Tathagata Karmakar

Andrew N. Jordan group

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Expertise

Quantum optimal control, open quantum systems, open quantum systems, .
Programming languages: Python (PyTorch, JAX), Mathematica, 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]**T. Karmakar** and A. N. Jordan, "CDJ-Pontryagin Optimal Control for General Continuously Monitored Quantum Systems", arXiv: 2504.08173 (2025).

[2] Sethuraj K. R., **T. Karmakar**, A. N. Jordan and A. N. Vamivakas, and "Experimental realization of supergrowing fields", Phys. Rev. Research **6**, L032043 (2024).

[3] **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).

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

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

[6] **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

- **Noise canceling feedback:** *2024 – Ongoing*
  - Designed feedback protocols to generate deterministic dynamics in continuously monitored systems.
  - Applied noise-canceling feedback for 5-to-1 magic state distillation based on [[5, 1, 3]] code.
  - Showed that noise-canceling feedback leads to a 300-400% boost in successful distillation probabilities.
- **Quantum optimal control [1]:** *2023 – 2025*
  - Generalized Pontryagin maximum principle to find the optimal control for general continuously monitored systems.
  - Solved for optimal control for oscillator state preparation problems, such as binomial codeword preparation, parametric cooling, and cat state to cat state transformation.
  - Showed that optimal control protocols lead to a 40-190% increase in the number of trajectories reaching the target state.
- **Stochastic path integral [6]:** *2020 – 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).