ME Seminar

Integrated computational and data-driven microstructure engineering for interdisciplinary research on advanced materials and manufacturing

Dr. Supriyo Ghosh, Los Alamos National Laboratory

ABSTRACT

The demand for 4D-printing of advanced engineering materials is rapidly increasing as it produces parts with improved material properties compared to traditional manufacturing and metal working routes. This seminar focuses broadly on the modeling of microstructure physics and engineering phenomena involved during the solidification of metal alloys. In particular, I will describe a hierarchial multiscale and multiphysics design-of-simulations approach that incorporates macroscale finite element and mesoscale phase field methods. This approach allows for modeling and manipulation of melt-pool microstructures under local additive manufacturing conditions. The length and time scales of the resulting microstructural gradients are extremely small and complex, leading to uncertainty in microstructure analysis. Appropriate benchmarking and statistical approaches quantify the variation and distribution of such location-specific uncertainty in far-from-equilibrium microstructural quantities of interest, such as solidification segregation. The machine learning analyses also result in data-driven approximate models that can rapidly predict these compute-heavy, high-fidelity microstructure signatures with reference to experimental measurements or the ground truth.

ABOUT THE SPEAKER

Dr. Supriyo Ghosh is currently a postdoc in the Theoretical Division of Los Alamos National Laboratory, working on high-performance computing for additive manufacturing of nuclear alloys. Prior to this, he worked in the Materials Science & Engineering Division at Texas A&M University and National Institute of Standards & Technology (NIST) on microstructure and machine learning of additive manufacturing processes in nickel-based superalloys. He completed his Ph.D. thesis in Materials Physics from École Polytechnique, Paris and Northeastern University, Boston (visiting) on modeling the effects of surface energy anisotropy on directional solidification of metal alloys. He is an IISc M.E. graduate in Materials Engineering. He is a recipient of the NIST Materials Measurement Laboratory Postdoctoral Fellow Accolade. He has several invited, review, and highlighted papers on the modeling of additive manufacturing microstructural processes.

October 28, 2020, 11:30 am, Microsoft Teams