

# Oakland University student solves uncertain preferences in autonomous decision-making

The Oakland University and School of Engineering and Computer Science communities are invited to attend Christopher Slon's defense of his Ph.D. dissertation. Seating is limited. RSVP with Katie Loodeen at [loodeen@oakland.edu](mailto:loodeen@oakland.edu).

## Accommodating Uncertain Preferences in Autonomous Decision-making for Smart Assembly

Committee: Vijitashwa Pandey, Ph.D. (Chair), Ravindra Khattree, Ph.D., Michael Latcha, Ph.D., Sankar Sengupta, Ph.D.

Industry 4.0 demands autonomous decision making on the plant floor that is simultaneously quick and adaptable to changing decision maker (DM) preferences. In this research, we apply the methods of decision-based design to autonomous decision-making for corrective assembly within a Smart Factory. We provide a closed-form approximation for the expected utility when there is uncertainty in both the outcomes and the DM preferences. The closed-form approximation accommodates any arbitrary distributions for the uncertainty, and at the same time avoids time-consuming numerical methods that have the potential to increase the cycle time of the corrective process. Additionally, we take a Bayesian perspective on the stochastic nature of the utility function and propose a distinction between a prior utility function based on preferences in the design phase, and a posterior utility function updated through data collected on observed preferences in production. We do this by treating the shape parameters that describe the risk preference of the decision makers as a random variable with a prior and posterior distribution. We demonstrate through an automotive assembly application that the approach significantly improves the assembled product.

**Time:** 1:00 – 3:00 p.m.  
**Date:** Monday, June 3, 2019  
**Location:** 347 EC

