

# STATISTICS SEMINAR

Dr. Siyeon Kim

Postdoctoral Researcher, Statistics Department at Duke  
Postdoctoral Scientist in the Reinforcement Learning Group at Amazon

**Development of Statistical Learning Methods in Precision Medicine**

**Friday, September 13, 2024**

**2:30 – 3:30 pm**

**310 MSCS**

**ZOOM Link for Applied M.S. Students**

<https://okstate-edu.zoom.us/j/6371949375>

**Abstract:** Precision medicine is an area that seeks to maximize clinical effectiveness by assigning treatment regimes tailored to individuals. In this talk, we present two topics that advance the methods and applications in the field of precision medicine. The first topic introduces a novel methodology termed random forest informed tree-based learning to discover underlying patient characteristics associated with differential improvement in knee osteoarthritis (OA) symptoms and to identify the individualized treatment regime (ITR) among three available treatments. The proposed algorithm suggests decision rules that divide participants into subgroups based on their characteristics. In our analysis, the estimated treatment rule yielded greater improvements in OA symptoms that could ultimately guide patients toward suitable treatment strategies. In the second topic, we propose a doubly robust estimator for patient-specific utilities and ITRs based on the inverse reinforcement framework from Lockett et al. (2021). This framework optimizes patient-utility for two outcomes by leveraging experts' decisions on observational data. The suggested doubly robust estimator guarantees consistency even when incorrect outcome models or incorrect propensity score models are applied, alleviating the need for exact formulation of the outcome model and improving the previous estimator. We also present asymptotic distributions for the estimators of boundary and utility functions using the newly developed indexed argmax theorem, which can be used for deriving weak convergence of M-estimators with multiple layers.

**Refreshments immediately following seminar in Room 309 MSCS.**