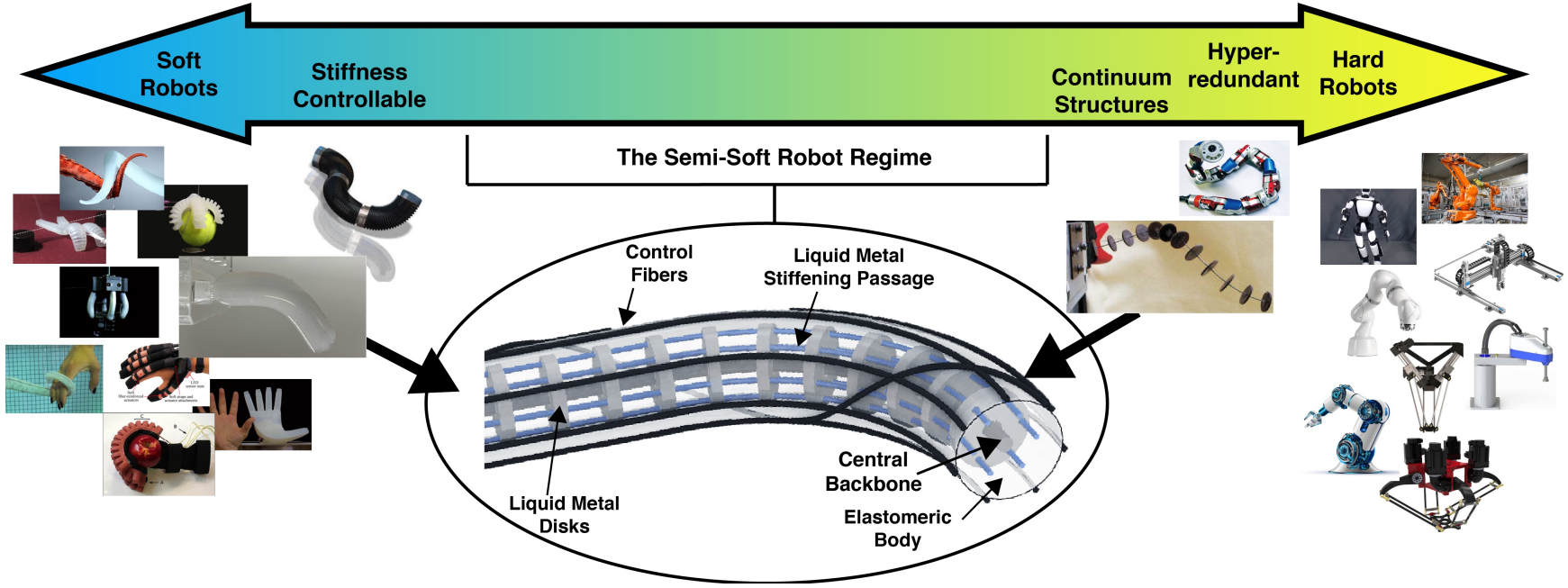
NRI: Liquid-Solid Metal for Embodied Intelligence in Semi-Soft, Human-Collaborative Robots

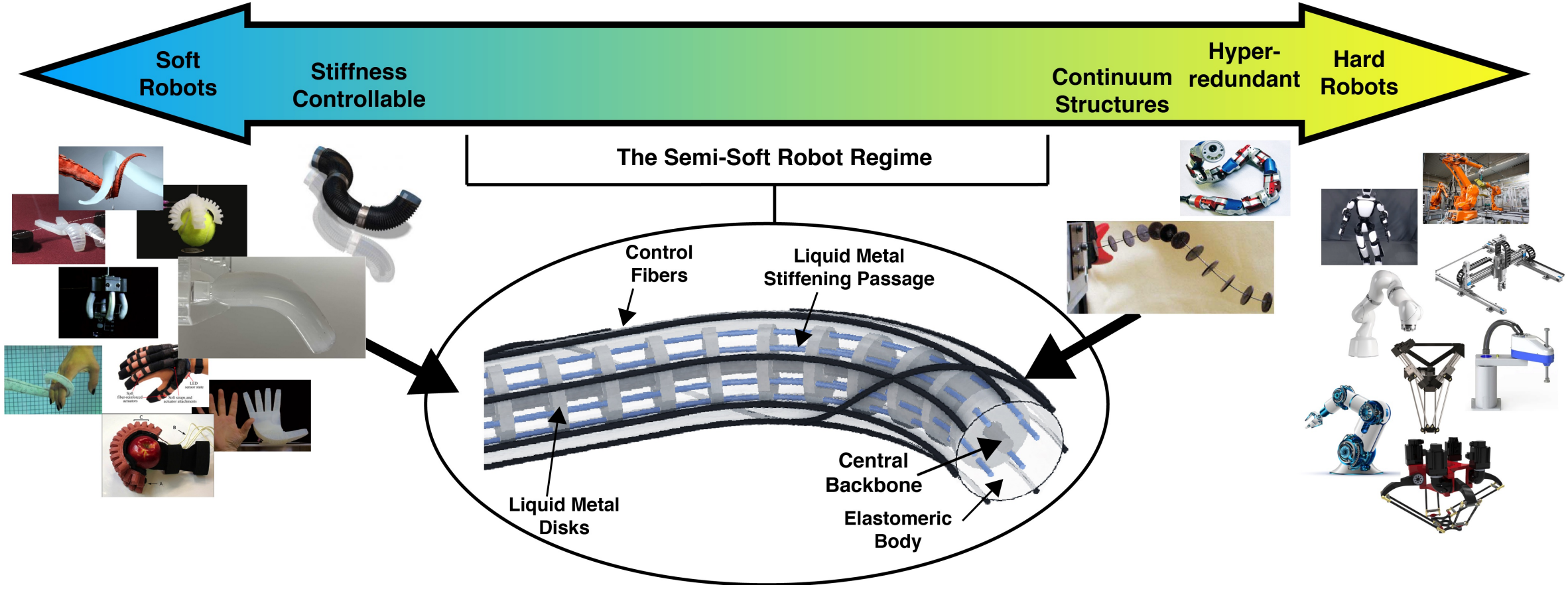


PI: Alan Kuntz, Robotics Center and School of Computing, University of Utah
Co-PI: Robert J. Webster III, Department of Mechanical Engineering, Vanderbilt University
Award ID# 2133027
alan.kuntz@utah.edu

Our Vision

alan.kuntz@utah.edu

Semi-Soft Robots



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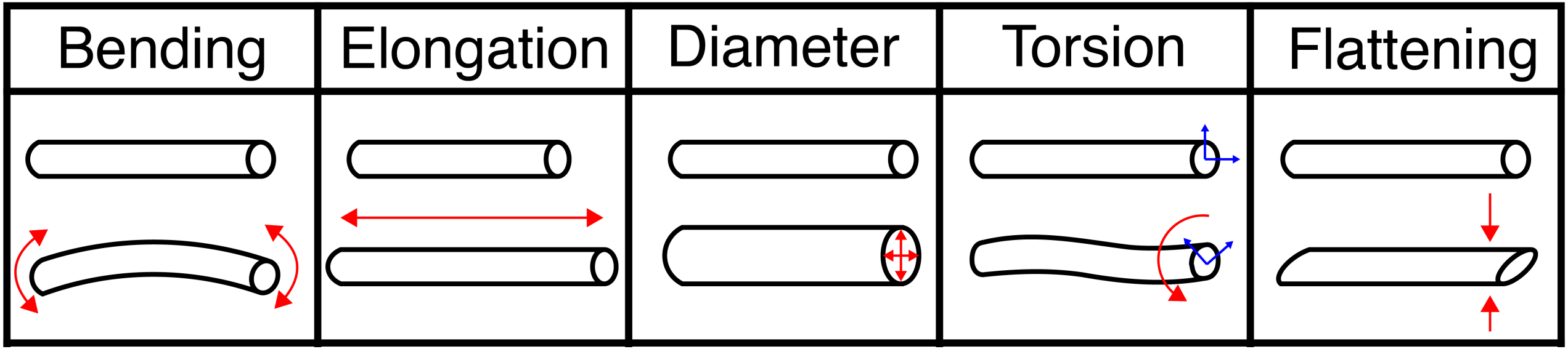
Rod-Based Deformation Modes



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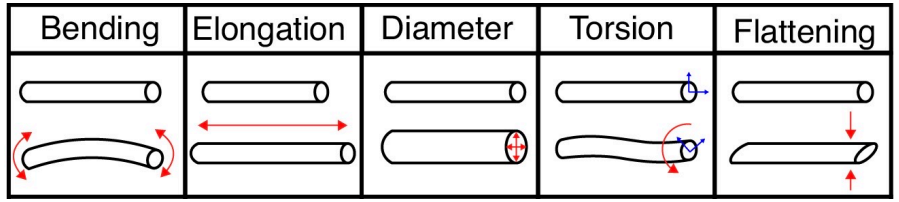
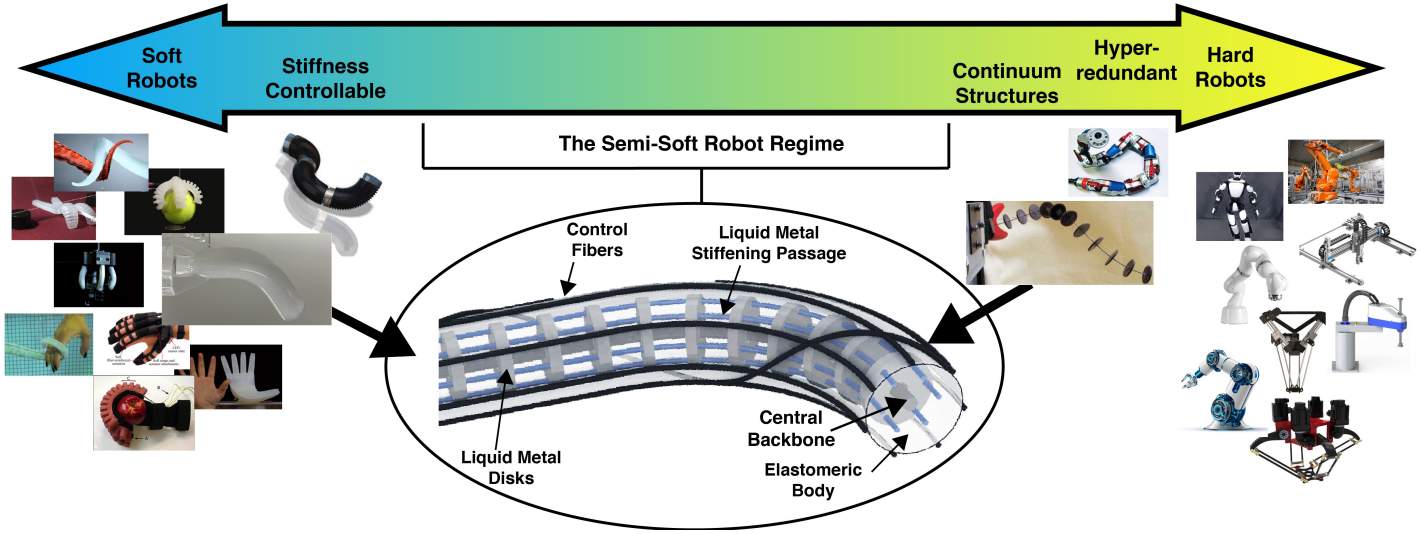




Our goal is to enable these

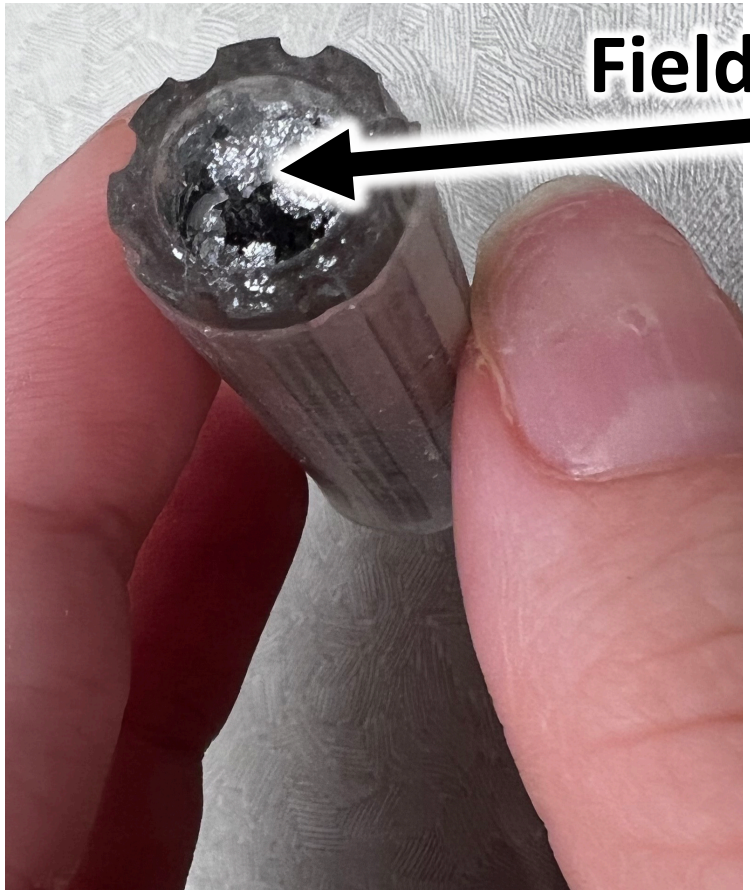
multimodal deformations in a single semi-soft robot.

alan.kuntz@utah.edu

Liquid-Metal Alloy and Elastomer Sheath

alan.kuntz@utah.edu

Liquid-Metal Alloy and Elastomer Sheath



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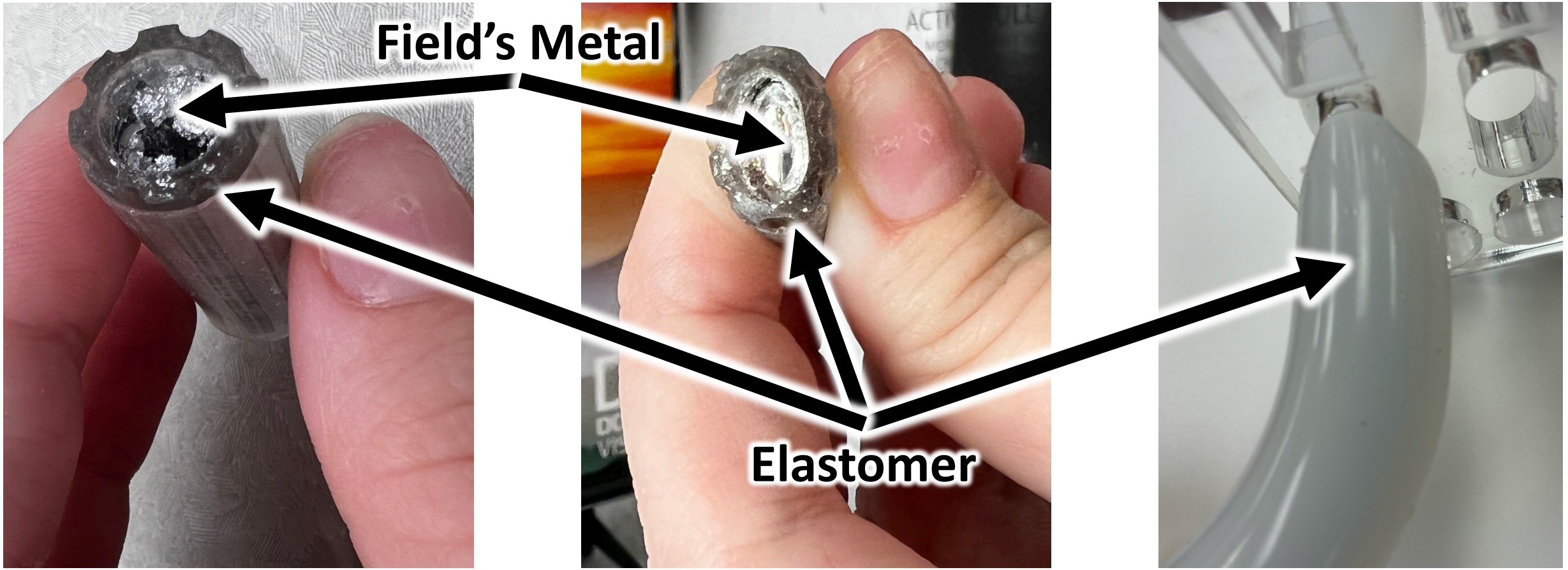

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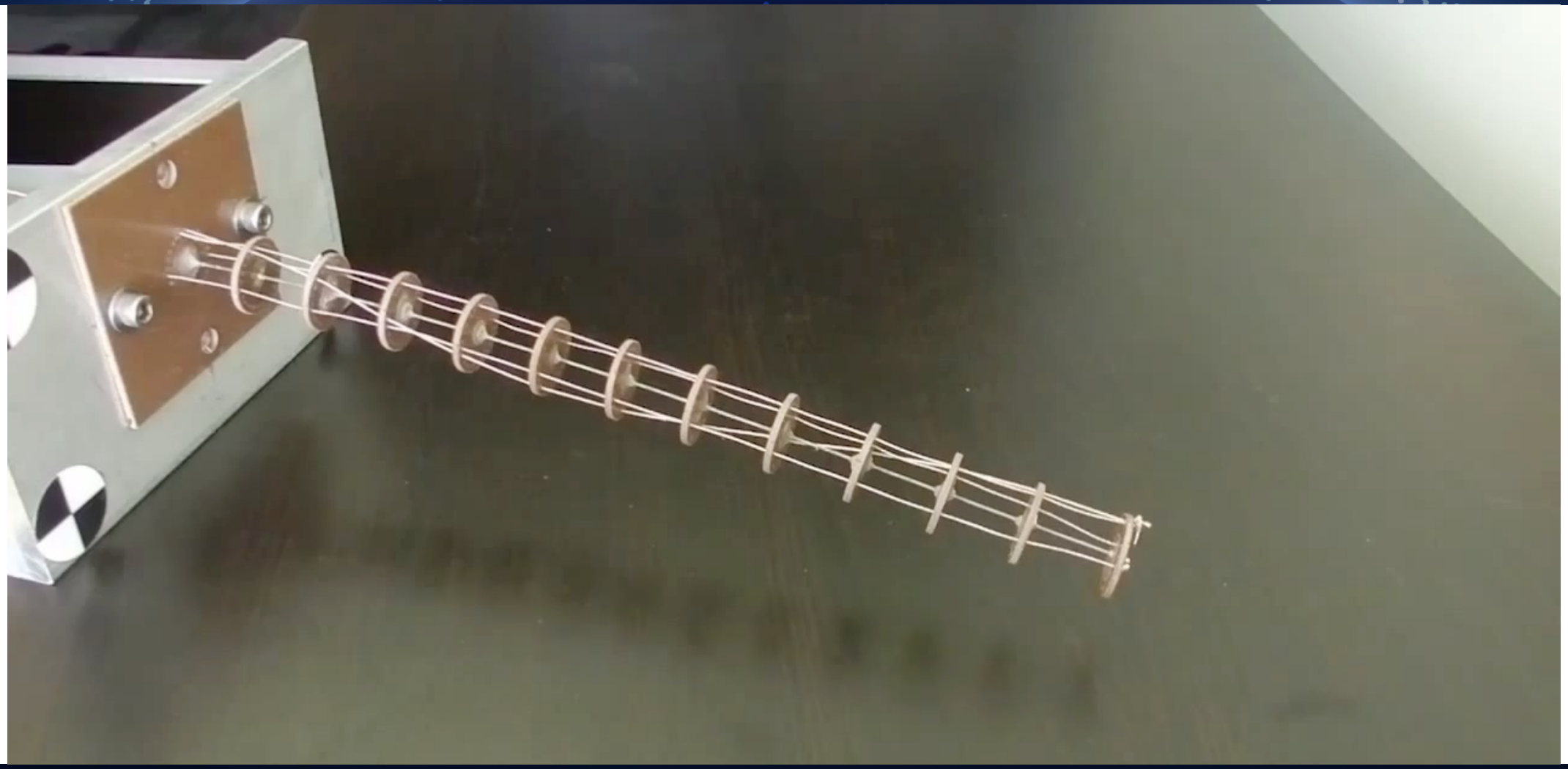
Non-Linearly Routed Control Fibers



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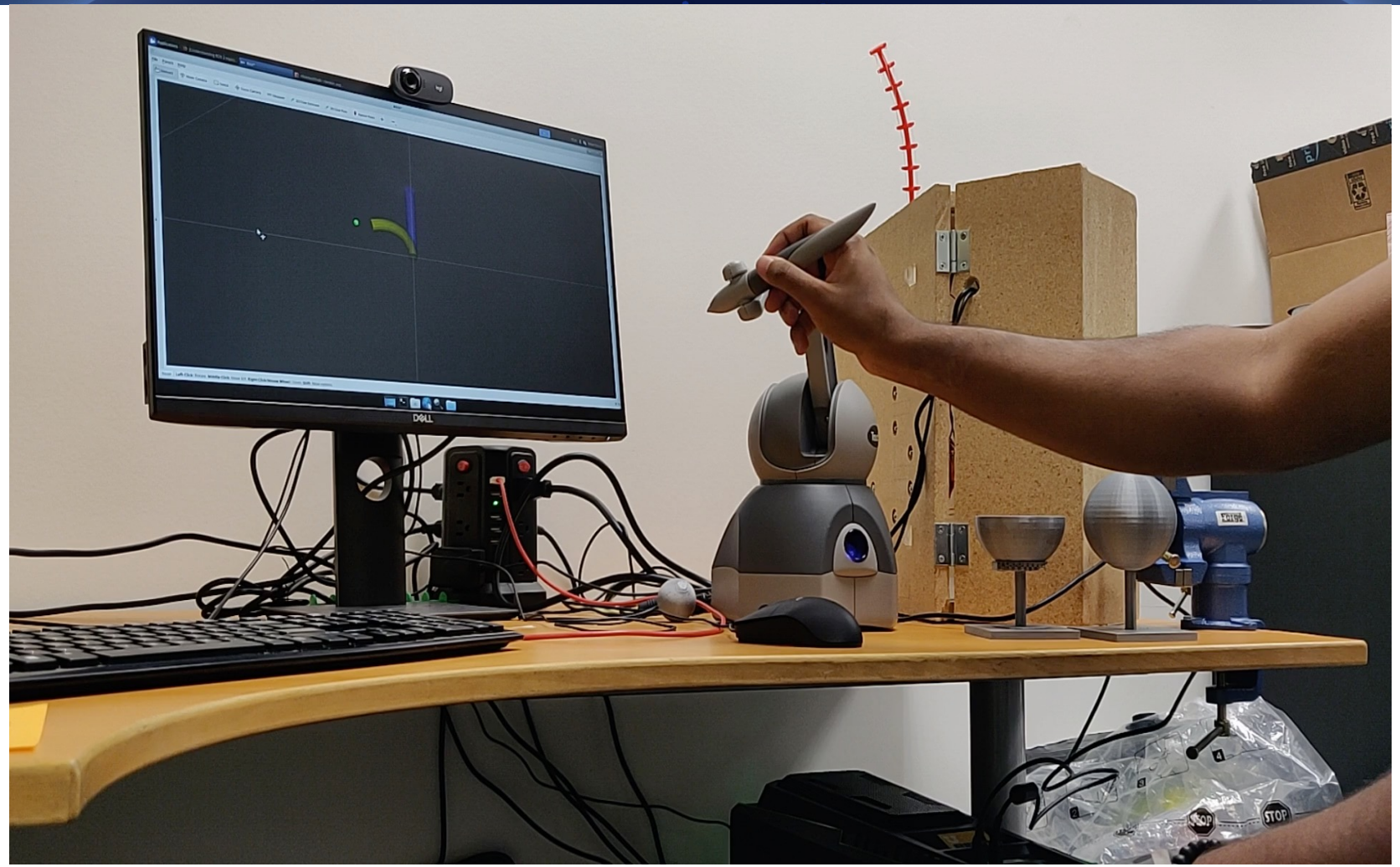
Control and Motion Planning



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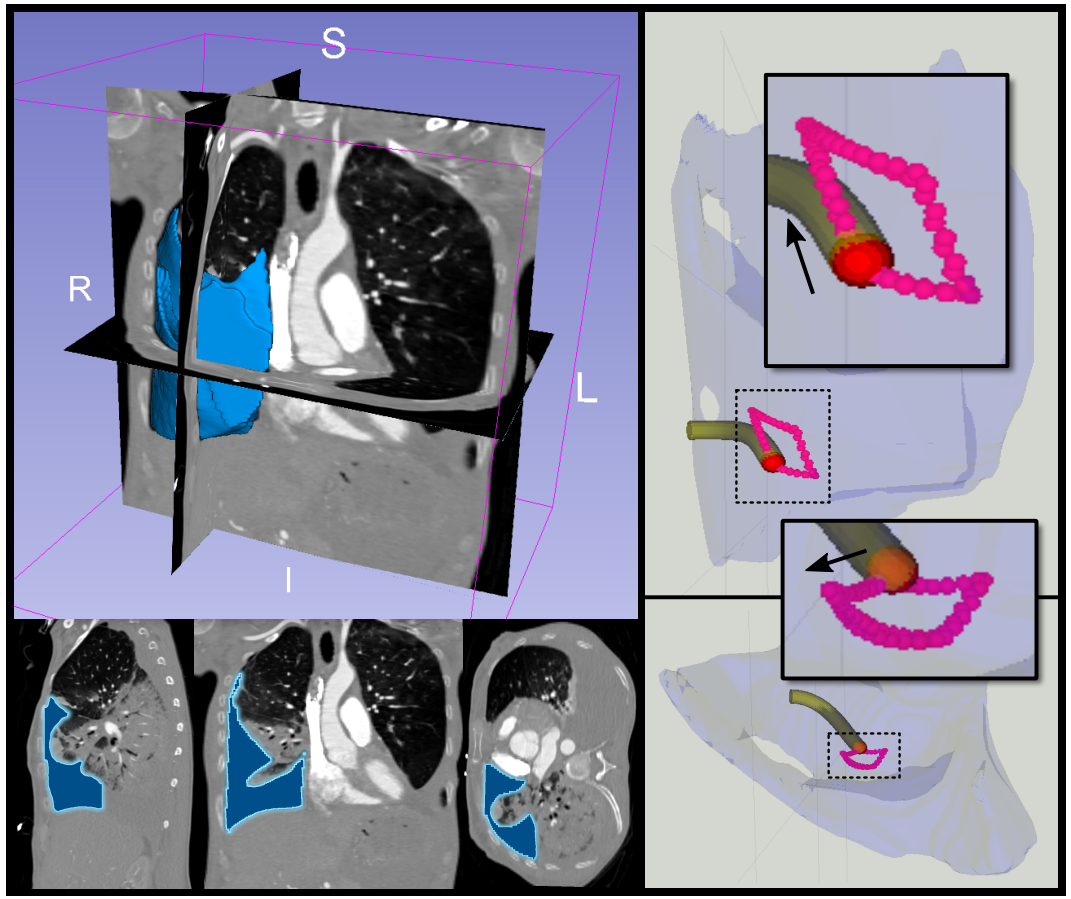
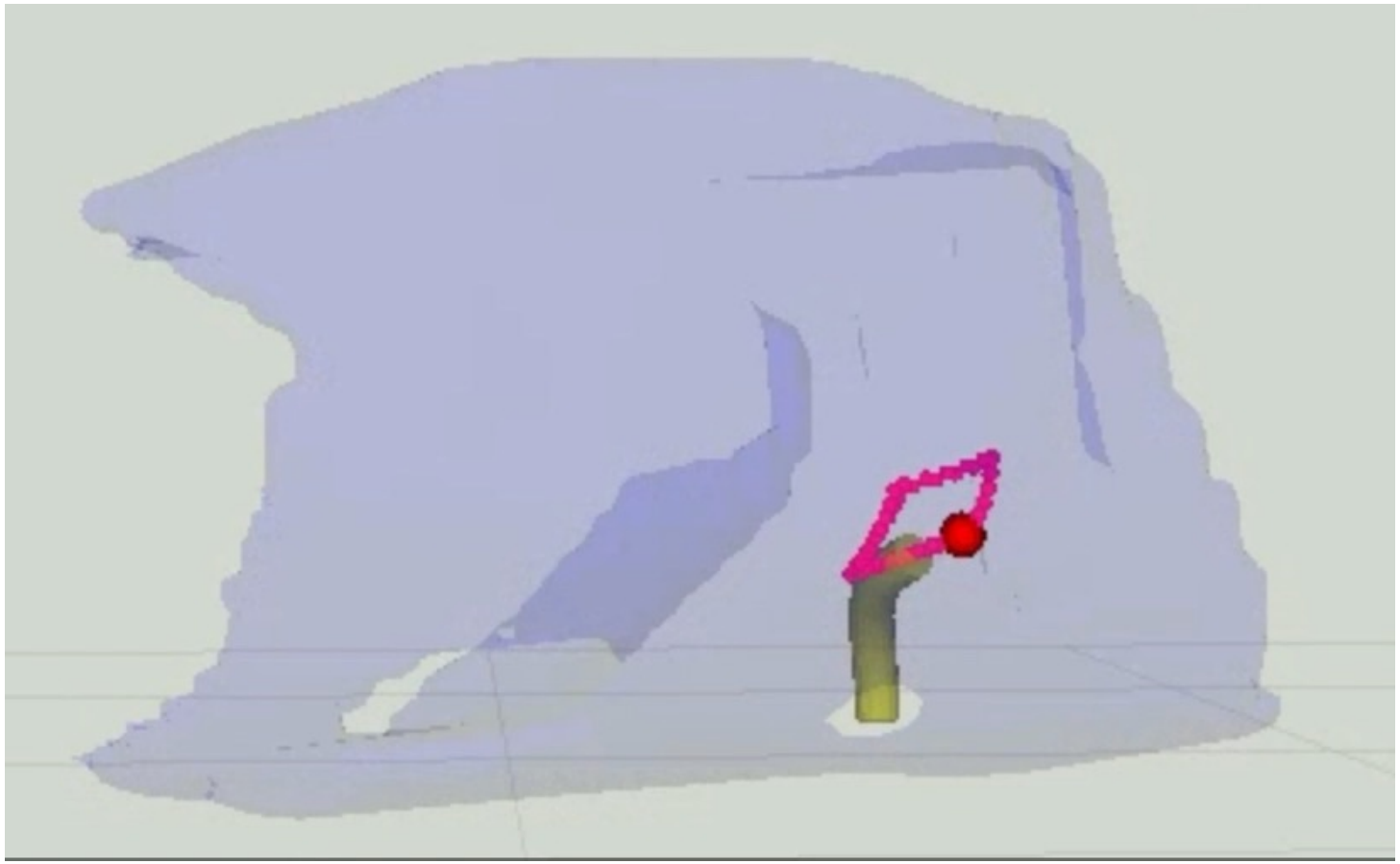
Learning Context-Dependent Subtasks from Demonstrations





Y. Huang, M. Bentley, T. Hermans and A. Kuntz, "Toward Learning Context-Dependent Tasks from Demonstration for Tendon-Driven Surgical Robots," *International Symposium on Medical Robotics (ISMR)*, 2021, pp. 1-7.

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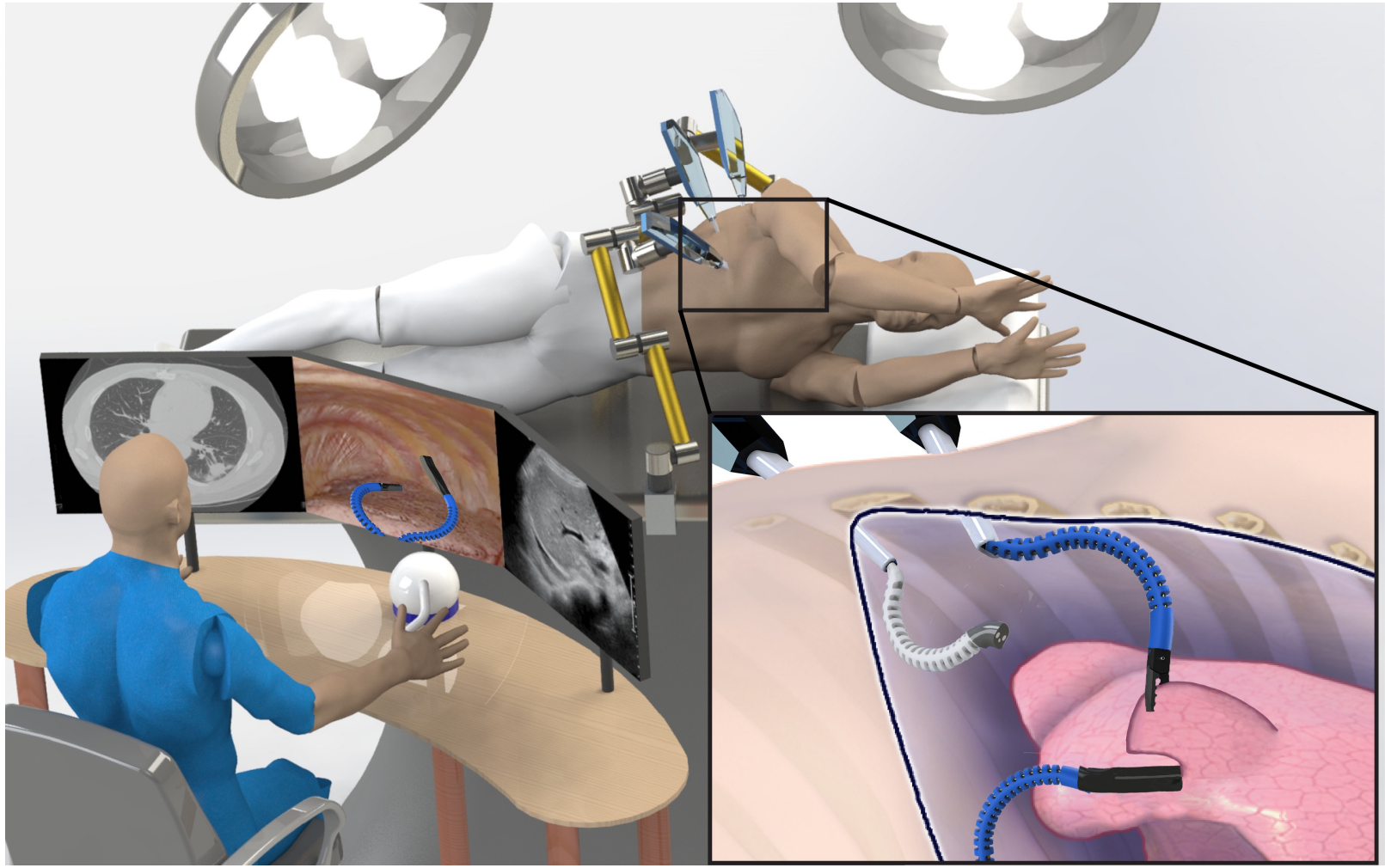
Broader Healthcare Impact

- **Reduce the invasiveness of surgical procedures** associated with Video Assisted Thoracoscopic Surgery (VATS), e.g., surgical biopsy of lung tumors.
- 150,000 people require surgical biopsy but, due in part to its risk, **83% of these patients (124,500 per year in the USA alone) do not receive it.**
- Reducing invasiveness via a semi-soft robot may enable **more patients treated and better patient outcomes**.



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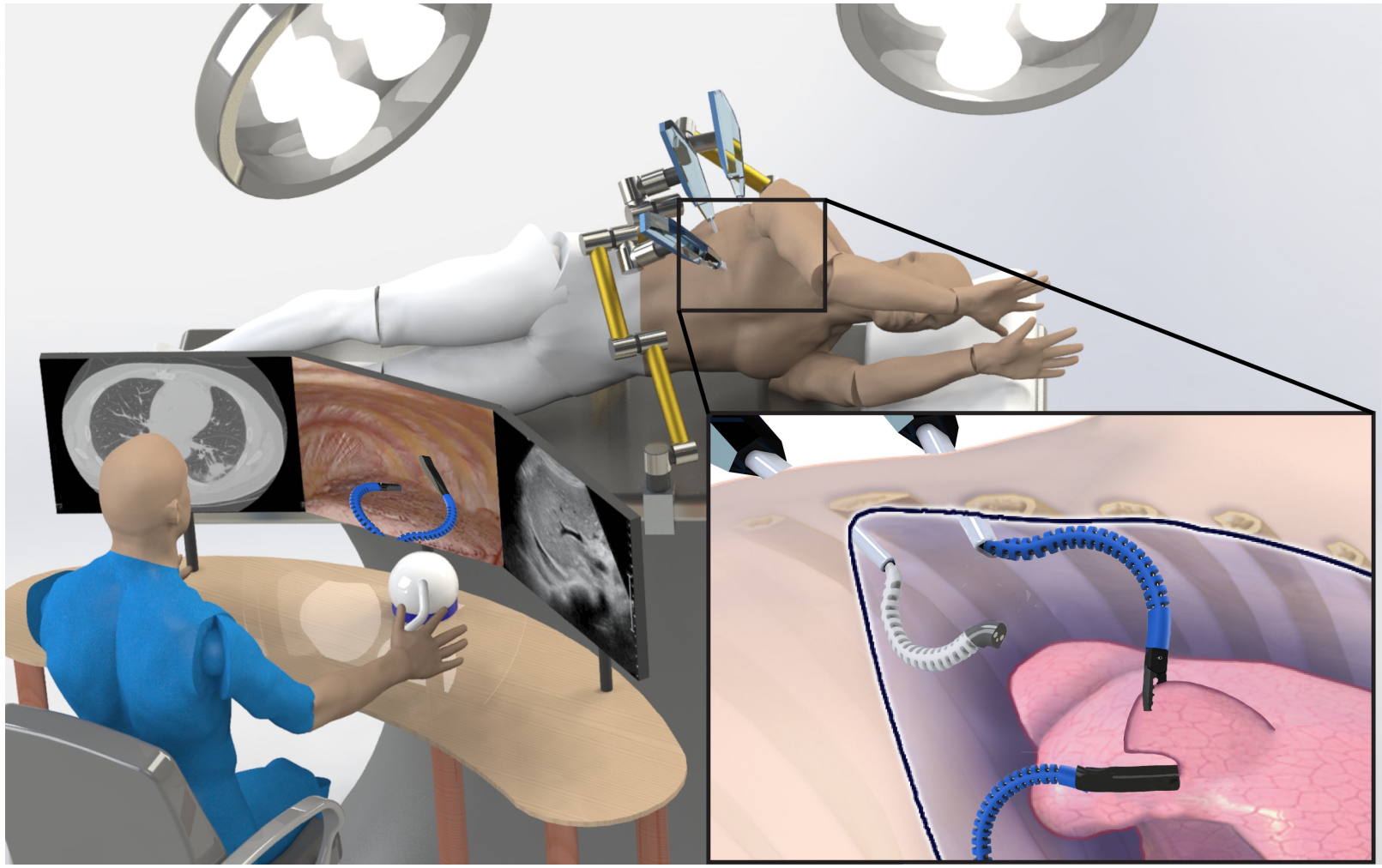
Scientific Impact

- **Understanding of how semi-soft robots can be built, modeled, and controlled** for the successful and safe execution of manipulation tasks
- Capable semi-soft robots have potential impact in e.g., **inspection, agriculture, and search and rescue**



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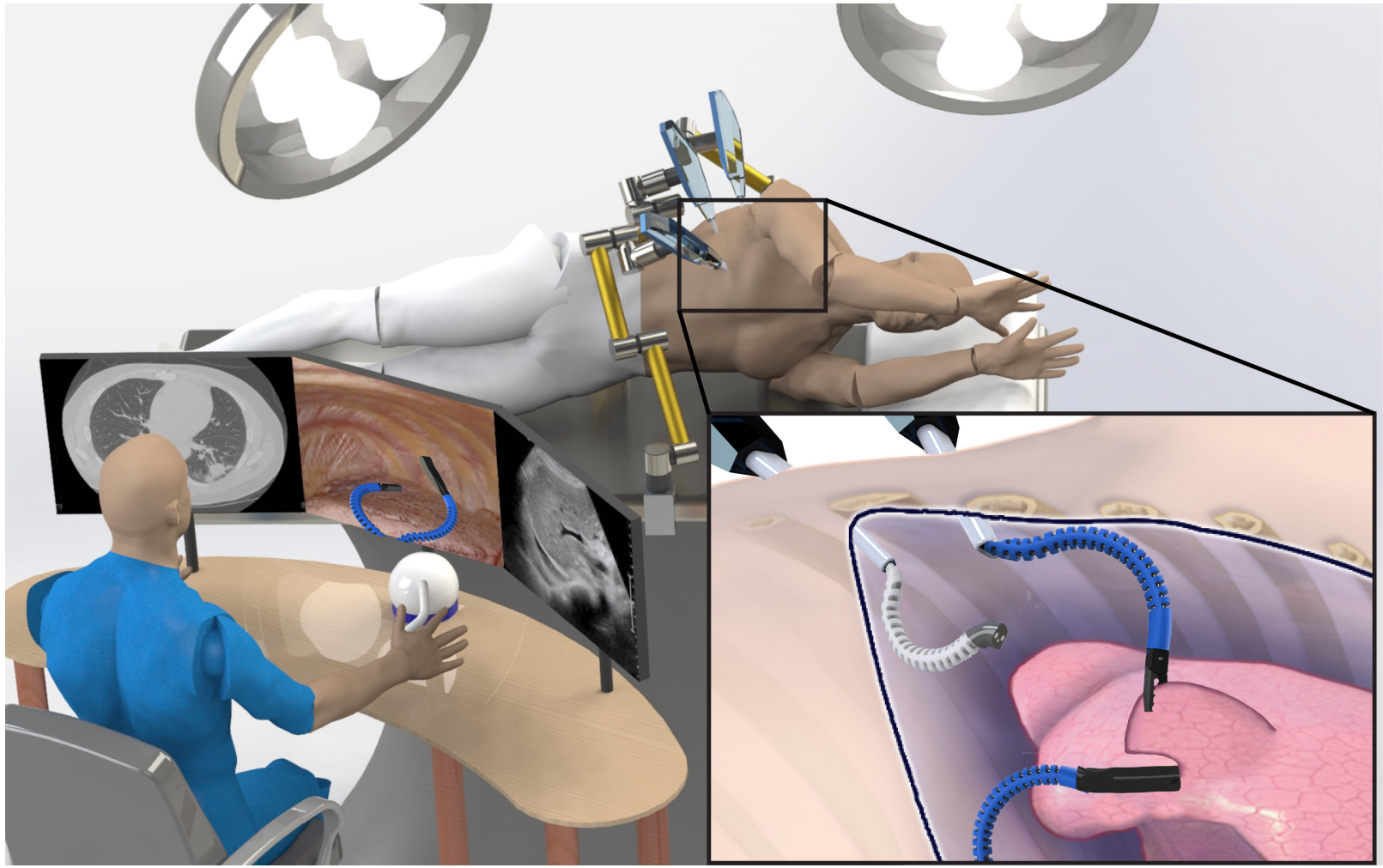
Outreach and Education

- Aspects incorporated into a **medical robotics graduate course**
- Planning demos in outreach at **K-12 events** in both Salt Lake City, UT and Nashville, TN



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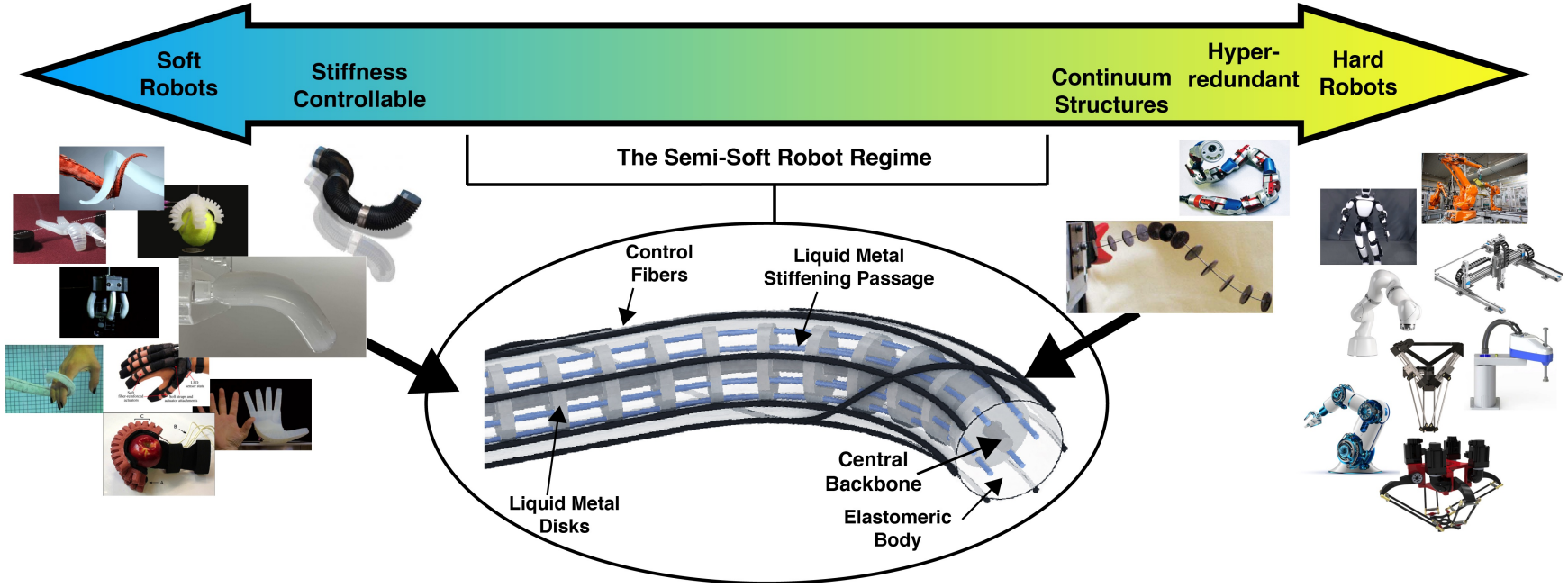

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