Tathagata Karmakar

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Expertise

Quantum optics, qubits, open quantum systems, quantum optimal control, simulations of open quantum systems, machine learning in physics, quantum measurements.
Programming skills: 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] **T. Karmakar**, É. Jussiau, S. K. Manikandan, and A. N. Jordan, "Cyclic superconducting refrigerators using guided fluxon propagation", Phys. Rev. Research, **6**, 013085 (2024).
[2] Sethuraj K. R., **T. Karmakar**, S. A. Wadood, A. N. Jordan and A. N. Vamivakas, and "Experimental realization of supergrowing fields", arXiv: 2309.00016 (2023).
[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

- **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 [2–4].** *Jun. 2022 – Jun. 2023*
  - Developed an algorithm to reconstruct objects that are an order of magnitude smaller than the illuminating wavelength.
- **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.

Selected Presentations

- *Supergrowing Optical Fields: Subwavelength Imaging and Experimental Synthesis* , Chapman University, Oct. 2023.
- *Stochastic path integral analysis of a harmonic oscillator undergoing continuous measurements* , Quantum Thermodynamics Conference, Jun. 2022.
- *Tomography of a Continuously Monitored Qubit*, APS March meeting, Mar. 2022.

Selected Courseworks

Quantum optics I and II, Quantum physics, Computational Physics.