

DEPARTMENT OF COMPUTER SCIENCE

SEMINAR

2026 SERIES

# Spatial Intelligence for Healthcare: Precise, Generalizable, and Trustworthy

DATE & TIME

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ONLINE VIA ZOOM



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### ABSTRACT

Spatial intelligence, the ability to extract, understand, and reason about spatial changes, plays a central role in a wide range of healthcare applications, including disease progression analysis, surgical guidance, radiation therapy, and large-scale brain studies. Despite its importance, enabling machines to reason reliably about medical spatial information remains challenging due to complex non-rigid anatomy, limited and imperfect data, and substantial distribution shifts across anatomies and imaging modalities.

In this talk, I focus on a core problem underlying spatial intelligence for healthcare: extracting spatial alignment from complex medical data in a way that is precise, generalizable, and trustworthy. I will present a connected line of work, GradICON and uniGradICON, that introduces gradient inverse consistency as a geometry-motivated regularization for learning-based spatial alignment, enabling precise registration under large deformations and robust generalization across anatomies and modalities. I will then discuss test-time uncertainty estimation for spatial alignment, which enables models to identify unreliable predictions and improves the interpretability of spatial alignment results. Together, these results establish a learning-based foundation for spatial intelligence in healthcare, providing a basis for future work on understanding the physical properties that govern deformation, supporting deformation simulation, and spatial reasoning.



SPEAKER'S  
BIOGRAPHY



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