

“TOWARD A COMPLETE THEORY OF FRACTURE WITHIN THE PHASE-FIELD FRAMEWORK”

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ABSTRACT

The phase-field framework has emerged as a mathematically rigorous and computationally tractable approach for studying crack propagation, closing a long chapter in the history of fracture mechanics. Nonetheless, many other important challenges remain in the quest for developing a complete theory, particularly in addressing fracture nucleation and incorporating inelastic dissipation and inertia. In this seminar, I will outline the key ingredients required for the development of a complete theory and discuss how these ingredients can potentially be incorporated within the phase-field framework in a unified manner. The focus will primarily be on brittle materials with some discussion of recent work in ductile materials. Special emphasis will be placed on insights gained from studying various fracture phenomena in soft materials.

BIOGRAPHY

Dr. Aditya Kumar is an Assistant Professor of Structural Mechanics at Georgia Tech. His research broadly focuses on answering fundamental problems in applied mechanics with a combination of new mathematical and computational tools. In addition to fracture, his group is working on developing a theory for material evolutions in biological tissues. Prior to joining GT, he was a postdoctoral researcher in Aerospace Engineering at the University of Illinois Urbana-Champaign. He received his Ph.D. from Illinois in 2020 and his B.Tech. from IIT Delhi in 2014. He is a recipient of the 2024 Haythornthwaite Foundation Research Initiation Award and is currently an outreach fellow of USNC/TAM.