ANIRUDDHA SAHA

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EDUCATION

Cornell University — Ithaca, NY
Ph.D. in Mechanical Engineering (Minor in Computational Sciences); GPA: 3.96/4.0 — *Aug 2021 - Dec 2025*

Relevant Courses: Financial Engineering, Stochastic Processes, Mathematical Programming, Causal Machine Learning, Strategic Management of Technology and Innovation, Risk Simulation & Monte Carlo Methods, Financial Markets.

Teaching Assistantship: Ordinary and Partial Differential Equations, Combustion Processes.

Indian Institute of Technology (IIT) — Kharagpur, India
Bachelor of Technology (Honours), Mechanical Engineering; GPA: 4.0 (Top department rank holder) — *Aug 2017 - May 2021*

Relevant Courses: Linear Algebra, Probability and Statistics, Financial Markets, Perturbation Analysis, Tensor Algebra, Soft Computing, Robots and Computer Controlled Machines, Programming and Data Structures.

RELEVANT EXPERIENCE

Sobhani-Lab, Cornell University | Doctoral Candidate — Ithaca, NY | *Oct 2021 - Present*

– **Development of Proprietary Multiphysics Solver:**
- Engineered a new C++/python based multiphysics solver for stiff partial differential equations using finite volume method (FVM).
- Implemented spatial averaging and solved elliptic equations using Preconditioned Conjugate Gradient method for symmetric positive definite matrices and highly nonlinear and non-symmetric equations are solved with implicit Backward Euler.
- The solver has been bench-marked using experimental data and has a running time < 5 minutes as compared to running times > 30 mins.

– **Analytical Modeling of Time-varying Flows:**
- Derived and implemented new mathematical models to solve Integral-differential equations using 2nd order Runge-Kutta method for flows.
- Researched and developed a stochastic optimization technique from scratch to perform a Fourier coefficient optimization on the flow and optimized performance through iterative fitting and error minimization to maximize flow control in complex geometries.

Cornell University | Class Project: ORIE 5630 - Portfolio Optimization — Ithaca, NY | *August 2024 - Dec 2024*
- Applied Markowitz theory using R to enhance return-to-risk ratios and achieve optimal asset allocation to maximize returns over 10+ stocks.
- Utilized t-distribution fitting to model return distributions, validating assumptions with Q-Q plots. Conducted time-series analysis to uncover trends and patterns in stock returns using auto-regressive and moving average models.

ANSYS | Application Engineering Intern — Austin, TX | *May 2024 - August 2024*
- Coded a novel method to convert grayscale pixel data into a weight matrix, automating the detection of geometric features for calculation.
- Engineered algorithms using pyEDB-based API producing unique thermal conductivity tensor, automating and improving existing models.
- Integrated advanced map data structures and computational geometry methods to efficiently handle >1000000 data points and spearheaded integration with Ansys Icepak using PySide6, achieving complex PCB processing <1 minute for reduced order model.

Cornell University | Class Project: ORIE 5600 - Geometric Brownian Motion — Ithaca, NY | *January 2024 - May 2024*
- Applied Monte Carlo simulations using Geometric Brownian Motion (GBM) to model the stochastic behavior of crop prices.
- Simulated correlated crop price movements to predict revenue volatility, informing probabilistic financial statements and cash flow analysis.

NASA Ames Research Center | Software Development Intern — Mountain View, CA | *Jun 2023 - Aug 2023*
- Collaborated with computational teams on PuMA (NASA multiphysics software) using Object-Oriented Python using deterministic and probabilistic methods to enhance numerical accuracy in evaluating integrals over 3D space, effectively handling voids within the boundary.
- Implemented an advanced Monte-Carlo algorithm that integrates the domain < 3 seconds which is 100X faster than previous versions.
- Conducted research on the convolution of kernel functions to effectively filter out periodicity in data for studying statistical mean properties.

ADDITIONAL EXPERIENCE

Heat Inverse | Software Development Intern — Ithaca, NY | *July 2022 - Dec 2022*
- Enhanced and optimized the codebase for modeling passive cooling systems that transmit specific wavelengths of electromagnetic radiation by utilizing Lowtran and Macromax packages in Python.

Indian Institute of Science | Computational Modeling Researcher — Bengaluru, India | *May 2019 - July 2021*
- Derived and published the first work on a mathematical model of coalescence of in fluids with non-linear stress tensors with memory. Developed high performance computing codes to study matter in atomic scales by modeling potential fields and designing particle tracking.

SKILLS & AWARDS

- **Tools:** Python, R, C++, Probability, Statistical Analysis, MATLAB
- **International Collaboration:** ISIP 2020 Princeton University | DAAD Fellowship, Germany (2020) | UTokyo-ESEP Fellowship (2020)
- **Science Olympiad:** KVPY Fellow [top 500 among 100K+ aspirants] (Dept. of Science, Govt of India) (2017)

SELECTED PUBLICATIONS & CONFERENCES [Link]

- **Saha, A.**, DiReda, N., Sobhani, S. (2024). Numerical model of flame stability enhancement in topology graded burners, Proc.C.Institute, (40) 105703
- Varma, S. C., **Saha, A.**, Kumar, A. (2021). Coalescence of polymeric sessile drops on a partially wettable substrate. Physics of Fluids,33(12),123101
- Varma, S. C., **Saha, A.**,...Chakraborty, S. (2020). Universality in coalescence of polymeric fluids. Soft Matter, 16(48), 10921-10927.
- **Saha, A.**, Sobhani, S. (2023). Numerical modeling of heterogeneous PMBs using volume-averaged method. RemPlex 2023 Global Summit, PNNL