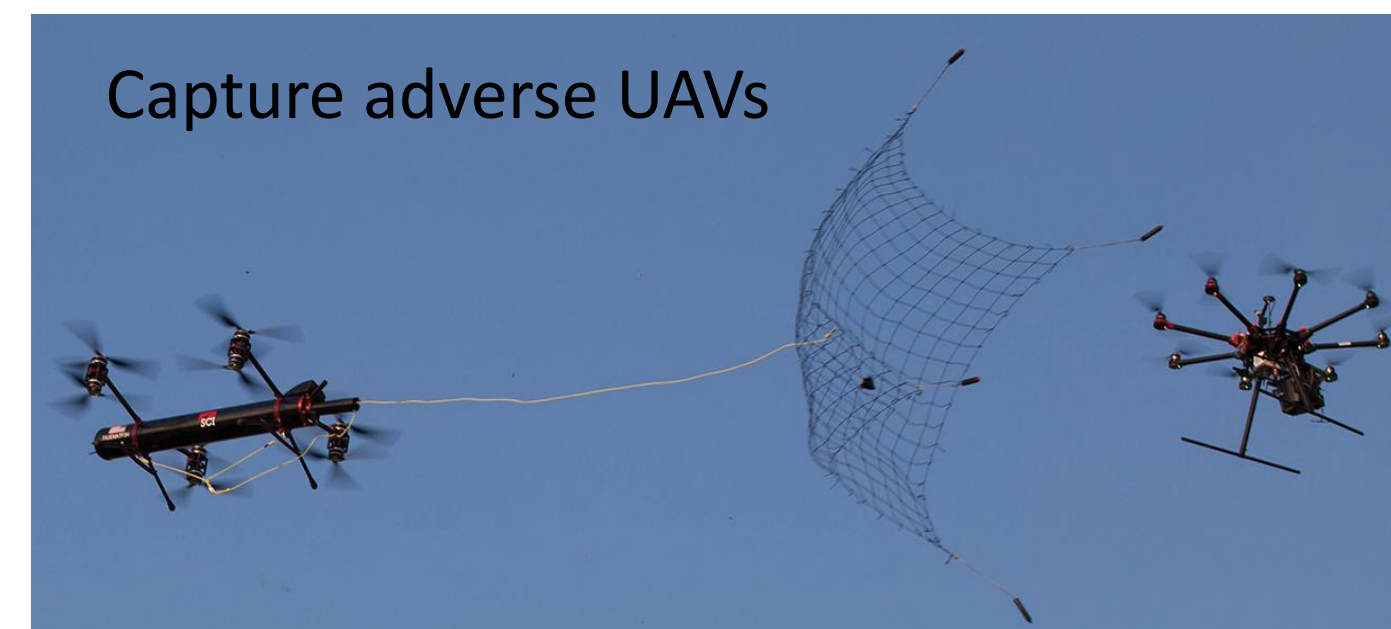


Modeling, Design and Operation of Robotic Tether-Net Systems for Reliable Capture of Targets

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Challenge

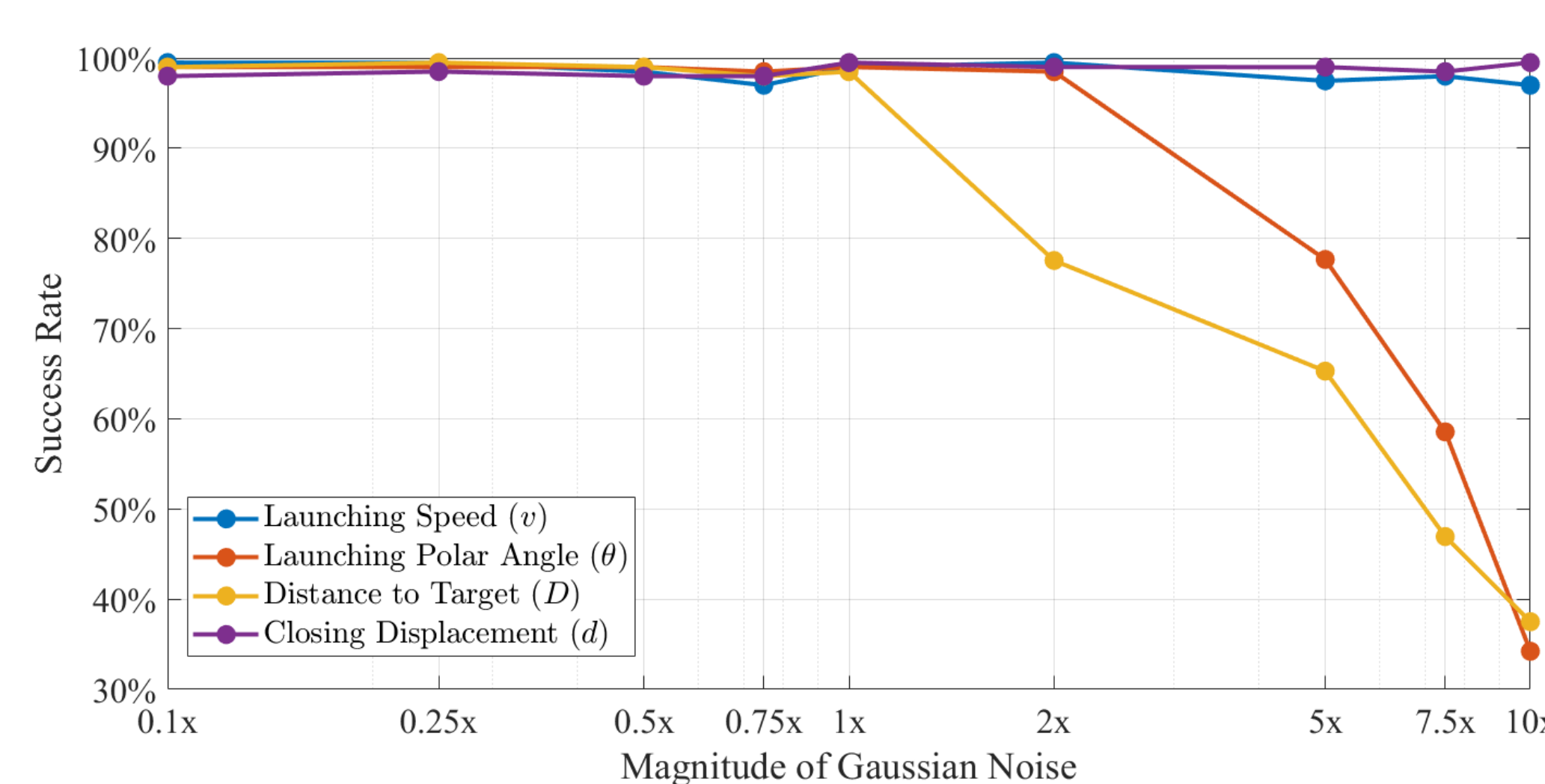
Advance scientific understanding of how to autonomously capture flying target objects using robotic tether-net systems that can be launched from a chaser vehicle such as an unmanned aircraft or spacecraft.



Solution Approach

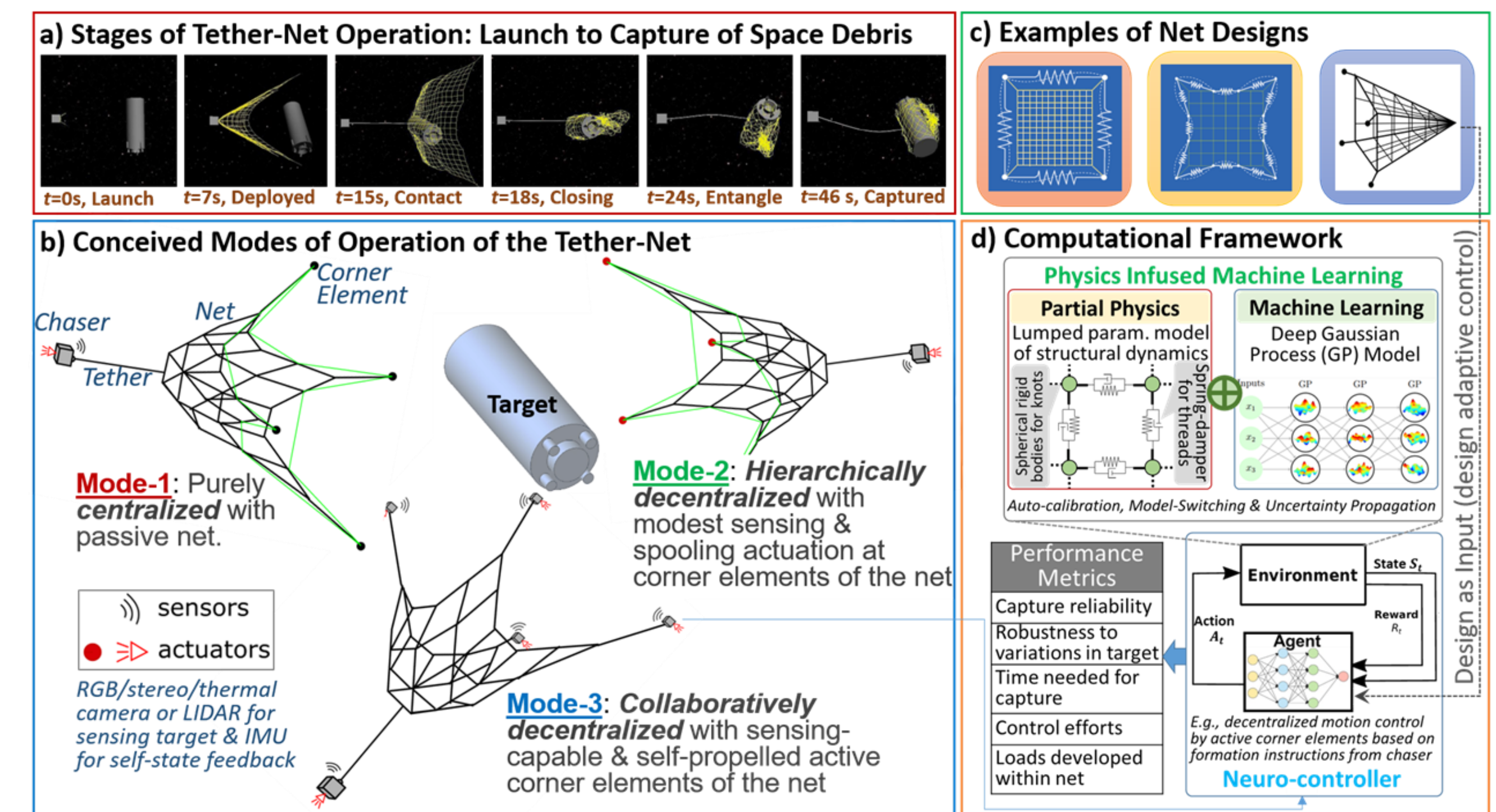
Synergizing net dynamics, contact mechanics, engineering optimization and machine learning (ML) to enable robust design and autonomy.

Sample results



Scientific Impact

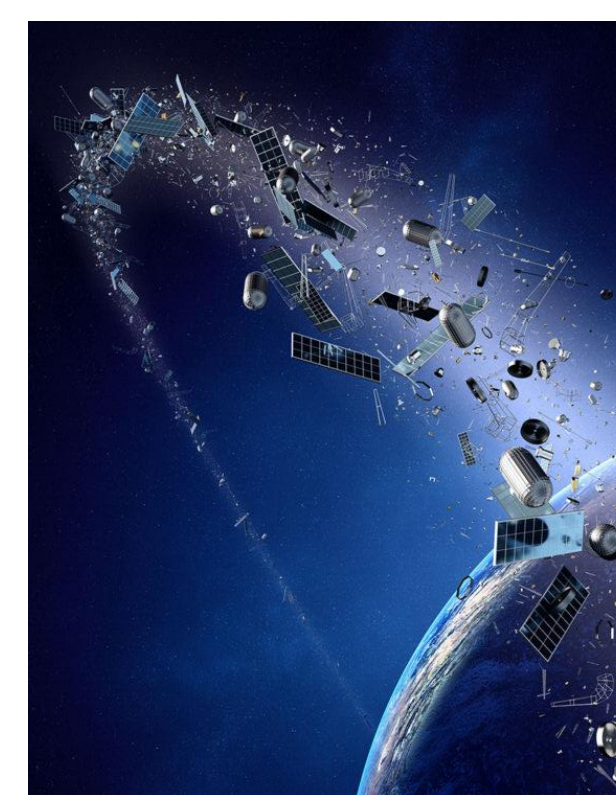
- **Physics-infused ML** to auto-calibrate dynamics/contact models with cost/fidelity trade-offs suitable for learning and deploying controllers.
- Compare and contrast centralized control and novel (**decentralized**) **formation control** approaches.
- **Reliability-based optimization** with **design-adaptive neuro-control** to identify optimal designs.



Broader impacts: Society

Use-case of space debris removal: continued safe exploitation of commercial orbits.

- Benefit satellite operators, U.S. national agencies, the public who rely on earth observation satellites
- Help strengthen U.S. leadership in Space.



Education

- Broaden participation of women in STEM, particularly robotics, through hands-on robotics experiences.
- Promote exposure of engineering students to the emerging technology of net-based robotics.



Distribution

Release first-of-their-kind open-source OpenAI benchmarks and ROS libraries on tether net systems (reducing barriers to entry to research).