

## **Seminar**

### **Physical Learning in Soft & Living Matter: From Loopy Vascular Networks to Continual Learning Machines**

**Purba Chatterjee**

**University of Pennsylvania, PA**

This talk will explore how learning and adaptation in disordered soft and living materials are shaped by local physical dynamics, constraints, and interacting timescales. First, I show that the interplay of short-term pulsatility and long-term structural adaptation in periodically driven elastic flow networks - inspired by animal vasculature - is key to stabilizing realistic looped architectures under biologically relevant material and metabolic constraints. Second, I demonstrate how tunable physical systems can exploit constrained local learning rules to continually acquire new functions without catastrophic forgetting of old ones - a hallmark of biological learning. Together, these examples highlight how the emerging framework of physical learning can provide insight into the general principles governing adaptation, emergent memory, and function in complex materials and living systems, while also informing the design of novel bio-inspired, energy-efficient metamaterials.

***Tuesday, Jul 7<sup>th</sup> 2026***

***16:00 Hrs (Tea / Coffee 15:45 Hrs)***

***Seminar Hall, TIFRH***