

Joint Optimization of School Bus Routes and Last-mile Services

Purpose: To study the feasibility of using ride-sharing vehicles to provide last-mile services for school bus trips and examine the potential to reduce transportation costs by creating shared transportation routes between schools.

Approach: The team started by conducting a market analysis to understand the landscape of ride-sourcing services designed to transport students in the United States. They reviewed publicly available information such as company data, school district contracts with ride-sourcing companies, and conducted private interviews with a leading company in the field. The researchers provided a tractable method to check the feasibility of route sharing among any coalition of schools, assuming every school would be responsible for the costs proportional to the ratio of their students on each (shared) route. They did so by leveraging classical results in transportation research, concepts from collaborative game theory, and computational methods from machine learning.

Key Findings:

- *Schools are unlikely to outsource student transportation at a large scale due to cost and regulation reasons*
- *As ride-sourcing is an emerging market, schools are actively seeking help from ride-sourcing companies to solve transportation issues*
- *Demand uncertainty can create issues with logistics and affect optimal vehicle fleet allocations*
- *Shared transportation presents a significant cost-saving opportunity*

Conclusion: The unavailability of first-mile and last-mile transportation services is one of the main deterrents to school buses for certain families. Ride-sourcing companies, such as Uber, Lyft, and Z-Trip, have leveraged their internet-based platforms to operate transportation services with flexible routes and schedules. Local schools could tap into this technology to connect students to their school busses.



Photo by [Marsik Thomas](#) on [Unsplash](#)

Research Team:

- Peter Zhang (Principal Investigator)
<https://orcid.org/0000-0002-0422-834X>

Project Record:

- <https://ppms.cit.cmu.edu/projects/detail/338>

Follow Us:

-  www.facebook.com/traffic21.tset
-  [@Traffic21CMU](https://twitter.com/Traffic21CMU)