Tathagata Karmakar

Andrew N. Jordan ⬀ group

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Interests

Open quantum systems, machine learning in physics, quantum measurements, tensor network representations, quantum optics, superconducting circuits, superconductivity.

Programming languages: Python (5+yrs, PyTorch, JAX), Mathematica (5+ yrs), QuTiP.

Education

- Ph.D., Department of Physics and Astronomy, University of Rochester   *2018–present*
- BS Physics CPI: 9.9/10, Indian Institute of Technology, Kanpur   *2014–2018*

Professional Appointments

- Affiliated student researcher, Chapman University.   *Aug. 2021–present*
- Research Intern, PHI Lab, NTT Research, Inc., Sunnyvale, CA.   *Jul. –Sep. 2023*
- Summer research assistant, CCA, Simons Foundation, NYC.   *May – Jul., 2017*

Selected Publications

[1] Sethuraj K. R., **T. Karmakar**, A. N. Jordan and A. N. Vamivakas, and "Experimental realization of supergrowing fields", arXiv: 2309.00016 (2023).

[2] **T. Karmakar**, A. Chakraborty, A. N. Vamivakas and A. N. Jordan, "Supergrowth and sub-wavelength object imaging", Opt. Exp. **31**, 37174-37185 (2023).

[3] **T. Karmakar** and A. N. Jordan, "Beyond Superoscillation: General Theory of Approximation with Bandlimited Functions", J. Phys. A: Math. Theor. (2023).

[4] **T. Karmakar**, É. Jussiau, S. K. Manikandan, and A. N. Jordan, "Cyclic superconducting quantum refrigerators using guided fluxon propagation", arXiv: 2212.00277 (2022).

[5] **T. Karmakar**, P. Lewalle, and A. N. Jordan, "Stochastic path-integral analysis of the continuously monitored quantum harmonic oscillator", PRX Quantum **3**, 010327 (2022).

Research Experience

- **ML based Model reduction, NTT Research, Inc.**   *Jul. 2023 – Sep. 2023*

    - Built a neural operator based learning architecture that can solve for the dynamics of 256 quantum harmonic oscillators simultaneously.

- **Superoscillations and supergrowth [1–3].**   *Jun. 2022 – Jun. 2023*

    - Developed an algorithm to generate functions with arbitrary superoscillation/supergrowth by choosing the values of only the first two coefficients in a series expansion.
    - Developed an algorithm to reconstruct objects that are an order of magnitude smaller than the illuminating wavelength.
    - Collaborated on the experimental realization of supergrowing optical fields.

- **Stochastic path integral [5].**   *Jan. 2020 – Mar. 2021*

    - Formulated a stochastic action based description of a quantum harmonic oscillator and confirmed analytical findings with 100,000 simulated trajectories.

Teaching

- Teaching assistant, 20th Century Physics (Jan.–Apr. 2018).
- Teaching assistant, Gravitation & General Relativity (Aug.–Nov. 2018).

Selected Coursework

Quantum optics I and II (UR), Graph theory (IIT Kanpur).