Graduate Student Research Seminar

Fall 2025

Data-driven Koopman Control-Oriented Learning Framework for Improved Autonomous Offroad Mobility

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Monday, November 24th
3:00 pm (EST) – 132 Fluor Daniel Building

Abstract

Autonomous off-road vehicles generate high-frequency sensor data that encapsulate complex interactions with unstructured terrain, often modeled using computationally expensive physics-based frameworks. This work proposes a data-driven alternative by updating Koopman operator-based models using streaming sensor data. To manage computational and memory constraints, we develop a batch learning algorithm that selectively updates the Koopman operator only when new data exhibits novel dynamics, detected via the Grassmannian distance between subspaces. The algorithm reduces computational load by updating only with novel data and learning basis functions, thereby minimizing data storage and processing time while maintaining prediction accuracy. This method demonstrates its applicability in controlled dynamical systems, thereby reducing model complexity and enhancing control strategies.

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