PHYSICAL MATHEMATICS SEMINAR

Controlling rigidity through topology: theory and experiments

MARCELO GUZMAN

Ecole Normale Superieure de Lyon

ABSTRACT:

Topology has shown its pervasive relevance in virtually all fields of physics from electronic systems to electric circuits, acoustic metamaterials, and mechanical networks. In this two-part talk, I will show how real-space and spectral topology effectively control the rigidity of mechanical metamaterials.

In the first part I will show how to control the floppiness of mechanical networks. Building on the seminal work of Kane and Lubensky, I will introduce a new material property stemming from an intimate tango between geometry and topology: the chiral polarization. This physical observable allows the detection of topological floppy modes in both crystalline and amorphous chiral materials. I will show how to locally probe mechanical metamaterials in experiments realizing both normal and higher-order topological insulators without resorting to any theoretical modelling of their mechanical vibrations.

In the second part I will discuss the stiffness of mechanical antiferromagnets. Drawing on a less explored facet of topology, orientability, we account for the emergence of zero-deformation nodes and lines when antiferromagnetic metamaterials are subject to homogeneous loads. Considering more general stress distributions, we exploit the non-orientability of their deformation bundle to engineer robust mechanical memory and achieve non-Abelian mechanical responses that carry an imprint of the braiding of local loads.

TUESDAY, FEBRUARY 22, 2022
2:30 PM – 3:30 PM
Building 2, Room 449

https://math.mit.edu/sites/pms/

ZOOM Link…

https://mit.zoom.us/j/95597721876

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- **remember to keep your mask on while inside buildings**
- **eating food is not allowed within lecture rooms**

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