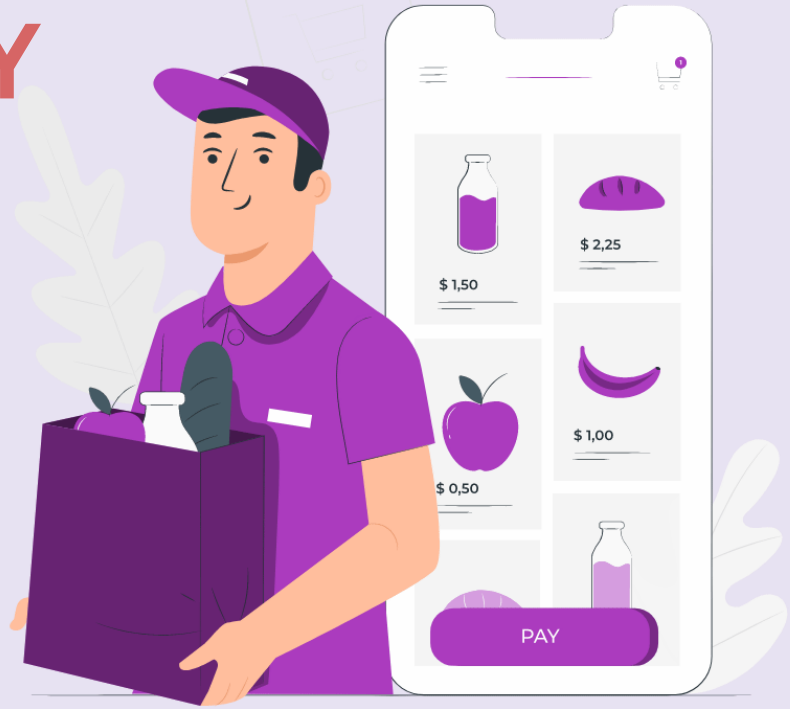
CONSOLIDATED SUBSCRIPTION - BASED LAST MILE DELIVERY



Supervisors: Dr. Nourinejad and Dr. Park

By: Behnaz Naeimian

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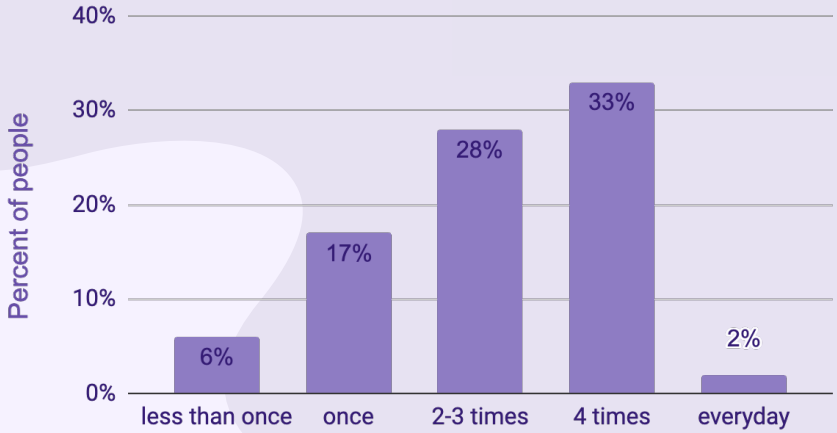
1. Current Overview

Convenience → Online grocery shopping

22.2 % Canadians intend to regularly purchase grocery or

How Often People Online Grocery Shop?



Grocer Delivery Options

Grocers	Price Per Deliver (CAD)	Cost Restrictions (CAD)	Premium Delivery Time Fees (CAD)
Walmart	$7.97	$35	$12.94
Loblaws	$7.95	$0	$9. 99-$13.99
Metro	$7.99	$50	$13.99

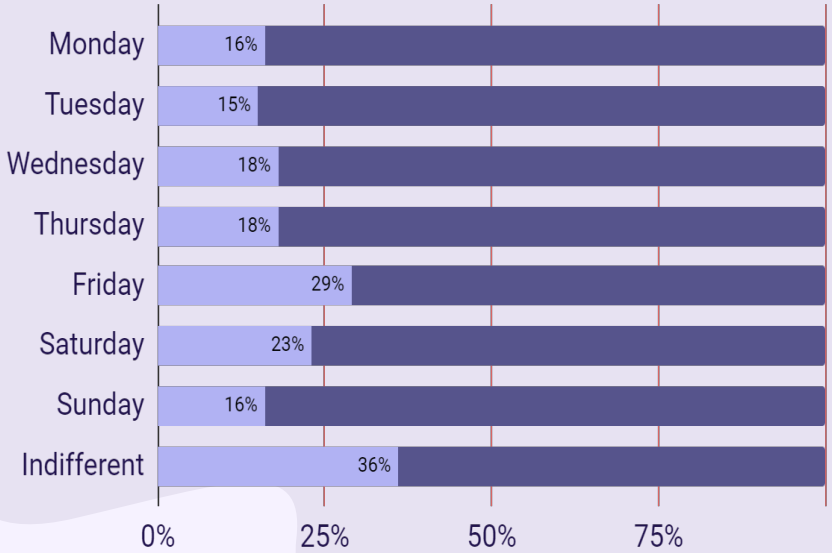
Food Delivery Examples

HELLO FRESH

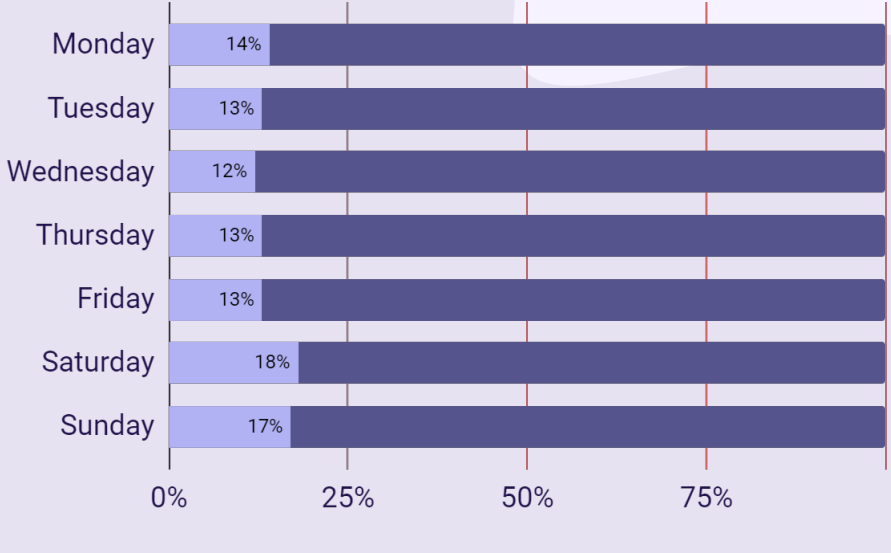
FRESH PREP

INSTACART

Preferences in terms of Dates



UNITED STATES



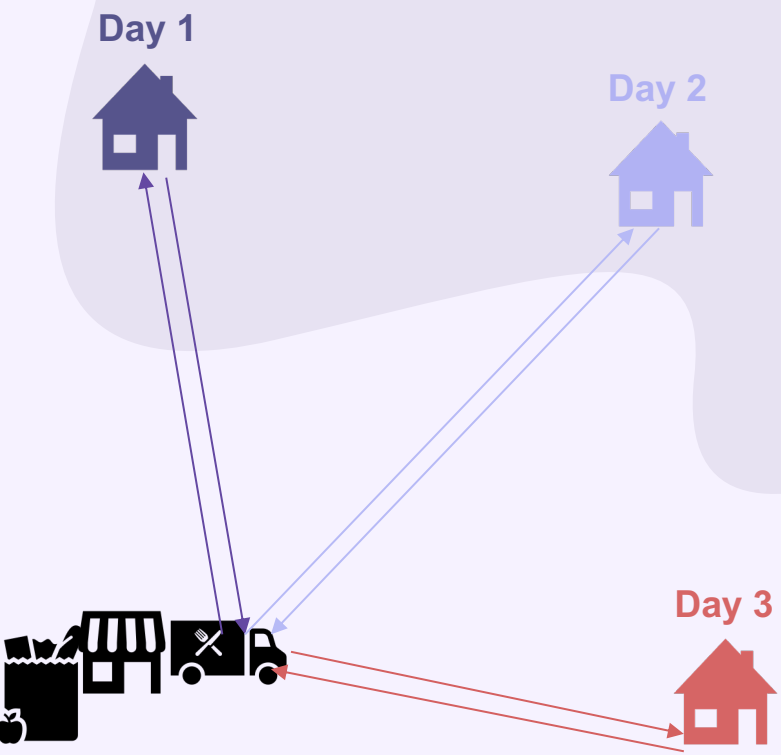
CANADA

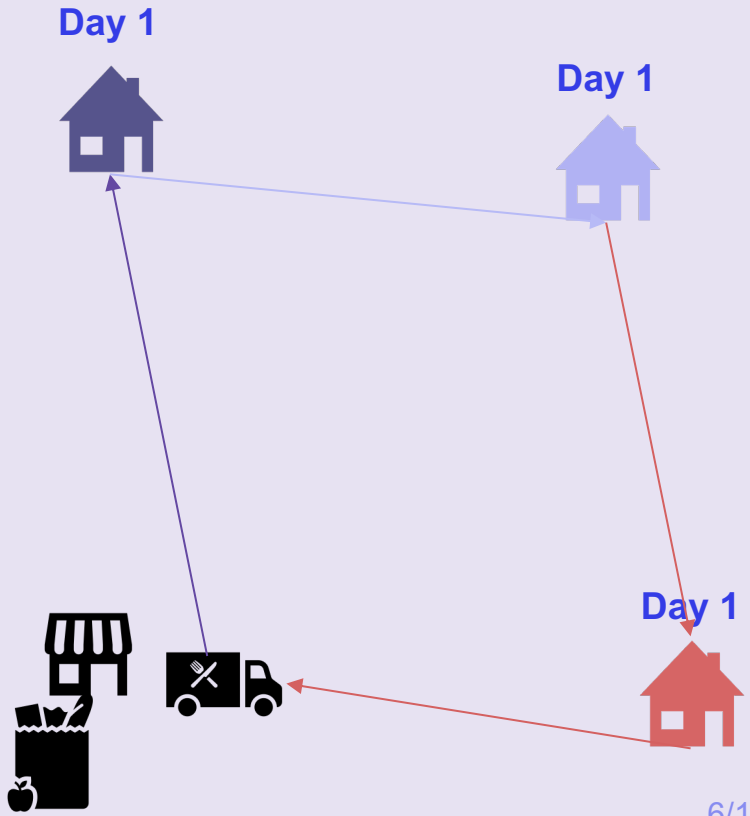
2.

The Problem Statement

Addressing the high cost of delivery for online grocery shoppers

Same-day Delivery vs Consolidated Delivery





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3.0 Proposing Solution

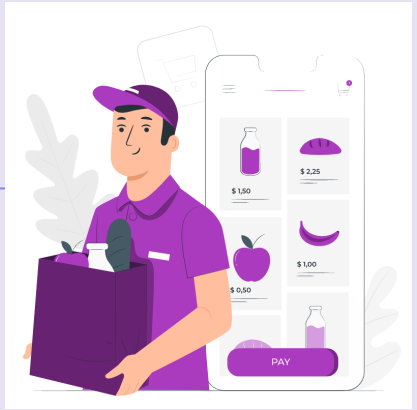
Brick & Mortar

Consolidated Delivery

Convenience

Less expensive

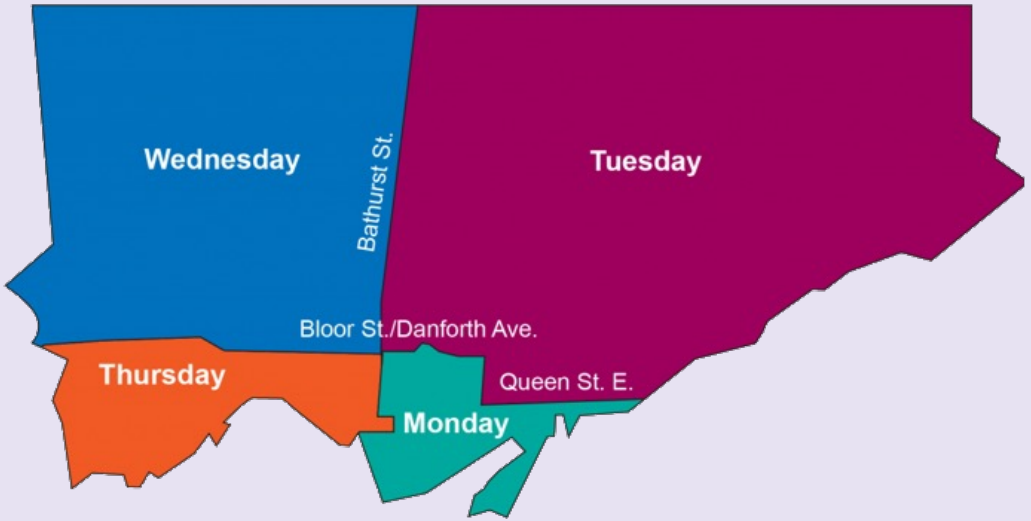
Same-day Delivery



Is it Realistic?

YES!

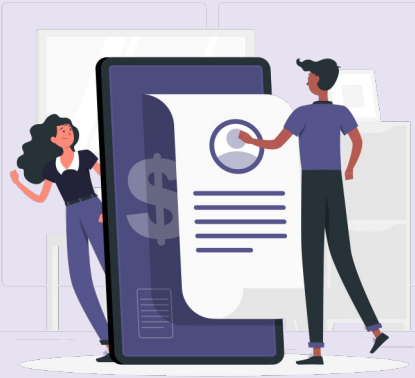
Garbage is collected on a weekly basis on specific days



Schedule is based on the neighborhood

3.2 Subscription Plans

Plan 1	Plan 2	Plan 3
Subscription fee $ P_1 per month	Subscription fee $ P_2 per month	No Subscription fee (P_3 =0)
No fee per delivery (k_1 =0)	Pay $ k_2 per delivery	Pay $ k_3 per delivery



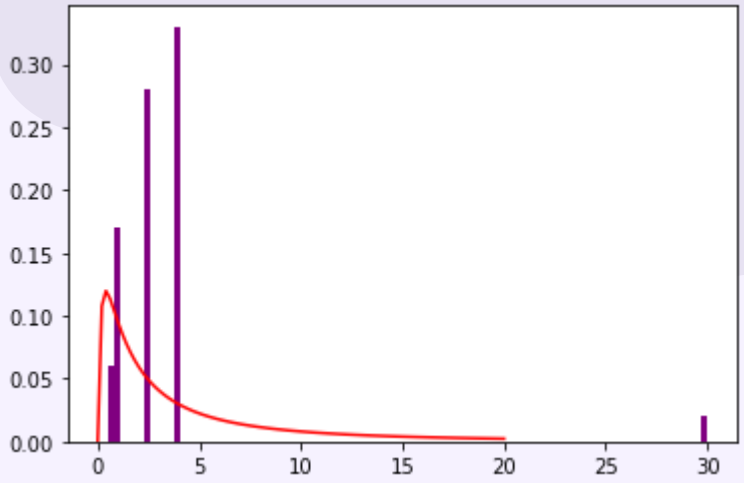
4.0

Methodology

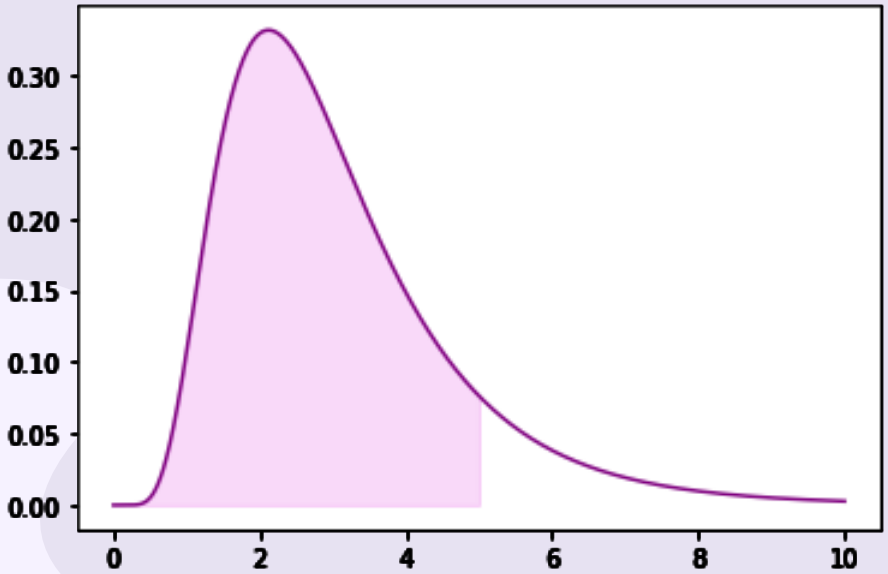
- Going over the:
  - Demand
  - Travel Distance
  - Profit Model

4.1 Demand Function

- **The fitted data of frequency of online grocery shopping into a lognormal distribution.**
  ($\mu = 1,\ \sigma = 1$)

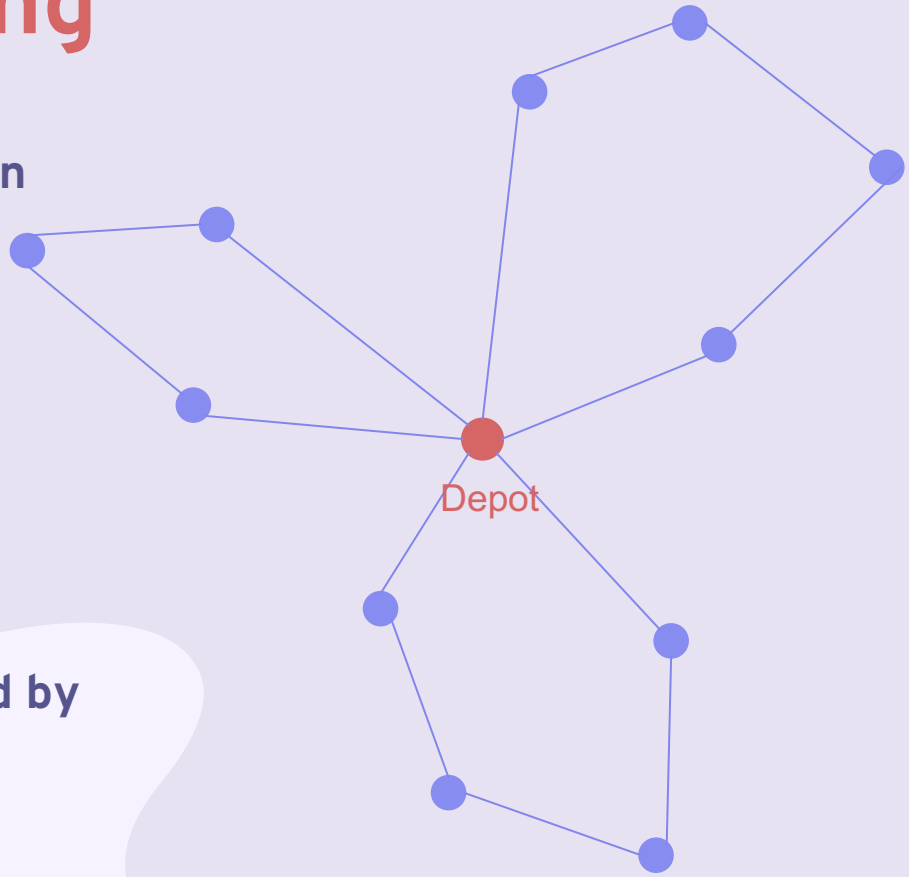


- **Assumption: People with preferred frequency less than or equal to our offering frequency will subscribe to our service.**



4.2 Inventory Routing

- We used continuous approximation to estimate the distance
- We assume that depot is in the center of a circular area
- The circular area is divided into slices
- Residents on each slice are served by a vehicle



4.3 Profit Model

Objective function:

$$\max_{f} PROFIT = Revenue - Cost$$

Revenue:

- Subscription Fee × Number of Subscribers
- Price of Delivery × Number of Deliveries

Cost:

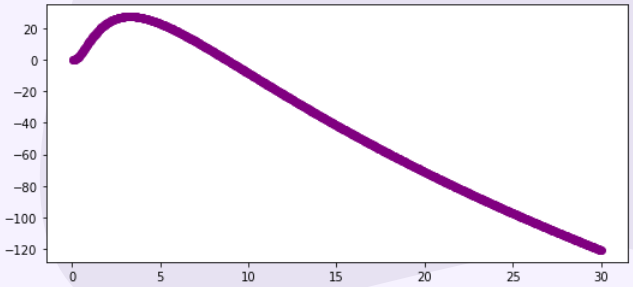
- Total Delivery Cost

5.0

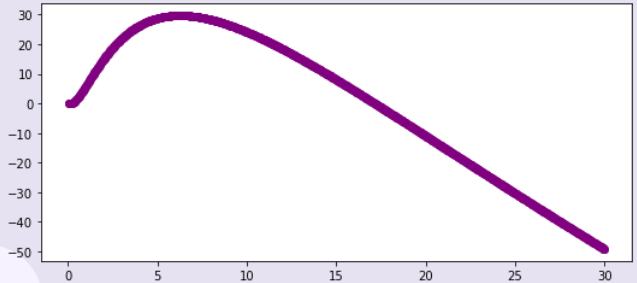
Results

Everyday Delivery

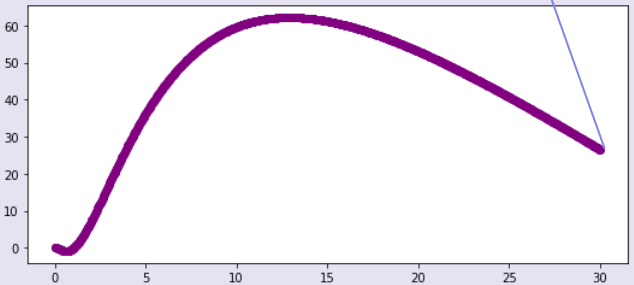
Plan 1



Plan 2



Plan 3



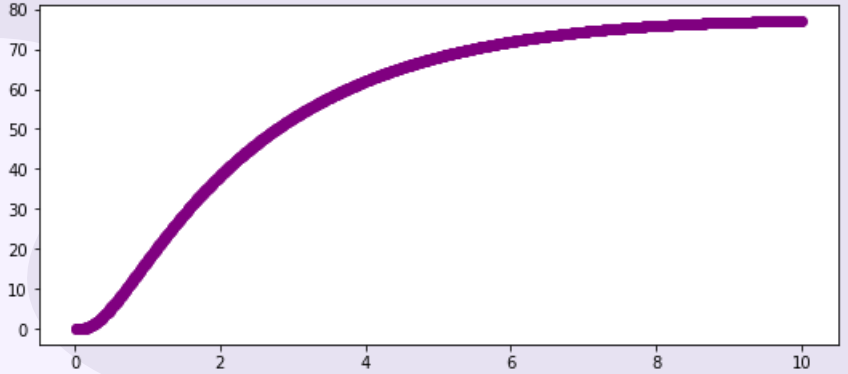
Plan	features		Freq	Profit	Cost	$\frac{Cost}{Profit}$
1	P_1=110	k_1=0	4	26	44	1.7
2	P_2=55	k_2=30	6	26	67	2.6
3	P_3=0	k_3=61	30	26	229	8.8

5.1

Results

Limited range of frequencies to highlight the optimal value in curve

Decreasing parameter c (transportation cost $ per km)



5.2

Results

Solving Travel Salesman Problem with customers being served based on probability of the specific day of service

Service Day	Probability of people joining	Average Distance in TSP	Average distance per customer
Saturday	18%	32.75	18.2
Sunday	17%	31.63	18.6
Saturday + Sunday	35%	43.03 (-0.33%)	12.3 (-0.33%)

THANK YOU!

Any Questions?

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