

# Tathagata Karmakar

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## Expertise

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Quantum optics, quantum measurement, path integral formulation, dyne detections, superconductivity, superresolution imaging, analytical/numerical modelling and optimization.

**Programming languages:** Python (5+ yrs), Mathematica (5+ yrs), Fortran, C.

## Education

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- 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*

## Academic Affiliations

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- Affiliated student researcher, Chapman University *Fall 2021–present*
- Graduate student, University of Rochester *Fall 2018–present*
- Summer research assistant,  
Center for Computational Astrophysics (CCA), Simons Foundation *May – July, 2017*

## Awards & Achievements

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- Okubo prize (one of the two graduate students awarded for best performance on the most recent preliminary assessment), Department of Physics and Astronomy, University of Rochester, 2020.
- Robert L. and Mary L. Sproull fellow (officially the most prestigious fellowship awarded to incoming Ph.D. students by the University of Rochester), 2018–20.
- S.N. Bose scholar (by Winstep forward, SERB DST Govt. of India and IUSSTF), 2017.
- Academic Excellence Award for outstanding performance in academic years 2014–15 and 2015–16 (dean's office, IIT Kanpur).
- All India rank: 15, KVPY (SB) 2013 (Kishore Vaigyanik Protsahan Yojana, fellowship funded by Dept. of Science and Technology, Govt. of India), granted fellowship 2014–18.

## Publications

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- [1] **T. Karmakar**, É. Jussiau, S. K. Manikandan, and A. N. Jordan, “Cyclic superconducting quantum refrigerators using guided fluxon propagation”, 10.48550/ARXIV.2212.00277 (2022).
- [2] **T. Karmakar**, P. Lewalle, and A. N. Jordan, “Stochastic path-integral analysis of the continuously monitored quantum harmonic oscillator”, PRX Quantum **3**, 010327 (2022).
- [3] **T. Karmakar**, S. Genel, and R. S. Somerville, “The relationship between galaxy and halo sizes in the Illustris and IllustrisTNG simulations”, Monthly Notices of the Royal Astronomical Society, stad178 (2023).
- [4] **T. Karmakar** and T. Sarkar, “Distinguishing Between Kerr and Rotating JNW Space-Times via Frame Dragging and Tidal Effects”, General Relativity and Gravitation **50**, 85 (2018).

## Work in Progress

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- Superoscillation, supergrowth and superresolution imaging.
- Tomography of a continuously monitored qubit coupled to a resonator.

## Peer-reviewer/Referee

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

## Presentations

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- *Stochastic path integral analysis of a harmonic oscillator undergoing simultaneous continuous position and momentum measurements*  $\square$  , Quantum Thermodynamics Conference, June 30, 2022.
- *Tomography of a Continuously Monitored Qubit*, APS March Meeting 2022.
- *A discussion on 36 entangled officers of Euler*  $\square$  , Institute for Quantum Studies, Chapman University, March 08, 2022.
- *Stochastic path integral analysis of a harmonic oscillator undergoing simultaneous continuous position and momentum measurements*  $\square$  , Institute for Quantum Studies, Chapman University, September 13, 2021.
- *Stochastic Path Integral Analysis of the Continuously Monitored Simple Harmonic Oscillator*, APS March Meeting 2021.
- *Simultaneous Weak-Continuous Position and Momentum measurements of a Harmonic Oscillator*, Graduate Student Research Meeting, University of Rochester, February 13, 2021.
- *Optical Field Quadrature Measurements: Introduction to Homodyne and Heterodyne Detections*, with Dr. Philippe Lewalle, University of Rochester, January 18, 2021.

## Summer Schools

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- Solstice of Foundations summer school (in person) organized by the Quantum Center, ETH Zürich. *June 2022.*
- Quantum thermodynamics summer school (online) organized by the Quantum Center, ETH Zürich. *August 2021.*

## Teaching and Mentorship Experiences

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- **PASSAGE mentorship program, University of Rochester (2020-2021):** Mentored a newly admitted Ph.D. student and ensured their smooth transition to graduate school.
- **Teaching assistant, 20th Century Physics (Spring 2019):** Administered workshops for 50+ freshmen students, introduced them to quantum physics, designed problems.
- **Teaching assistant, Gravitation & General Relativity (Fall 2018):** Graded assignments and conducted office hours for 20+ senior/junior undergraduates.

## Selected Coursework

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### University of Rochester:

Quantum optics I and II

Statistics and data analysis

Condensed matter physics I and II

**Coursera:** Machine learning by Andrew Ng

### Indian Institute of Technology, Kanpur:

Graph theory

Computational methods in engineering

Computational physics

Optics