Nonlocal Calculus of Variations and Asymptotically Compatible Schemes

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Nonlocality is a generic feature of multiscale modeling. In this talk, Dr. Du will present recent developments of nonlocal calculus of variations based on the nonlocal vector calculus. Being reminiscent of classical calculus and variational methods, these nonlocal analogs represent the basic elements of a systematic and axiomatic framework for the mathematical understanding of nonlocal operators and nonlocal models, and they have been successful in applications used to analyze various linear and nonlinear nonlocal balance laws and variational problems. They also have provided the foundation for development of asymptotically compatible schemes as robust discretizations of nonlocal models and their local limits. Such schemes may be important for validation and verification of multiscale models and simulations.