

Tathagata Karmakar

Andrew N. Jordan  group

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<https://tathagata-karmakar.github.io/>

INTERESTS

Open quantum systems, continuous measurements, tensor network approaches, machine learning approaches in physics.

EDUCATION

Ongoing Ph.D., Physics and Astronomy, University of Rochester.
2020 M.A., Physics and Astronomy, University of Rochester.
2018 BS, Physics CPI: 9.9/10, IIT Kanpur.

PROFESSIONAL APPOINTMENTS

2021–Ongoing Affiliated student researcher, Chapman University.
Jul.–Sep. 2023 Research Intern, PHI Lab, NTT Research, Inc., CA.
2017 Summer research assistant, CCA, Simons Foundation.

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., **56** 495204 (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

2023–Ongoing **ML based Model reduction, NTT Research, Inc.**
Built a neural operator based learning architecture that can solve for the dynamics of 256 quantum harmonic oscillators simultaneously.

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

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.

2020-2021 **Stochastic path integral [5]**

Formulated a stochastic action principle-based description of a continuously monitored harmonic oscillator.

PROGRAMMING EXPERIENCE

Python (5+yrs, PyTorch, JAX), Mathematica (5+ yrs), QuTiP, Fortran, C.

SELECTED TALKS

- Oct. 2023* *Supergrowing Optical Fields: Subwavelength Imaging and Experimental Synthesis* \square , Chapman University.
- Aug. 2023* *A discussion on quantum convolutional neural networks*, PHI Lab, NTT Research, Inc.
- Jun. 2022* *Stochastic path integral analysis of a harmonic oscillator* \square , Quantum Thermodynamics Conference.
- Mar. 2022* *Tomography of a Continuously Monitored Qubit*, APS March Meeting.

AWARDS AND FELLOWSHIPS

- 2020* Okubo Prize, Department of Physics and Astronomy, UR.
- 2018-2020* Robert L. and Mary L. Sproull fellow, UR.
- 2017* S. N. Bose Scholar (WSF, DST Govt. of India, IUSSTF).
- 2016* Academic Excellence Award (dean's office, IIT Kanpur).
- 2015* Academic Excellence Award (dean's office, IIT Kanpur).
- 2014-2018* KVPY fellow, DST, Govt. of India.

SUMMER SCHOOLS

- Jun. 2023* Quantum Connections, Stockholm, Sweden.
- Jun. 2022* Solstice of Foundations, ETH Zürich.
- Aug. 2021* Quantum Thermodynamics (online), ETH Zürich.

TEACHING EXPERIENCE

- Jan.-Apr. 2019* Teaching assistant, 20th Century Physics.
- Aug.-Nov. 2018* Teaching assistant, Gravitation and General Relativity.

PEER-REVIEWER/REFEREE

Phys. Rev. A, Annals of Physics, npj Quantum Information, Applied Physics Letters.