

# Mansueto Institute for Urban Innovation

## Lunch Colloquium Series



## Graph Augmentation for Equitable Access via Reinforcement Learning

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**Wednesday, October 27**  
**12:30 - 1:30pm CST**  
**Hybrid Event**

**Register for Zoom link:**  
**<https://bit.ly/LVarshney>**

**In-Person Location:**  
**1155 E. 60th St.**

**Room 140C**  
**Lunch will be provided**

Disparate access to resources by different subpopulations is a prevalent issue in societal and sociotechnical networks. For example, urban infrastructure networks may enable certain racial groups to more easily access resources such as high-quality schools, grocery stores, vaccination sites, and polling places. Similarly, social networks within universities and organizations may enable certain groups to more easily access people with valuable information or influence. Here we introduce a new class of problems, Graph Augmentation for Equitable Access (GAEA), to enhance equity in networked systems by editing graph edges under budget constraints. We prove such problems are NP-hard, and cannot be approximated within a factor of  $(1-1/3e)$ . We develop a principled, sample- and time- efficient Markov Reward Process (MRP)-based mechanism design framework for GAEA. Our algorithm outperforms baselines on a diverse set of synthetic graphs. We further demonstrate the method on real-world networks, by merging public census, school, and transportation datasets for the city of Chicago and applying our algorithm to find human-interpretable edits to the bus network that enhance equitable access to high-quality schools across racial groups. Further experiments on Facebook networks of universities yield sets of new social connections that would increase equitable access to certain attributed nodes across gender groups. We close by discussing several other AI for Good problems that we have considered in Chicago, other American cities, and throughout the world.