

# The University of Chicago Computer Science Department

## PRESENTS:

### “Moving Toward Autonomy for Healthcare Robots”



**Ron Alterovitz**

University of North Carolina at Chapel Hill

#### **Abstract:**

Advances in robotics have the potential to improve healthcare delivery, from enabling surgical procedures that are beyond current clinical capabilities to autonomously assisting people with daily tasks in their homes. In this talk, we will discuss new motion planning and learning algorithms to enable medical and assistive robots to safely and semi-autonomously operate inside people's bodies or homes. These algorithms must effectively leverage human expertise, compensate for uncertainty due to variability in humans and the environment, consider deformations of soft tissues, and guarantee safety.

First, we will discuss how our new algorithms apply to two emerging medical devices, steerable needles and tentacle-like robots, designed for neurosurgery and pulmonary procedures. These devices can maneuver around anatomical obstacles to perform procedures at surgical sites inaccessible to traditional straight instruments. To ensure patient safety, our algorithms explicitly consider uncertainty in motion and sensing to maximize the probability of avoiding obstacles and successfully accomplishing the task. We compute motion policies by integrating sampling-based motion planners, optimal control, and parallel computation. Second, we will discuss how our new algorithms apply to autonomous robotic assistance for tasks of daily living in the home. We will present demonstration-guided motion planning, an approach in which the robot first learns an assistive task from human-conducted demonstrations and then autonomously plans motions to accomplish the learned task in new, dynamic environments with never-before-seen obstacles.

#### **Bio:**

*Ron Alterovitz is an Associate Professor in the Department of Computer Science at the University of North Carolina at Chapel Hill. He leads the Computational Robotics Research Group which develops novel algorithms for robots to enable new, less invasive medical procedures and to assist people in their homes. Prior to joining UNC-Chapel Hill in 2009, Dr. Alterovitz earned his B.S. with Honors from Caltech, completed his Ph.D. at the University of California, Berkeley, and conducted postdoctoral research at the UCSF Comprehensive Cancer Center and the Robotics & AI group at LAAS-CNRS (National Center for Scientific Research) in Toulouse, France. Dr. Alterovitz has co-authored a book on Motion Planning in Medicine, was co-awarded a patent for a medical device, and has received multiple best paper finalist awards at IEEE robotics and computer-assisted medicine conferences. He is the recipient of an NIH Ruth L. Kirschstein National Research Service Award, two UNC Computer Science Department Excellence in Teaching Awards, and an NSF Early Career Development (CAREER) Award. Research group web site: <http://robotics.cs.unc.edu>*

**Thursday, October 20, 2016**

**3:00 pm**

**Ryerson 251**

**Host: Michael Franklin**

*Refreshments will be served in Ryerson 255 after the talk*