Geometry, Topology, and Symmetry of Open Smooth and Hybrid Systems

Anthony Bloch[1*]

Department of Mathematics,
University of Michigan, Ann Arbor, MI[1]

Abstract

This talk covers two topics in geometry, topology, and symmetry of open systems.

(i) Exploring Symmetry Breaking Impacts: Symmetries are important in the study of dynamical systems as they can provide a recipe for finding invariants. In the context of impact systems, an invariant is produced when the impact is internal. External impacts, however, break this symmetry and can be used to generate non-trivial holonomy which is useful for control applications.

(ii) Open Classical and Quantum Systems: We discuss methods for describing a classical or quantum system interacting smoothly with its environment. In particular we discuss double bracket and other classical notions of nonlinear Rayleigh dissipation. We also discuss metriplectic systems in various settings and relate this to double bracket dissipation and to quantum dissipation. In the quantum setting we consider Lindblad equations and their analysis with applications to controllability and the description of stable asymptotic orbits.