Dissertation Defense
Doctor of Philosophy in Computer Science

"DATA-DRIVEN PREDICTIVE MODELING AND MULTI-STAKEHOLDER RECOMMENDER
SYSTEMS FOR THE PUBLIC GOOD" by Tahereh Arabghalizi

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Abstract:
Public transit is a key aspect of "smart cities". As such, many technologies, applications, and infrastructure have been deployed to improve public transportation. For example, a commuter may receive a notification while waiting at the bus stop, alerting them to the next bus being full and offering a discount (e.g., $2 off) at a nearby coffee shop if they take a later bus.

In the first part of this thesis, we address the issue of bus fullness to increase the utilization and quality of public transportation. Specifically, we propose and develop multiple predictive models and evaluate their accuracy using data from the Pittsburgh region. Our models consistently outperform the baselines.

The second part of this thesis aims to propose new approaches for recommending items (e.g., coupons) while also considering the preferences of all stakeholders. Traditional recommender systems focus on the needs and preferences of the user but overlook the preferences of other parties involved (e.g., "product suppliers" or "service providers"). The goal of this work is to propose solutions for "multi-stakeholder recommender systems" in an online environment where the number of stakeholders, their importance level, the number of offers, and the availability of items can change.

In particular, we propose and develop several recommendation solutions using Multi-armed Bandits to provide a reasonable level of satisfaction for all stakeholders in a multi-stakeholder platform in the long term. Our extensive experimental results on a real-world dataset show that our proposed approaches outperform the baseline methods and provide a good balance between the satisfaction of different stakeholders over time.