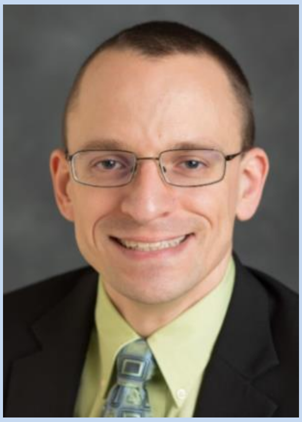
KTH SOLID MECHANICS SEMINAR; Thursday, May 19th , 16.15; https://kth-se.zoom.us/j/64894784882

Timothy Truster
"Variational Multiscale DG: A Stabilized Framework for Modeling Slip and Fracture at Interfaces"

As computational resources have continued to expand, the drive for developing computational methods with higher fidelity for complex material modeling problems has continued to increase. A persistent challenge in computational multi-phase modeling is the robust treatment of non-smooth features or interfaces, such as grain boundaries in metals, interphases between constituents in composite materials, lubricated and bolted joints in structural systems, etc. Across these diverse applications, the major bottleneck revolves around imposing kinematic conditions upon discontinuous discrete functions in a mathematically consistent fashion.

This talk explores the efforts of our colleagues and my group on deriving and advancing the Variational Multiscale Discontinuous Galerkin (VMDG) computational framework for modeling solid mechanics problems with a range of interface kinematics. The framework serves as a robust platform for predictive modeling of mechanical and material systems containing interfaces due to the underlying philosophy of the variational multiscale method. We begin by providing context for the framework amongst Mortar, Nitsche, and other interface methods. Then, various applications are presented for nonlinear problems with evolving strong and weak discontinuities, in particular for frictional dissipation in bolted mechanical joints, debonding of fibrous composites, and imposing periodic boundary conditions.



Dr. Truster is an associate professor in the Department of Civil and Environmental Engineering at the University of Tennessee. He earned his PhD in Civil Engineering with a concentration in structures from the University of Illinois at Urbana-Champaign in 2013. His teaching interests include finite element modeling, nonlinear finite element methods, and structural analysis. Truster's current research interests include computational interface mechanics, process modeling of titanium alloys, creep modeling in natural and engineered materials, stabilized finite element methods, and high performance computing. He was the recipient of a US National Science Foundation CAREER grant in 2018 on the topic "Predictive Fatigue Behavior of Structural Materials Through Computationally-Informed Textural and Microstructural Influences"