Subject: Application of Reinforcement Learning to Mobility Service

Presenter: Gyugeun Yoon, Ph.D.

[Abstract]

Mobility service route design requires demand information to operate in a service region. Transit planners and operators can access various data sources including household travel survey data and mobile device location logs. However, when implementing a mobility system with emerging technologies, estimating demand becomes harder because of limited data resulting in uncertainty. This study proposes an artificial intelligence-driven algorithm that combines sequential transit network design with optimal learning to address the operation under limited data. An operator gradually expands its route system to avoid risks from inconsistency between designed routes and actual travel demand. At the same time, observed information is archived to update the knowledge that the operator currently uses. Three learning policies are compared within the algorithm: multi-armed bandit, knowledge gradient, and knowledge gradient with correlated beliefs. For validation, a new route system is designed on an artificial network based on public use microdata areas in New York City. Prior knowledge is reproduced from the regional household travel survey data. The results suggest that exploration considering correlations can achieve better performance compared to greedy choices and other independent belief-based techniques in general. In future work, the problem may incorporate more complexities such as demand elasticity to travel time, no limitations to the number of transfers, and costs for expansion.