

Contribution ID: 374

Type: **Presentazione orale**

Design and Testing of a Fully 3D-Printed Self-Sensing Metamaterial

Thursday 3 September 2026 10:00 (15 minutes)

Metamaterials are engineered structures designed to achieve unique physical properties through their geometric architecture. By integrating monitoring capabilities directly into these structures, self-sensing metamaterials can autonomously detect their own mechanical state. These technologies have important applications in soft robotics, smart medical devices, and structural health monitoring.

This work presents the development of a fully 3D-printed metamaterial featuring integrated sensing capabilities. Specifically, the system exploits the capacitance effect to sense the applied pressure during deformation. The project combines numerical simulations to optimize sensitivity and structural response, followed by experimental tests to validate the performance of the structure.

This research represents a step toward the development of smart metamaterials. Future work will focus on integrating actuation mechanisms within the architecture, aiming to realize fully autonomous smart metamaterial capable of closed-loop sensing and response.

Primary author: CASARTELLI, Alberto (Politecnico di Milano; Department of Mechanical engineering)

Co-authors: CADINI, Francesco (Politecnico di Milano; Department of Mechanical engineering); LOMAZZI, Luca (Politecnico di Milano; Department of Mechanical Engineering)

Presenter: CASARTELLI, Alberto (Politecnico di Milano; Department of Mechanical engineering)

Session Classification: Additive Manufacturing

Track Classification: Additive Manufacturing