Ankush G. Kumar

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Education

Ph. D. in Physics
University of California, Merced • Expected 2028
Grade Point Average (GPA): **3.90/4**
Advisor: Prof. Ajay Gopinathan

M. Sc. in Physics and B. Engg. in Mechanical Engineering
Birla Institute of Technology and Science Pilani (BITS Pilani) - Hyderabad • Graduated 2022
Cumulative Grade Point Average (CGPA): **7.86/10**
Thesis 1 advisor: Dr. Yong Wang
Thesis 2 advisor: Dr. Aravinda Raghavan

Research Experience

Graduate Student University of California, Merced
Topic: Lytic Granule Transport and Centrosome Polarization in T Cells • Fall 2024 - present
Guided by: Prof. Ajay Gopinathan
» Investigating how Cytotoxic T Lymphocytes (CTLs or T Cells) deliver toxic proteins into the target cells during immune response. Developing theoretical models to understand (i) how granules converge onto the centrosome and (ii) how centrosomes polarize to the immune synapse, with the help of particle-based simulations and analysis of experimental data.

Graduate Student University of California, Merced
Topic: Single Microtubule Rotation on a Gliding Assay • Fall 2023 - present
Guided by: Prof. Ajay Gopinathan
» Building an image analysis pipeline to analyze movies from dilute Microtubule (MT) gliding assays. Quantifying the different rotation rates based on the structural chirality of MTs prepared under different experimental conditions to compare with the theoretical results. Why do individual MTs rotate, when the Kinesin motors walking on them provide only an off-axis force which should lead to translational motion? How is this rotation connected to the structural chirality of a MT?

Visiting Student International Centre for Theoretical Sciences (ICTS-TIFR), India
Topic: Active Nematics Patterns on Manifolds • Fall 2022 - Spring 2023
Guided by: Dr. Vijaykumar Krishnamurthy
» Built a framework for modelling self-organization in an Active Nematic system representing, for example, the actomyosin cytoskeleton of a cell. Used FEniCS (a finite-element solver) to solve nematodynamics equation with a 2nd rank tensor order parameter on different geometries: 2D flat manifold, and 2D curved manifold embedded in 3D space.

Teaching Experience

Teaching Assistant University of California, Merced

Course: PHYS 009D - Introductory Physics II for Physical Sciences • Fall 2026
» Facilitated discussion sessions, guided problem-solving sessions for introductory electrostatics and magnetism concepts.

Course: PHYS 008L - Introductory Physics I for Physical Sciences • Fall 2026, Spring 2026, Fall 2025
» Guiding undergraduates to perform simple lab experiments that cover concepts in mechanics like Forces, Energy, Momentum and Rotation.

Course: PHYS 009L - Introductory Physics II for Physical Sciences • Spring 2025, Spring 2024, Fall 2023
» Guiding undergraduates to perform simple lab experiments that cover concepts in Kinematics and Electrostatics.

Course: PHYS 008D - Introductory Physics I for Physical Sciences • Fall 2024
» Facilitated discussion sessions, guided problem-solving sessions for introductory classical mechanics concepts like force, energy, momentum and rotational motion.

Preprints

- Athani, M. G., Prouse, N., Sarpangala, N., Noerr, P., Schiano-Lomoriello, G., **Kumar, A. G.**, ... & Beller, D. A. (2025). Gliding microtubules exhibit tunable collective rotation driven by chiral active forces. arXiv preprint arXiv:2507.00245. • (Submitted to Small (Wiley))

Fellowships/Awards

- Department of Physics Summer Fellowship at University of California, Merced • (2026, 2024)

Talks, Posters & Workshops

- **Kumar, A.G.** et al., *Tunable transport of lytic granules in Cytotoxic T Lymphocytes*, APS Global Physics Summit 2026, Denver, USA • March 2026 (Contributed Talk)
- **Kumar, A. G.** & Gopinathan, A., *Transport of Lytic Granules in Cytotoxic T Lymphocytes*, Mechanics of Life 3 Workshop, Flatiron Institute, New York, USA • December 2025 (Poster)
- **Kumar, A.G.** et al., *Active Forces Behind Centrosome Polarization in Cytotoxic T Lymphocytes*, APS Global Physics Summit 2025, Anaheim, USA • March 2025 (Contributed Talk)
- Kogan, O, **Kumar, A. G.**, and Gopinathan A., *Intracellular transport in the presence of dynamical microtubule organizing center*, APS Global Physics Summit 2025, Anaheim, USA • March 2025 (Poster)
- Bangalore School on Statistical Physics - XIII, International Centre for Theoretical Sciences (ICTS-TIFR), Bengaluru, India • July 2022