

MAE Distinguished Speaker Series 2026



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Instability of elastic structures for the design of architected materials

Date : January 12, 2026
Time : 10:30 am – 11:30 am
Venue : LT6 (NS2-02-05)
Host : Prof K Jimmy Hsia

Abstract

Flutter instability induced by follower loads was experimentally demonstrated with the development of the freely rotating wheel structure by Bigoni and Noselli, the flutter machine, and a dedicated device for generating Reut-type loads. Further research in this field has proven that flutter instability, Hopf bifurcation, dissipation instabilities, and Ziegler paradox are all possible in conservative systems, thus disproving an erroneous belief that has continued for at least 50 years. A new type of flutter instability is shown to be generated by the 'fusion' of two structures which are separately stable, but become unstable when joined together and so involving a discontinuity in curvature. Finally, it is shown how rigorous homogenization theory leads to the use of the above-mentioned structures to design architected materials capable of innovative mechanical properties, such as for instance the restabilization after shear banding and the possibility of achieving an elastic material violating hyperelasticity.

Biography

Since 2001, Professor Bigoni has served as Full Professor at the University of Trento. His distinctions include election as Euromech Fellow, the Ceramic Technology Transfer Day Award, a Doctor Honoris Causa from Ovidius University of Constanța, and the Panetti–Ferrari Prize for Applied Mechanics from the Accademia delle Scienze di Torino. Professor Bigoni delivered the 2018 Midwest Mechanics Seminars, was featured in the 60th Anniversary Issue of JMPS, he is a Fellow of the Italian Academy “Istituto Lombardo di Scienze e Lettere” and of the “Italian Academy of Engineering”. His work has appeared on the covers of nine international journals, and he has been a driving force in academia–industry collaboration, coordinating major European initiatives and earning two ERC Advanced Grants (2013, 2021).