Tathagata Karmakar

Andrew N. Jordan ↗ group

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Expertise

Theoretical quantum optics, machine learning in physics, quantum measurement, superresolution imaging, analytical/numerical modeling and optimization.
Programming languages: Python (PyTorch, JAX, 5+ yrs), Mathematica (5+ yrs), QuTiP.

Education

- Ph.D., Department of Physics and Astronomy, University of Rochester *2018–2024*
- BS Physics CPI: 9.9/10, Indian Institute of Technology, Kanpur *2014–2018*

Internships & academic affiliations

- Postdoctoral scholar, Department of Chemistry, UC Berkeley. *Oct. 2024–Ongoing*
- Research Intern, PHI Lab, NTT Research, Inc., Sunnyvale, CA. *Jul. –Sep. 2023*
- Affiliated student researcher, Chapman University. *Aug. 2021–present*
- 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", Phys. Rev. Research **6**, L032043 (2024).

[2] **T. Karmakar**, É. Jussiau, S. K. Manikandan, and A. N. Jordan, "Cyclic superconducting quantum refrigerators using guided fluxon propagation", Phys. Rev. Research, **6**, 013085 (2024).

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

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

[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

- **Superoscillations and supergrowth [1–3].** *Jun. 2022 – Jun. 2023*
  - Collaborated on the first-ever experimental synthesis of supergrowing optical fields.
  - Developed a numerical algorithm for subwavelength object reconstruction using superoscillatory/supergrowing point spread functions.
  - Prescribed a Legendre polynomial-based algorithm for generating functions with arbitrary superoscillatory/supergrowing properties.
- **Fluxon refrigerator [4].** *Apr. 2021 – Dec. 2022*
  - Devised and optimized a refrigeration scheme utilizing the flow of magnetic field vortices along a magnetic field gradient in a type-II superconducting device.
- **Stochastic path integral [5].** *Jan. 2020 – Mar. 2021*
  - Formulated and optimized a stochastic action principle based description of a harmonic oscillator and confirmed analytical findings with 100,000 simulated trajectories.

Other Experiences

- Mentor, PASSAGE, Dept. of Physics and Astronomy, University of Rochester (2020-2021).
- Teaching assistant, Dept. of Physics and Astronomy, University of Rochester (2018-2019).