ME Seminar

Data-driven characterization of generic materials without stress-tensor data

Dr. Akshay Joshi, University of Cambridge

ABSTRACT

The use of data-driven techniques to characterize generic materials has experienced a significant resurgence over the latter half of the past decade owing to availability of better computational resources and machine learning techniques. However, the theoretical development of these data-driven frameworks seems to have significantly outpaced the practical adoption of these techniques to characterize and design novel materials. A primary reason for this is that almost all existing frameworks fail to account for the lack of stress-tensor data in real experiments/events. To address this, a newly developed data-driven paradigm-the EUCLID framework uses only experimentally available displacement and boundary force data to characterize materials. This makes EUCLID a stress-unsupervised model discovery framework. Although the EUCLID platform is versatile and efficient, it is currently limited to characterizing homogeneous hyperelastic and elastoplastic materials and is yet to be validated using experimental data, which inevitably involve non-trivial noise. Making use of the working principles of the EUCLID framework, I wish to develop new data-driven methodologies that can characterize generic viscoelastic, and history-dependent materials using experimentally available displacement and boundary force data. To achieve this, I intend to leverage my experience in the fields of experimental and computational mechanics, shock physics, and data-driven mechanics. In the talk I will describe my previous research on shock mechanics and the data-driven EUCLID framework, while outlining my future research plans that leverage this experience.

ABOUT THE SPEAKER

I hail from south Bangalore- a place where grew up for 12 yrs of my life and completed all my schooling. I graduated with a B. Tech in Aerospace Engineering from IIT Madras in 2017, with a silver medal for the best academic performance in my department's cohort. I went on to pursue my master's and PhD from California Institute of Technology, graduating in June of 2021. My first postdoctoral experience was an year working with Prof. Sid Kumar at TU Delft, followed by my current work with Prof. Vikram Deshpande at the University of Cambridge. My research interests include data-driven mechanics and frameworks, high-strain rate solid mechanics, machine learning, fracture and fatigue, biomechanics and mechanobiology. I also like going on long walks and having philosophical chats with anyone!

May 19, 2023
5:00 PM, TEAMS