AI-based autonomy for aerospace systems

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Abstract: Recent advances in AI are enabling a new paradigm for aerospace autonomy, where learning augments—but does not replace—model-based optimization and control. This talk highlights two emerging directions: (i) the use of transformer-based models to provide fast, high-quality warm starts for trajectory optimization in safety-critical tasks such as spacecraft rendezvous, and (ii) the adaptation of multimodal foundation models to endow space robotic agents with contextual reasoning and generalization capabilities in unstructured environments. Together, these approaches point toward scalable, trustworthy autonomy that combines data-driven intelligence with rigorous assurances for aerospace systems.

Bio: Dr. Marco Pavone is an Associate Professor of Aeronautics and Astronautics at Stanford University, where he directs the Autonomous Systems Laboratory. He also leads autonomous vehicle research at NVIDIA. Prior to joining Stanford, he was a Research Technologist in the Robotics Section at NASA's Jet Propulsion Laboratory. He received his Ph.D. in Aeronautics and Astronautics from the Massachusetts Institute of Technology in 2010. His research centers on Physical AI—the development of AI systems grounded in physics, perception, and control that can operate robustly in the real world. His work spans applications including self-driving cars, autonomous aerospace vehicles, and general-purpose robotic systems. He has received numerous honors, including the Presidential Early Career Award for Scientists and Engineers from President Barack Obama.