

**Friday, April 14, 2023, 12 PM – 1 PM**  
**Klug Room (Boelter Hall 8500)**

## **Inflatable Structures: from Soft Robots to Reconfigurable Structures**

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**ABSTRACT:** Inflation of compliant structures leads to dramatic shape changes: a property that is exploited in a wide range of applications, such as soft robots, deployable structures and medical devices. On the one hand, fluid-driven actuators capable of complex motion can power highly adaptive and inherently safe soft robots. On the other hand, inflation can be used to transform seemingly flat shapes into shelters, field hospitals, and space modules.

Here, we embrace instability of inflatable structures as a paradigm to further expand the functionality of inflatable systems. In the first part of this seminar, I exploit snapping instabilities in spherical shells to decouple the input signal from the output deformation in soft actuators—a functionality that can be utilized to design a soft machine capable of jumping. Further, I show that buckling instabilities can be harnessed to generate complex motion out of uniform cylindrical shells. In the second part of the seminar, I focus on quasi-inextensible structures and show that the crumples introduced upon inflation provide opportunities for the design of reconfigurable structures. Together, these projects highlight the potential of instabilities in expanding the functionality of inflatable structures.

**BIO:** Katia Bertoldi is the William and Ami Kuan Danoff Professor of Applied Mechanics at the Harvard John A. Paulson School of Engineering and Applied Sciences. Upon earning a Ph.D. degree in Mechanics of Materials and Structures from Trento University, in 2006, Katia joined as a PostDoc the group of Mary Boyce at MIT. In 2008 she moved to the University of Twente (the Netherlands) where she was an Assistant Professor in the faculty of Engineering Technology. In January 2010 Katia joined the School of Engineering and Applied Sciences at Harvard University and established a group studying the mechanics of materials and structures. She is the recipient of the NSF Career Award 2011 and of the ASME's 2014 Hughes Young Investigator Award. She serves as an Associate Editor for the journal Extreme Mechanics Letters. She published over 120 peer-reviewed papers and several patents. For a complete list of publication and research information: <https://bertoldi.seas.harvard.edu/>