

**Title:**

Koopman Expectation-Based Optimization for Offline Spacecraft Rendezvous Guidance Under Parametric Uncertainties

**Abstract:**

This work introduces a novel operator-theoretic framework for spacecraft offline guidance under uncertainty, leveraging the Koopman expectation (KE) theoretical method. The KE approach enables deterministic evaluation of expected outcomes, eliminating the need for Monte Carlo sampling while ensuring probabilistic constraint satisfaction. To further improve computational efficiency, this manuscript also proposes Koopman Expectation Deep Learning (KEDL), a new method which combines KE-optimized solutions with neural network generalization.

**Bio:**

Lakshay Arora is a Ph.D. candidate in Aerospace Engineering at Carleton University's Spacecraft Robotics Laboratory (SRL), supervised by Prof. Steve Ulrich. He earned his M.S. in Aerospace Engineering from Wichita State University, USA, and his B.Tech. in Aeronautical Engineering from Manipal Institute of Technology, India. His research focuses on uncertainty-aware trajectory optimization for spacecraft rendezvous and proximity operations using Koopman Expectation and data-driven learning frameworks. His broader interests include autonomous systems, control theory, and artificial intelligence, with a focus on developing intelligent, uncertainty-resilient guidance and control strategies for space applications.