

# Amit Dawadi

Graduate Student

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## Education

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### Ph.D. candidate in Physics

Clark University, MA

Expected: May 2026

Advisor: Arshad Kudrolli

#### Research Focus:

- My research explores the mechanics of soft materials (thin sheets, elastic filaments), focusing on how geometric constraints and external forces govern their deformation, self-organization, and resulting structural and dynamic properties.
- Self-propulsion of asymmetric ice blocks driven by buoyancy-induced convection during melting, with implications for iceberg dynamics in warm oceans.
- Adaptable granular metamaterials for energy absorption and impact mitigation.

### M.Sc. in Physics

2020

Thesis: *Study of Structural and Electronic Properties of Half Heusler Alloys  $\text{CuCdX}$  ( $X = \text{Ge, As and Se}$ ).*

Advisors: Manoj Kumar Yadav and Vinaya Kumar Jha

## Research Interests

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Emergent structures and dynamics in soft matter and complex systems shaped by geometry, interactions, and external driving far from equilibrium.

## Publications and Preprints

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- [1] A. Dawadi and A. Kudrolli. Memory in cyclically crumpled sheets. *Physical Review Research*, 6(4), November 2024.
- [2] A. Dawadi, A. Biswas, J. Chopin, and A. Kudrolli. Bundling architecture in elastic filaments with applied twist. *arXiv preprint*, arXiv:2501.04650, 2025. (Accepted in PRE)
- [3] M. Berhanu, A. Dawadi, M. Chaigne, J. Jovet, and A. Kudrolli. Self-propulsion of floating ice blocks caused by melting in water. *arXiv preprint*, arXiv:2412.16010, 2024.(Under Review)

## Conference Presentations

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- Architected granular materials for impact mitigation, *A. Dawadi and A. Kudrolli*, 21<sup>st</sup> Northeastern Granular Materials Workshop at Yale University, 2025
- Self-propulsion of floating ice blocks in saline water, *A. Dawadi and A. Kudrolli*, 103<sup>rd</sup> New England Complex Fluids Workshop at UMass Amherst, 2025
- Bundle architecture of twisted elastic filaments with migration, *A. Dawadi, A. Biswas, J. Chopin, and A. Kudrolli*, APS March Meeting, 2025
- Self-Propulsion of floating ice blocks in water, *A. Dawadi and A. Kudrolli*, 101<sup>st</sup> New England Complex Fluids Workshop, Harvard, 2024
- Folding pathways to crumpling a sheet with cyclic wringing, *A. Dawadi and A. Kudrolli*, APS March Meeting, 2024
- Twisted structure of multifilament bundles and sheets, *A. Biswas, A. Dawadi, and A. Kudrolli*, APS March Meeting, 2024
- Self-propulsion of floating ice blocks by melting, *M. Chaigne, J. Jovet, M. Berhanu, A. Dawadi, and A. Kudrolli*, Rencontre du Non-Linéaire, 2024

## Research Experience

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**Graduate Research Assistant**, Complex Matter and Nonlinear Physics Lab, Clark University  
Jun 2023 – Present  
May 2022 – Dec 2022  
Advisor: Prof. Arshad Kudrolli

- Designed and developed an automated twisting system using stepper motors for cyclic twisting of cylindrical shells and filament bundles, with precise control over speed, direction, and cycle count. Integrated real-time image acquisition and torque sensing for dynamic mechanical response analysis.
- Developed a custom laser profilometer using a sheet laser and camera for high-resolution surface profiling.
- Integrated the laser profilometer into the twisting setup to enable in-situ surface scanning after each twist-untwist cycle, eliminating the need for remounting and reducing experimental error.
- Designed and performed experiments, and collected data to study the self-propulsion of ice blocks in water due to melting.
- Designed and fabricated 3D-printed experimental samples for shock-mitigating and energy-absorbing metamaterials with novel architectures. Developed customized mechanical testing setups and conducted experiments to evaluate their performance.
- Utilized 3D printing (Formlabs, Prusa) extensively to prototype and fabricate custom experimental components and fixtures.

## Teaching Experience

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**Teaching Assistant – Oscillations, Waves and Optics**

Clark University, MA

Fall 2021

**Teaching Assistant – Quantum Physics and Relativity Optics**

Clark University, MA

Spring 2022 & Spring 2023

Supervised labs, graded reports and assignments, and occasionally taught classes when needed.

## Current Research Projects

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- **Architected granular materials for impact mitigation:** Investigating energy dissipation and structural response of designed granular lattice systems under dynamic loading for impact mitigation using experimental impact tests and modeling.

## Selected Projects

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- **Estimating Atomic Mass via Brownian Motion – Final Project, Fluid Mechanics Course**  
Tracked microbead Brownian motion using confocal microscopy.  
Extracted diffusion coefficients and estimated Avogadro's number.  
Used Einstein's relation to infer atomic mass of hydrogen.
- **Statistical Analysis of Facet Formation by Random Line Segmentation – Final Project, Advanced Computer Simulation Course**  
Studied the statistics of facet size, edges number/length/angle distributions resulting from random line intersections within a confined area using computational simulations.

## Technical Skills

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- **Experimental:** Optical imaging, X-ray tomography, laser profilometry, experimental design, force and torque measurements, shadowgraphy imaging, confocal microscopy image analysis, signal processing and analysis, particle tracking, Particle image velocimetry (PIV)
- **Tools and Softwares:**
  - **Programming:** C, Python, Java, MATLAB, LaTeX, Quantum Espresso, **Deep Learning**.
  - **Designing:** Inkscape, AutoCAD, Autodesk Fusion 360, Prusa Slicer, Meshmixer, Formlabs PreForm
  - **Image analysis:** ImageJ, Matlab
  - **Operating systems:** Windows, Ubuntu
- **Analytical:**
  - **Mathematical and numerical methods:** Linear algebra, Differential equations, FFT, least square and regression analysis, Runge-Kutta Methods, Monte Carlo simulations
  - **Theoretical Foundations:** Statistical mechanics, Fluid mechanics, Dimensional analysis, Elastoplasticity, Hyperelasticity, Non-linear dynamics, Density Functional Theory (DFT)

- **Industry Tools:** Prusa Mk3/Mk4 3D printing, Formlabs Form 3/Form 4 3D printing, Arduino, Oscilloscope, Function Generator, Operational Amplifier, Torque/Force sensor, Motor Controller Systems (operation, troubleshooting, and integration with custom experimental hardware for precise motion control)

## Professional Recognitions and Outreach

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- Winner, APS GSNP Image of the Month, Jan 2025
- APS Student Ambassador for Physics, 2025
- Outreach: Demonstrated physics at APS Squishy Science Sunday (2024, 2025), Cambridge Science Festival

## Professional Memberships

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- American Physical Society (APS)
- Association of Nepali Physicists in America
- Nepal Physical Society