Department of Mathematics,
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Math 278A: Center for Computational Mathematics Seminar

Brian Tran

UCSD

Geometric Integration of Adjoint DAE Systems

Abstract:

Adjoint systems are widely used to inform control, optimization, and design in systems described by ordinary differential equations and differential-algebraic equations. In this talk, we begin by exploring the geometric properties of adjoint systems associated to ordinary differential equations by investigating their symplectic and Hamiltonian structures. We then extend this to adjoint systems associated to differential-algebraic equations and develop geometric methods for such systems by utilizing presymplectic geometry to characterize the fundamental properties of such systems, such as the adjoint variational quadratic conservation laws admitted by these systems, which are key to adjoint sensitivity analysis. We develop structure-preserving numerical methods for such systems by extending the Galerkin Hamiltonian variational integrator construction of Leok and Zhang to the presymplectic setting. Such methods are natural, in the sense that reduction, forming the adjoint system, and discretization commute for suitable choices of these processes. We conclude with a numerical example. This is joint work with Prof. Melvin Leok.

October 11, 2022

11:00 AM

APM 7218 and Zoom
Zoom ID 986 1678 1113

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