

SUMMARY

- Research Scientist passionate about designing **nonlinear optimization algorithms**
- Proficient Libraries: Pandas, NumPy, Gurobi, TensorFlow, PyTorch, Pyomo, CPLEX, Scikit-learn, cvxpy
- Coding Skills: Python, R, Object-Oriented Programming, MATLAB, Bash, Linux
- Major Areas: Numerical Optimization, Stochastic Simulations, Optimal Control, Mathematical Modeling

EDUCATION

- **Ph.D. The University of Texas at Austin, Austin, TX** *Aug 2020 - May 2025*
 - Operations Research and Industrial Engineering, GPA: 4.0/4.0
 - Supervised by Prof Raghu Bollapragada
 - Thesis title : Methods for Large-Scale Constrained Optimization
- **M.S.E. The University of Texas at Austin, Austin, TX** *Aug 2020 - Dec 2023*
 - Operations Research and Industrial Engineering, GPA: 4.0/4.0
- **B.Tech. Indian Institute of Technology Delhi, Delhi, India** *Jul 2016 - May 2020*
 - Production and Industrial Engineering, GPA: 9.067/10

WORK EXPERIENCE

- **Argonne National Lab - MCS Givens Associate** *Jun 2023 - Aug 2023*

Supervised by Jeffery Larson and Matt Menickelly

 - Built solver in Python (NumPy, SciPy) for **noisy derivative free optimization** for quantum computing.
 - Improved upon existing deterministic trust region methods by incorporating adaptive estimation of noise.
 - Achieved up to a **30% reduction in operating cost** to reach desired accuracy in Qiskit quantum simulations.
- **MD Anderson Cancer Center - Financial Planning and Analysis** *Jan 2022 - May 2022*

Graduate Student Intern in Department of Financial Planning and Analysis

 - Modeled medical clinics as a stochastic simulation using Python (NumPy) to analyze doctor schedules.
 - Cleaned and refined patient data to model appointment characteristics such as duration, intervals, cancellations using Gaussian Mixture models (SciPy) for each category of patient, appointment and doctor.
 - Provided evidence for increasing proportion of new patient appointments in schedules to reduce overall wait times.
- **NTU India Connect Scholarship - Data Interface for Smart Manufacturing** *May 2019 - Jul 2019*

Prof. Yeo Swee Hock at Nanyang Technological University, Singapore

 - Awarded a scholarship to pursue research at Nanyang Technological University, Singapore.
 - Built a data collection system for a traditional CNC lathe machine using sensors such as dynamometer, temperature probe, acoustic emissions sensor connected to an OPC-UA server to enable smart machining features.

RESEARCH PROJECTS

- **Retrospective Approximation based Tuning-Free Constrained Stochastic Optimization** *Aug 2023 - Present*

Prof. Raghu Bollapragada at University of Texas, Austin

 - Designing an algorithm for stochastic constrained optimization by building sequential deterministic approximations, each solved using **Sequential Quadratic Programming** for a tuning free second-order stochastic algorithm.
- **Tuning-Free SVRG Optimization Algorithm** *March 2023 - Present*

Prof. Raghu Bollapragada at University of Texas, Austin

 - Designing policies for **adaptive selection** of hyperparameters (step size and inner loop length) in Stochastic Variance Reduced Gradient (SVRG) for **tuning-free stochastic optimization in machine learning**.
 - Illustrated close to tuned parameter performance for initial progress on the algorithm.
- **Decentralized Optimization over Networks** *Jan 2022 - Dec 2023*

Prof. Raghu Bollapragada at University of Texas, Austin

 - Designed a flexible framework for **gradient tracking methods in decentralized optimization** to accommodate varying communication and computation costs in distributed applications and improve overall efficiency.
 - Provided theoretical and empirical evidence of reducing overall cost in synthetic and machine learning problems.

- **Extreme Weather Electric Grid Resilience** Apr 2021 - Sep 2021
Prof. Erhan Kutanoglu and Prof. John Hasenbein at University of Texas, Austin
 - Analyzed preparedness decisions from **stochastic and robust optimization** models (Pyomo, Gurobi) for flooding mitigation for the Texas electric grid under hurricanes Harvey and Imelda using pre-hurricane flooding forecasts.
 - Displayed **discontinuity and unfairness in decisions** from standard load loss minimization objective models.
- **Disaster Resilience Planning Under Uncertainty - A Nexus Approach** Apr 2021 - Jan 2022
Prof. Benjamin Leibowicz at University of Texas, Austin
 - Developed a **two stage stochastic optimization model** for utility resilience planning to extreme weather events incorporating interdependence of water and power utility infrastructures via pumps and water treatment plants.
 - Displayed novelty of modeling interdependence using a case study of Guayama city in Puerto Rico.
- **Reducing Delays in Supreme Court of India** Jul 2019 - Jul 2020
Prof. Ramandeep Randhawa at USC and Prof. Nitin Bakshi at The University of Utah
 - Developed a simulation of the Supreme Court of India and **quantified effects of remedial policies** for delays
 - Modeled duration of hearings using **mixture of Gaussian and Weibull distributions**
 - Designed **queuing network and decision tree** for daily scheduling and processing of cases

PUBLICATIONS

- Working Papers
 - A. Berahas, R. Bollapragada, **S. Gupta**, *Retrospective Approximation for Stochastic Constrained Problems Using Sequential Quadratic Programming*, 2024
 - J. Larson, M. Menickelly, **S. Gupta**, *A practical Noisy DFO solver for expensive function oracles*, 2024
 - A. Berahas, R. Bollapragada, **S. Gupta**, J. Shi, *Adaptive SVRG : Tuning Free Stochastic Optimization with Variance Reduction*, 2024
- Under Review
 - A. Berahas, R. Bollapragada, **S. Gupta**, *A Flexible Gradient Tracking Algorithmic Framework for Decentralized Optimization*, 2023, Under Review, <http://arxiv.org/abs/2312.06814>
 - A. Berahas, R. Bollapragada, **S. Gupta**, *Balancing Communications and Computations in Gradient Tracking Algorithms*, 2023, Under Review, <https://arxiv.org/pdf/2303.14289>
- Conference and Journal Publications
 - R. Moglen, J. Barth, **S. Gupta**, E. Kawai, K. Klise, B. Leibowicz, *A Nexus Approach to Infrastructure Resilience Planning under Uncertainty*, 2023, Reliability Engineering and System Safety, <https://www.sciencedirect.com/science/article/abs/pii/S0951832022005464>
 - B. Austgen, **S. Gupta**, E. Kutanoglu, J. Hasenbein, *Stochastic Hurricane Flood Mitigation for Power Grid Resilience, Best Paper Session*, 2022 IEEE Power and Energy Society General Meeting (PESGM) <https://ieeexplore.ieee.org/document/9916992>

PRESENTATIONS

- Invited Talks
 - **25th International Symposium on Mathematical Programming (July, 2024): Retrospective Approximation for Stochastic Constrained Problems Using Sequential Quadratic Programming**, (Upcoming)
 - **Inform's Optimization Society Conference 2024 (March, 2024): Retrospective Approximation for Stochastic Constrained Problems Using Sequential Quadratic Programming**, (Upcoming)
 - **Inform's Annual Meeting 2023 (Oct, 2023): Balancing Communications and Computations in Gradient Tracking Algorithms**
 - **SIAMS Optimization Conference (May, 2023): Balancing Communications and Computations in Gradient Tracking Algorithms**
 - **Inform's Annual Meeting 2022 (Oct, 2022): Balancing Communications and Computations in Gradient Tracking Algorithms**
- Conference Presentations
 - **Midwest Optimization Meeting (Oct, 2023): Balancing Communications and Computations in Gradient Tracking Algorithms**
- Seminars
 - **Reimagining Professional Development, TCE, UT Austin (Feb, 2024): A Guide to Using AI Tools in Daily Workflows**, (Upcoming)

AWARDS

- **Reimagining Professional Development Award** from the Texas Career Engagement at UT Austin 2024
- **Travel Award** for support to present my research at the 2023 Midwest Optimization Meeting 2023
- **NTU India-Connect Scholarship:** Awarded opportunity to pursue pre-final year internship in Singapore 2019
- **Awarded Certificate of Appreciation** for development of Smart Manufacturing Modules, Industry Day, IITD 2018
- **IITD Semester Merit Award** for being among the top 7% academic performers of the institute twice 2017 - 2018
- Amongst **top 3% quarterfinalists** in India Innovation Challenge Design Contest by Texas Instruments and IIMB 2018

SOFTWARE

- **Optimization Problems**
 - A collection of problems for testing various optimization algorithms.
 - Synthetic and real world problems for unconstrained and constrained, and deterministic and stochastic problems.
- **Gradient Tracking Algorithmic Framework**
 - Implementation for optimization algorithms for the Manuscript for testing and result recreation.

OTHER ACTIVITIES

- **Student Organizations : University of Texas at Austin**
 - Treasurer for Informs Student Chapter *Fall 2022 - Present*
 - Treasurer for Mechanical Engineering Graduate Student Board *Fall 2022 - Spring 2023*
 - Member of Informs Student Chapter *Fall 2020 - Spring 2022*
 - Member of Mechanical Engineering Graduate Student Board *Fall 2020 - Spring 2022*
- **Graduate Teaching Assistant, UT Austin**
 - CE 311S: Probability and Statistics for Civil Engineers *Fall 2021*
 - ME 353: Engineering Finance *Summer 2021*
 - ME 335: Engineering Statistics *Spring 2021*