

# Stochastic Hybrid Systems

Taeyoung Lee\*

Department of Mechanical and Aerospace Engineering

The George Washington University

Washington DC, USA

## Abstract

This talk summarizes recent efforts to formulate and analyze the role of uncertainties in hybrid dynamical systems. We first present a generalized stochastic hybrid system in accordance with measure theory, which can incorporate various types of uncertainties that occur in both the continuous and discrete flows. Then, the stochastic Koopman operator and the Frobenius-Perron operator are constructed for the stochastic hybrid system. These operators are utilized to study the mean-field game and mean-field control for hybrid systems, and they are applied to an example of crowd escape behaviors. Finally, we present a stochastic mechanical hybrid system that corresponds to a stochastic Lagrangian/Hamiltonian system undergoing jumps, and structure-preserving numerical integrators for such systems are introduced.

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\*Partially supported by the Air Force Office of Scientific Research under the Award No: MURI FA9550-23-1-0400, e-mail: [tylee@gwu.edu](mailto:tylee@gwu.edu)