Dynamic Decision Support System for Taxi Drivers

15.093 – Optimization Methods Project
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AGENDA

1. PROBLEM
2. OPTIMIZATION
3. DEPLOYMENT
4. TAKEAWAYS

PROBLEM STATEMENT

- An average taxi driver completes 6-10 trips per shift (~5 hours)
- Driver makes on-the-fly decisions about accepting/declining ride requests

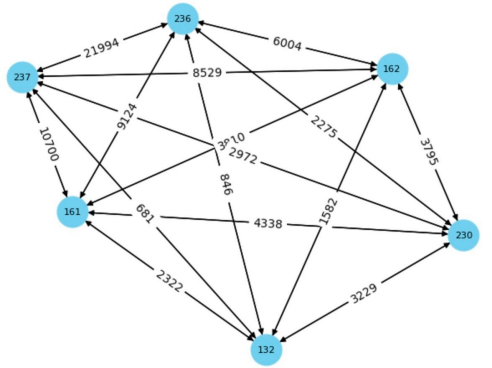
MOTIVATION
To address the limitations of the current manual decision-making paradigm of accepting/declining ride requests
OBJECTIVE
To develop an optimization model that guides taxi drivers with an optimal decision based on potential returns for the day

DATA

- Dataset used: NYC Taxi Trips dataset for June 2023
- Trip data bucketed into 30-minute intervals
- In practice, driver enters details regarding their preferences

Input Parameters	Temporal Data Obtained
Driver Preferences • Trip Details • Shift times • Starting location • Number of trips	**NYC Taxi Trip Data** • Average Fares between locations • Transitional probabilities between locations

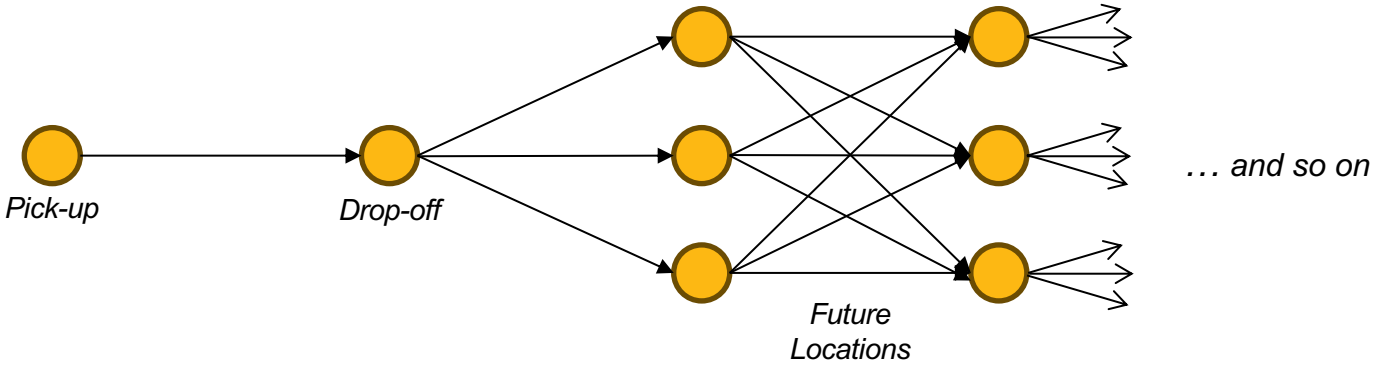
TRIPS VISUALIZATION



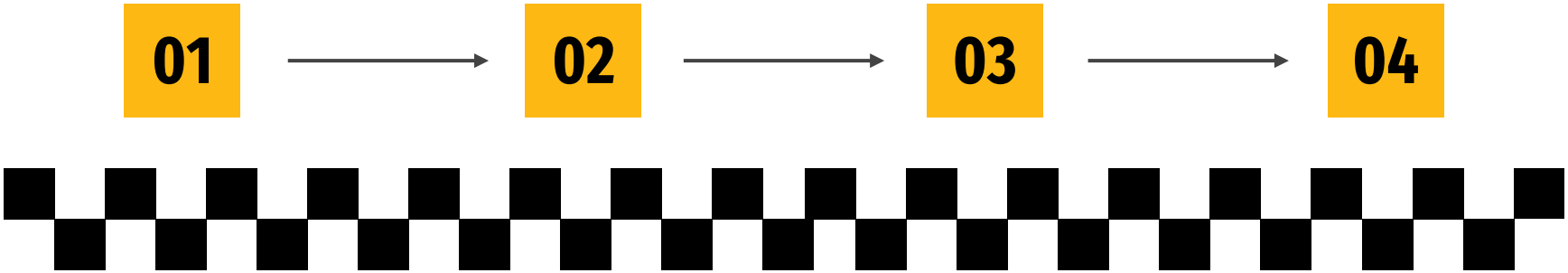
OPTIMIZATION MODEL

DECISION	OBJECTIVE	CONSTRAINTS
Binary z (Accept/Decline Request)	Maximize Expected Profits	- Shift time cannot be exceeded - Limited number of trips - Expected Returns calculation

Expected Profits Recursion: Fare of Current Trip + γ * Expected Profit from drop-off location



MODEL DEPLOYMENT



INPUT

Driver enters in their preferences and trip request details

OPTIMIZATION

Model calculates the expected profit for the received request

DECISION

Model output is an optimal decision to accept/decline the request

NEXT TRIP

Driver repeats the process for their subsequentt trips

KEY TAKEAWAYS

01

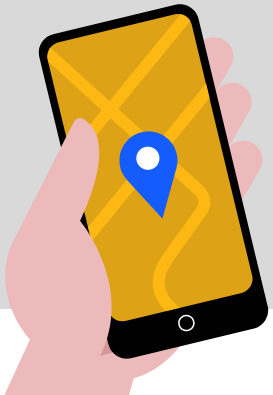
RESULTS

Enhanced Decision-Making Process

- Model outperforms manual method by up to 68.5% on simulations

Long-Term Profitability Focus

- Decisions made on basis of overall benefit over the course of the driver's shift lead to greater profits



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IMPACT

Practical Real-World Applicability

- Data-driven approach aligns well with current challenges facing taxi drivers

Adaptability to Diverse Operations

- Model stacks up well in dynamic and competitive environments