Stanford



Raghu Mahajan

Visiting Assistant Professor, Physics

Bio

ACADEMIC APPOINTMENTS

- Visiting Assistant Professor, Physics

HONORS AND AWARDS

- Stanford Graduate Fellowship, Stanford University (2012)
- Tyson Medal, University of Cambridge (2012)
- Gates Cambridge Scholarship, Bill and Melinda Gates Foundation (2011)
- Joel Matthew Orloff Award for Scholarship, Massachusetts Institute of Technology (2011)
- Aditya Birla Scholarship, Aditya Birla Group (2006)

PROFESSIONAL EDUCATION

- SB, Massachusetts Institute of Technology , Physics and Mathematics (2011)
- MASt, University of Cambridge , Theoretical Physics (2012)

LINKS

- My Stanford Page: http://web.stanford.edu/~rm89/

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

My research interests are wide-ranging:

1) In the context of gravity, how does spacetime emerge from its dual quantum system? How does the dual quantum system encode the answers to questions that involve local physics in semi-classical gravity? How do you avoid the "firewall" paradox in the context of black-hole evaporation?

2) How do you calculate electrical and heat currents in strongly-coupled many-body systems? How do you explain the linear-in-temperature resistivity in high-temperature cuprates?

3) Use tensor network methods to study electrical and heat transport and also the real-time dynamics of systems out of thermal equilibrium.

Teaching

COURSES

2024-25

- Topics in High Energy Theory: Introduction to Worldsheet String Theory: PHYSICS 452 (Spr)

Publications

PUBLICATIONS

- **Normalization of ZZ instanton amplitudes in type 0B minimal superstring theory** *JOURNAL OF HIGH ENERGY PHYSICS*
  Chakrabhavi, V., Eniceicu, D., Mahajan, R., Murdia, C.
  2024
- **Instantons in sine-Liouville theory** *JOURNAL OF HIGH ENERGY PHYSICS*
  Alexandrov, S., Mahajan, R., Sen, A.
  2024
- **Complex eigenvalue instantons and the Fredholm determinant expansion in the Gross-Witten-Wadia model** *JOURNAL OF HIGH ENERGY PHYSICS*
  Eniceicu, D., Mahajan, R., Murdia, C.
  2024
- **The ZZ annulus one-point function in non-critical string theory: A string field theory analysis** *JOURNAL OF HIGH ENERGY PHYSICS*
  Eniceicu, D., Mahajan, R., Maity, P., Murdia, C., Sen, A.
  2022
- **Multi-instantons in minimal string theory and in matrix integrals** *JOURNAL OF HIGH ENERGY PHYSICS*
  Eniceicu, D., Mahajan, R., Murdia, C., Sen, A.
  2022
- **Normalization of ZZ instanton amplitudes in minimal string theory** *JOURNAL OF HIGH ENERGY PHYSICS*
  Eniceicu, D., Mahajan, R., Murdia, C., Sen, A.
  2022
- **Sphere and disk partition functions in Liouville and in matrix integrals** *JOURNAL OF HIGH ENERGY PHYSICS*
  Mahajan, R., Stanford, D., Yan, C.
  2022
- **The double cone geometry is stable to brane nucleation** *JOURNAL OF HIGH ENERGY PHYSICS*
  Mahajan, R., Marolf, D., Santos, J. E.
  2021
- **Free fermion entanglement with a semitransparent interface: he effect of graybody factors on entanglement islands** *SCIPOST PHYSICS*
  Kruthoff, J., Mahajan, R., Murdia, C.
  2021; 11 (3)
- **Comments on the quantum field theory of the Coulomb gas formalism** *JOURNAL OF HIGH ENERGY PHYSICS*
  Kapec, D., Mahajan, R.
  2021
- **Recent Progress on the Black Hole Information Paradox Computation of the Page Curve** *RESONANCE-JOURNAL OF SCIENCE EDUCATION*
  Mahajan, R.
  2021; 26 (1): 33–46
- **Density matrices in quantum gravity** *SCIPOST PHYSICS*
  Anous, T., Kruthoff, J., Mahajan, R.

2020; 9 (4)

- **Matrix ensembles with global symmetries and 't Hooft anomalies from 2d gauge theory** *JOURNAL OF HIGH ENERGY PHYSICS*
  Kapec, D., Mahajan, R., Stanford, D.
  2020
- **Upper Bound on Diffusivity.** *Physical review letters*
  Hartman, T., Hartnoll, S. A., Mahajan, R.
  2017; 119 (14): 141601
- **Late-time structure of the Bunch-Davies FRW wavefunction** *JOURNAL OF HIGH ENERGY PHYSICS*
  Konstantinidis, G., Mahajan, R., Shaghoulian, E.
  2016
- **Transport in Chern-Simons-matter theories** *JOURNAL OF HIGH ENERGY PHYSICS*
  Gur-Ari, G., Hartnoll, S., Mahajan, R.
  2016
- **Connecting entanglement in time and space: Improving the folding algorithm** *PHYSICAL REVIEW A*
  Hastings, M. B., Mahajan, R.
  2015; 91 (3)
- **Holographic mutual information and distinguishability of Wilson loop and defect operators** *JOURNAL OF HIGH ENERGY PHYSICS*
  Hartnoll, S. A., Mahajan, R.
  2015
- **Chern-Simons-Ghost theories and De Sitter space** *JOURNAL OF HIGH ENERGY PHYSICS*
  Anninos, D., Mahajan, R., Radicevic, D., Shaghoulian, E.
  2015
- **Transport near the Ising-nematic quantum critical point of metals in two dimensions** *PHYSICAL REVIEW B*
  Hartnoll, S. A., Mahajan, R., Punk, M., Sachdev, S.
  2014; 89 (15)
- **Quantum critical metals in d=3+1 dimensions** *PHYSICAL REVIEW B*
  Mahajan, R., Ramirez, D. M., Kachru, S., Raghu, S.
  2013; 88 (11)
- **Non-Fermi liquids and the Wiedemann-Franz law** *PHYSICAL REVIEW B*
  Mahajan, R., Barkeshli, M., Hartnoll, S. A.
  2013; 88 (12)

PRESENTATIONS

- The entropy of Hawking radiation - IIT Chennai