## UCLA Samueli School of Engineering

Mechanical & Aerospace Engineering Department Seminar



## Friday, March 17, 2023 11 AM – 12 PM Klug Memorial Seminar Room, 8500 Boelter Risk-Aware Control and Planning in Unstructered Environments Anushri Dixit

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**ABSTRACT:** Providing safety and performance guarantees for motion planning and control algorithms is a well-studied problem for robotic systems with well-known dynamics that operate in structured environments. However, when robots operate in a real-world setting where the environment is dynamic and unstructured, common assumptions used to develop the planning algorithms are no longer valid and consequently, the safety guarantees no longer hold. In this talk, I will describe my work on developing new theoretical tools for risk-aware, stochastic motion planning to account for diverse and varying uncertainty descriptions while retaining the tractability of the state-of-art approaches. The theory has practical and

scalable implementation and has been deployed not just in controlled laboratory settings but also in complex, real-world environments. I will provide techniques to account for uncertainty in static, extreme terrain and in dynamic environments. I will introduce a theoretical framework for motion planning while accounting for risk in a model predictive The risk-aware policies control setting. control are distributionally-robust to the uncertainty in the environment and have probabilistic guarantees for task completion and recursive feasibility. These techniques will be described in the context of my work deployed on ground robots for search and rescue operations in the DARPA Subterranean Challenge and



for aerial vehicles in dynamic environments. The goal of my research is to develop verifiable algorithms for safety-critica lautonomous systems that are able to perceive their dynamic and uncertain environments to enable safe and intelligent decision-making in hazardous or sensitive environments.

**BIO:** Anushri Dixit is a Postdoctoral Researcher in the Department of Mechanical & Aerospace Engineering at Princeton University. She earned her Ph.D. in Control and Dynamical Systems from California Institute of Technology in 2023 and her B.S. in Electrical Engineering from Georgia Institute of Technology in 2017. Her research focuses on motion planning and control of robots in extreme terrain while accounting for uncertainty in a principled manner. Her work on risk-aware methodologies for planning has been deployed on various robotic platforms as a part of the Team CoSTAR's effort in the DARPA Subterranean Challenge. She (and her co-first author) received the Outstanding Student Paper Award at the 61<sup>st</sup> IEEE Conference on Decision and Control. She was selected as a Rising Star in Data Science by The University of Chicago in 2022.

Host: Prof Ann Karagozian, ark@seas.ucla.edu