

1162-65-26

**Jia Zhao\*** ([jia.zhao@usu.edu](mailto:jia.zhao@usu.edu)), 3900 Old Main Hill Animal Science 108, Logan, UT 84322.

*Arbitrarily High-order Unconditionally Energy Stable Schemes for Thermodynamically Consistent Gradient Flow Models.*

In this talk, I will present a systematical approach to developing arbitrarily high order, unconditionally energy stable numerical schemes for thermodynamically consistent gradient flow models that satisfy energy dissipation laws. Utilizing the energy quadratization (EQ) method, we formulate the gradient flow model into an equivalent form with a corresponding quadratic free energy functional. Based on the equivalent form with a quadratic energy, we adopt the Gaussian collocation method to discretize the equivalent form with a quadratic energy, arriving at an arbitrarily high-order scheme for gradient flow models. Schemes derived using both approaches are proved rigorously to be unconditionally energy stable. Numerical results will be shown to illustrate their accuracy and effectiveness. This is a joint work with Yuezheng Gong and Qi Wang. (Received August 13, 2020)