

# Archisman Panigrahi

Graduate Student · Physics

Massachusetts Institute of Technology, Cambridge, MA, USA

+1 (857) 706-9484 | [archi137@mit.edu](mailto:archi137@mit.edu) | [archisman-panigrahi.github.io](https://github.com/archisman-panigrahi) | [Google Scholar Profile](#)

## Education

### Ph.D. in Physics

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

- C.G.P.A - 5.0/5.0

Supervisor: Prof. Leonid Levitov

Cambridge, MA, USA

August 2022 - Ongoing

### Master of Science in Physics

INDIAN INSTITUTE OF SCIENCE

- C.G.P.A - 9.8/10.0

Bangalore, India

Aug. 2021 - Jun. 2022

### Bachelor of Science (Research) in Physics

INDIAN INSTITUTE OF SCIENCE

- C.G.P.A - 9.8/10.0

Bangalore, India

Aug. 2017 - Jun. 2021

## Research Articles

- A. Panigrahi, L. Levitov; *Signatures of electronic ordering in transport in graphene flat bands* [Phys. Rev. B \*\*110\*\*, 035122 \(2024\)](#)
- M. Masseroni, M. Gull, A. Panigrahi, N. Jacobsen, F. Fischer, C. Tong, J. D. Gerber, M. Niese, T. Taniguchi, K. Watanabe, L. Levitov, T. Ihn, K. Ensslin, H. Duprez; *Spin-orbit proximity in MoS<sub>2</sub>/bilayer graphene heterostructures* [arxiv:2403.17120](#) (Under review in Nature Communications)
- A. Panigrahi, S. Mukerjee; *Energy magnetization and transport in systems with a non-zero Berry curvature in a magnetic field* [SciPost Phys. Core \*\*6\*\*, 052 \(2023\)](#)
- A. Panigrahi, V. Juričić, B. Roy; *Projected Topological Branes* [Commun Phys \*\*5\*\*, 230 \(2022\)](#)
- A. Panigrahi, R. Moessner, B. Roy; *Non-Hermitian dislocation modes: Stability and melting across exceptional points* [PRB \*\*106\*\*, L041302 \(2022\)](#)

## Research Experience

### Transport in ordered phases in graphene

WITH PROF. LEONID LEVITOV

- Predicted that momentum-polarized nematic phases in biased bilayer graphene can lead to resistance decreasing with rising temperature
- Demonstrated hysteresis-like switching behavior under the action of a strong electric field

MIT, Cambridge, MA, USA

March 2023 –

### Many Body Localization (MBL) and thermalization of interacting quantum spin chain

WITH PROF. SUBROTO MUKERJEE

- Studied how the Out-of-Time Ordered Correlator (OTOC) behaves for MBL and thermal systems
- Studied behavior of OTOC in MBL systems with random and incommensurate potential, with and without interaction

IISc, Bangalore, India

(Master's thesis)

September 2021 - April 2022

### Topological phases in projected lower dimensional branes

JOINTLY WITH PROF. BITAN ROY AND PROF. VLADIMIR JURIČIĆ

- Numerically studied how topological properties of parent systems emerge in projected crystals and Fibonacci quasicrystals
- Verified the existence of dislocation modes, Weyl points, and Landau levels in projected crystals and quasicrystals
- Proposed how this method can be utilized to study higher dimensional (>3D) topological phases within 3D systems

MPIPKS, Dresden, Germany

(remotely)

June 2021 - September 2021

### Berry curvature effects on thermoelectric transport

WITH PROF. SUBROTO MUKERJEE

- Studied how Berry curvature can alter thermoelectric transport, leading to anomalous Hall and anomalous Nernst effects
- Studied the Boltzmann transport formalism
- Studied how the Onsager relation can be demonstrated from microscopic theories for a system with a non-trivial Berry curvature
- Found a condition on the energy magnetization such that the Einstein relation holds for the transport energy current in these systems
- Showcased a physical interpretation of this condition, and obtained a closed expression for energy magnetization
- Analytically solved the Boltzmann transport equation (including Berry curvature effects) for two-dimensional systems

IISc, Bangalore, India

(Bachelor's thesis)

October 2020 - June 2021

## Non-Hermitian Topological Insulators and Dislocations

MPIPKS, Dresden, Germany  
(remotely)

May 2020 - September 2020

WITH PROF. BITAN ROY

- Studied and numerically implemented SSH Model, Chern Insulators, Quantum Spin Hall Insulators
- Studied the effects of dislocation in Hermitian and Non-Hermitian Chern Insulators
- Obtained phase diagrams for regimes where topological states get pinned at dislocation centers
- Proposed how dislocations can be used to probe topological phases in non-Hermitian systems, where the non-Hermitian skin effect masks the traditional bulk-boundary correspondence

## Research Interests

### Broadly interested in theoretical Condensed Matter Physics

- Electronic transport in two-dimensional systems and the effects of Berry curvature in transport
- Computational methods in quantum condensed matter physics
- Topological phases of matter and Quantum Phase transitions
- Thermalization of quantum systems and Many body localization

## Skills

**Programming skills** Julia, MATLAB/Octave, Mathematica, Python

**Advanced Physics Courses** Strongly Correlated Systems, Advanced Statistical Physics, Quantum Field Theory I, General Relativity

**Languages** Fluent in English, Bengali, Hindi

## Talks

### Transport Signatures of Electronic Ordering in Graphene Flat Bands

Indian Institute of Science,  
Bangalore, India

January 2024

CLICK [HERE](#) TO DOWNLOAD THE PRESENTATION

### Topological phases in quasicrystals: A general principle of construction

APS March Meeting (virtually)

March 2022

CLICK [HERE](#) TO DOWNLOAD THE PRESENTATION

### Dislocation as a bulk probe of non-Hermitian topology

MPIPKS, Dresden, Germany  
(remotely)

July 6, 2021

CLICK [HERE](#) TO DOWNLOAD THE PRESENTATION

## Academic Achievements

2023	Qualified among the top 16 participants in MIT Integration Bee	MIT
2022	<b>1st Rank in India</b> in CSIR-NET (JRF) in Physics (score 186/200)	India
2022	<b>1st Rank in India</b> in Graduate Aptitude Test in Engineering (G.A.T.E.) in Physics	India
2017-22	<b>C.G.P.A</b> 9.8/10 in B.S. (Research) and M.S., highest GPA in batch	IISc, Bangalore
2017	<b>1st rank (99.2 %) in Board</b> in Higher Secondary Examination, among about 0.7 million candidates	West Bengal, India

## References

- Prof. **Leonid Levitov**, Dept. of Physics, Massachusetts Institute of Technology, Cambridge, MA 02139, USA.  
Email Address - levitov@mit.edu
- Prof. **Subroto Mukerjee**, Dept. of Physics, Indian Institute of Science, Bangalore, India.  
Email Address - smukerjee@iisc.ac.in
- Prof. **Bitan Roy**, Dept. of Physics, Lehigh University, Bethlehem, PA 18015, USA.  
Email Address - bitan.roy@lehigh.edu