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Aniket Deshpande

My interests lie in mathematical and statistical methods for quantum information, namely tensor network methods, random matrix theory, and representation theory. I also enjoy learning about mathematical finance and theoretical neuroscience.

Education

University Of Illinois, Urbana-Champaign — Urbana, IL

B.S. Physics, Specialization in Mathematical Physics — 2023 - 2027 *(expected)*

- *Relevant Coursework:*

  Undergraduate: Quantum Mechanics I, Electromagnetic Fields I, Classical Mechanics I & II, Special Relativity & Mathematical Methods, Stochastic Processes, Real Analysis, Differential Equations, Abstract Linear Algebra

  Graduate-level: Differentiable Manifolds I, Real Analysis, Representation Theory for Quantum Information, Quantum Information Processing

- Minors in Mathematics and Scientific Computing

Talks

Quantum Circuit Volume for Graph Models, *Illinois Math Lab Open House* *12.2024*

Poster developed through the *Illinois Mathematics Lab*; available on website.

Research

Computation & Neurodynamics Lab | Urbana, IL — 01.2025 - Present

- Developing and applying neural-symbolic regression techniques to uncover interpretable mathematical models from complex datasets, enhancing understanding of underlying neural mechanisms.
- PI: Dr. Matthew Singh

Lab for Numerical Parallel Algorithms | Urbana, IL — 09.2024 - Present

- Performing research in quantum complexity and quantum Monte Carlo methods for tensor networks.
- Implementing Monte Carlo methods for contractions (traces, etc.) of arbitrary tensor networks.
- PI: Dr. Edgar Solomonik

Polymer Physics Theory Group | Urbana, IL — 08.2024 - 01.2025

- Performed computational simulations of free-draining bottle brush polymers with explicit side-chains using a coarse-grain model
- Refactored and improved coarse-grain model using stochastic differential equations and brownian motion results. Implemented the model in `C`.
- Visualized relationships between various physical attributes of the bottle brush polymers in `Python`.

Industry

Space Dynamics Laboratory | Ionospheric Analyst Intern — 05 - 08.2024

- Developed a `Python` scraper to expedite the data collection of NICT ionograms to 600+ ionograms downloaded per hour.
- Researched numerical analysis methods to improve the noise reduction of ionograms using various filtering methods. Implemented filters in `Python` and `Julia` and ran statistical analysis (PSNR, MSE, SSIM) to compare efficiencies.
- Researched methods to improve automatic ionogram scalers using deep learning architecture (CNNs) and techniques.

Skills

Programming: Python, C/C++, Java, Julia, Mathematica

Libraries: Matplotlib, SciPy, NumPy, Pandas

Utilities: Anaconda, Git, Jupyter, Shell, LaTeX