Department of Mathematical Sciences
Faculty and Graduate Research Colloquium

Thursday, November 20, 2025
1:00-1:50pm
RB 450

"Variational limit of parametrized energy functionals"
Dr. Tadele Mengesha
University of Tennessee, Knoxville

Abstract:

This talk will explore the powerful framework of Gamma-convergence for analyzing the limits of sequences of parametrized variational energies. Variational models, which seek to minimize an energy functional, are central to describing a vast range of physical phenomena. However, these energies often depend on parameters such as interaction length, scaling factors, etc.., whose limits can be challenging to analyze rigorously. Gamma-convergence provides the appropriate notion of variational convergence--a way to ensure that not only do the energy functionals converge to a limit functional but that the corresponding minimizers and minimum energy values also converge.

We will demonstrate the utility of Gamma-convergence by presenting some applications: Convergence of Nonlocal to Local Models: establishing the rigorous convergence of nonlocal energy models to their classical, local counterparts (nonlocal mechanics to classical elasticity), Linearization of Nonlocal Models: rigorously justifying the linearization of non-convex, nonlocal energies as a parameter approaches a critical value and, Justification of Diffuse Domain Methods: providing a rigorous mathematical foundation for the convergence of Diffuse Domain Methods (or phase-field models) to sharp-interface limits.