Instability-induced Pattern-transformation of Elastomeric Structures

Traditionally, buckling is considered as a limit state for structural components of mechanical systems. However, there has recently been an interesting paradigm shift regarding instability in the research community of mechanics. Through simple yet innovative geometry, researchers are seeking to harness instability rather than to avoid it. This presentation focuses on using elastic instability to improve structural functionality through smart design, and introduces a class of continuum porous structures that show instability-induced pattern transformations under mechanical loading. The speaker will explain the underlying mechanisms of the considered pattern transformations, and demonstrate potential applications to design mechanical metamaterials having auxetic behavior or phononic band gaps. The potential application of the proposed structures to micro-scale fabrications will open avenues for a new type of innovative mechanical metamaterials.

Bio

Dr. Shim is an Assistant Professor in the Civil, Structural and Environmental Engineering at University at Buffalo, SUNY. He received a doctoral degree from MIT in 2010. His research interests include instability-induced pattern transformations, analysis and design of mechanical metamaterials, material characterization under high strain rate loading, and constitutive modeling based on finite deformation theory.