

THE UNIVERSITY OF CHICAGO

Computational and Applied Mathematics & Statistics Student Seminar

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Modeling Prison Accessibility: Optimization on Weighted Graphs with Capacity Constraints

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Jones 303

ABSTRACT

People need to visit their family members in prison. When they must travel farther to do so, that imposes costs on visitors, prisoners, and society at large through increased recidivism. Currently, the law lacks a way to talk about and measure how far away a state's prisons are from a state's population overall. This talk proposes a novel metric to quantify this "prison accessibility". First, we introduce the model used to identify the optimal siting of prisons (the theoretical placement that minimizes the aggregate travel distance for state residents). We frame the optimal prison siting as a capacitated p-median problem on a population-weighted graph. Generating the optimum placement requires solving an NP-hard mixed-integer linear program (MILP). The talk will detail our approach to solving this MILP, with a focus on resolving residual symmetry, guaranteeing a unique minimum, and isolating a single optimal facility footprint. Finally, we use this optimal baseline to calculate the ratio between the real-world travel distance and the optimum, yielding a rigorous score for how (in)accessible a state's prisons are.