NRI:FND: Unifying standard physics-based control with learning-based perception and action to enable safe and agile object manipulation using unmanned aerial vehicle

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Objectives:
- robust action-perception framework combining standard and learned models
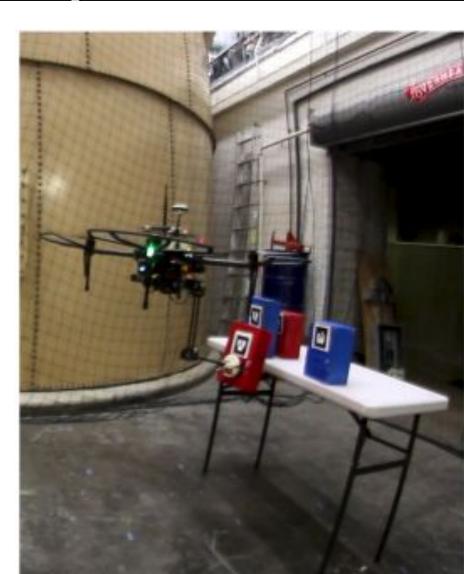- object manipulation using aerial vehicles

Key Problems
- difficult to handle contacts, compliance, occlusions, and dynamic environments
- achieving high agility while behaving safety
- providing performance guarantees

Technical Approach
- Unified perception and control framework combining standard control and estimation with learning-based perception and action
- action policy takes richer visual perception information
- approximately-correct safety certificates using realistic simulations

Broader Impact
- enable agile and safe robotic systems
- automate access to difficult or dangerous locations
- warehouse / factory automation
- infrastructure inspection and maintenance
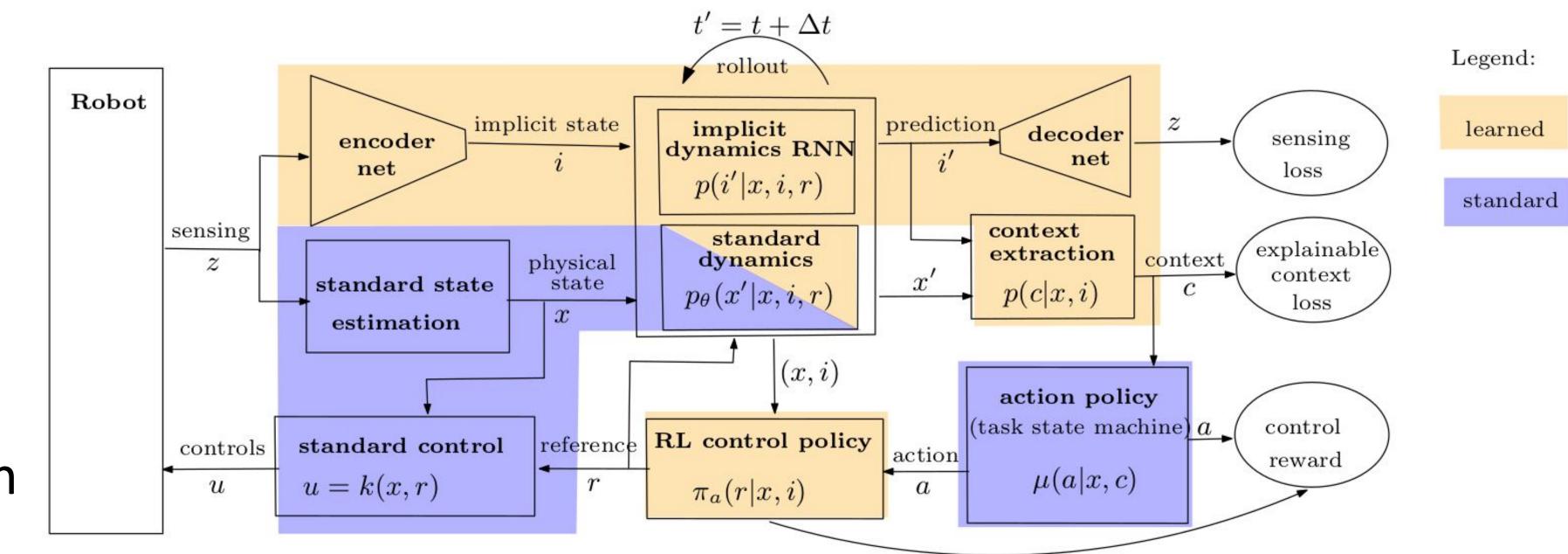- agricultural monitoring, sampling, and harvesting

JHU AirGripper performing package sorting

environmental sensor placement

vehicle for larger payloads

Education and Outreach
- collaboration with (WISE), women in science and engineering high-school program
- unergraduate research projects
- identify aerial manipulation applications relevant to farming on the Eastern Shore in MD