uncertainty: Mathematical and Statistical (MUMS) 2018
- Statistical and Applied Mathematical Science Institute (SAMSI) for the workshop on Precision Medicine (PMED) 2018
- Special Class on Graph Theory, Tata Institute of Fundamental Research (TIFR), Bombay India 2012

Mentorship

- Ruhaan Singh
- Tri Do
- Mikolaj Jakowski

Memberships and Outreach Activities

- Member at Delta Omega Honorary Society in Public Health 2023–Present
- Member at IEEE 2023–Present
- Member at ACM 2023–Present
- Member at AGU 2022–Present
- Member at SIAM 2014–2023
- Student Member at Association for Women in Mathematics (AWM) 2014–2023
- Student Member at Women in STEM Cooperative (WiSC) 2014–2023
- SMIODE 2014–Present
- Student Member at Institute of Actuaries, India 2013–2015
- Volunteer at Youth for Seva (YFS) Fall 2012-2014