

Uber vs Taxi Usage: the Toronto VfH Case Study

TMG Workshop
Mobility Tools & Services
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Barcelona taxi drivers prepare legal battle against Uber and Cabify

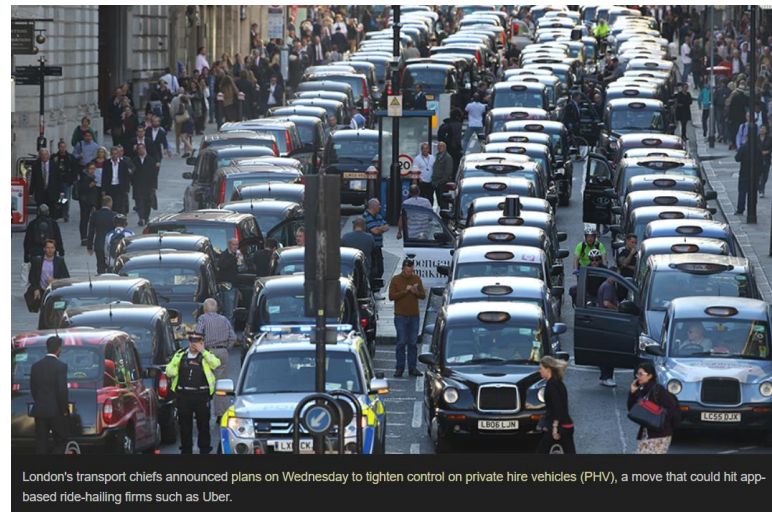


The Local, 2019



Toronto cab drivers say playing field with Uber still not 'level'

Global News, 2017



The Telegraph, 2015

VIEWFINDER: TAXI DRIVERS PROTEST AGAINST UBER IN MEXICO CITY



Pacific Standard, 2019

TAXI DRIVERS PROTEST AGAINST UBER IN THE HAGUE

By Janene Pieters on February 19, 2019 - 10:30



NL Times, 2019

Uber protests sweep Europe

Traffic chaos blights Europe as licensed cabbies seek to ban Uber app



The Telegraph, 2014



Agenda



Credit: <https://canadianobligation.weebly.com/blog/uber-protesting-toronto-taxi-drivers-block-traffic-downtown>



Study Area & Objectives

(1)

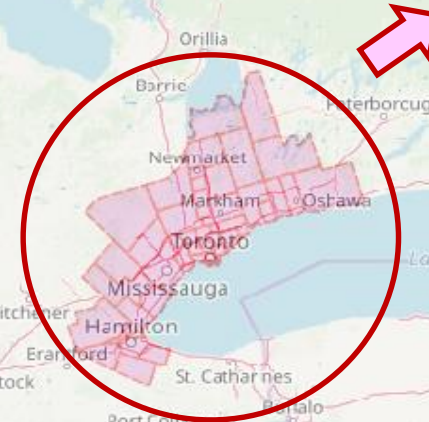
Validating the representativeness of the most recent regional travel survey's Uber trips

(2)

Tracking the changes or stabilities in taxi usage between 1996 & 2016

(3)

Identifying profiles for Uber and taxi users



*Greater Toronto
and
Hamilton Area
(GTHA)*

Data

Credit: <https://www.cnet.com/news/uber-will-reportedly-let-riders-drivers-record-audio-of-trips-for-safety/>



Uber Trip Data through the City of Toronto

- Pick-up/drop-off times & dates
- Distance traveled
- Service type

Credit: <http://tts2016.ca/en/index.php>



Transportation Tomorrow Survey (TTS)

- ~ 5% of the GTHA
- Household-based
- Daily travel diary

1996
TTS

2001
TTS

2006
TTS

2011
TTS

2016
TTS





Credit: INRO, 2019

+ Emme4 Network Assignment

- Travel times

Fall 2016 Uber & 2016 TTS

- Trip pattern comparison analysis:
 - Spatiotemporal
 - Trip length ( & )

Survey vs Actual
Uber Trips

TTS between 1996 & 2016

- Taxi time-series analysis:
 - Attributes of taxi users
 - Trip patterns

Taxi Users & Trips
[1996-2016]

2016 TTS

- Subsample comparison analysis:
 - Survey population / trip-making population / Uber users / taxi users
- Persona analysis:
 - Decision trees

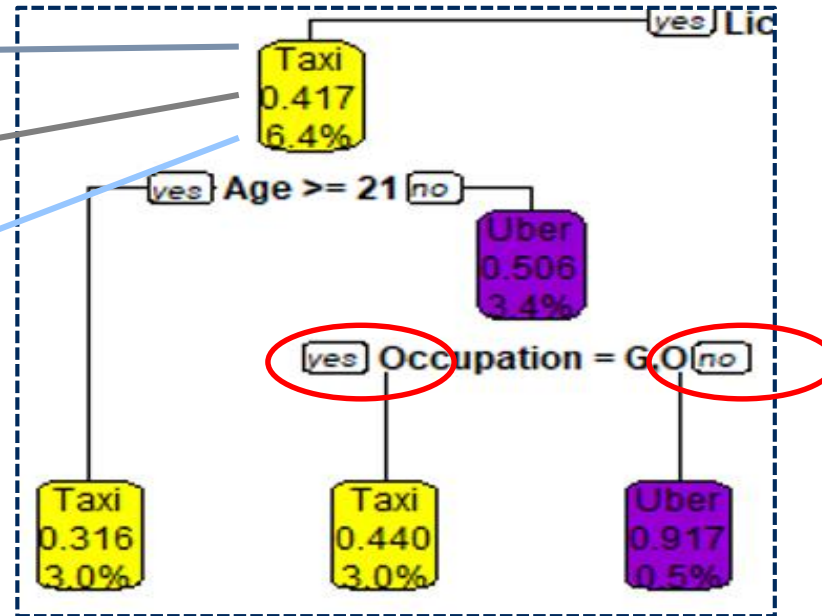
User Profiles

Methods

predicted class label

predicted probability
for “Uber”

% of observations in
that node



Feature selection

Avoid overfitting!

Homogeneity

- Determined based on purity/impurity measures
 - e.g., entropy, Gini index, Chi square, etc.

Variable Importance

- Evaluating the impact of each variable on the outcome
- Random forests
 - Permutation importance

Decision Trees

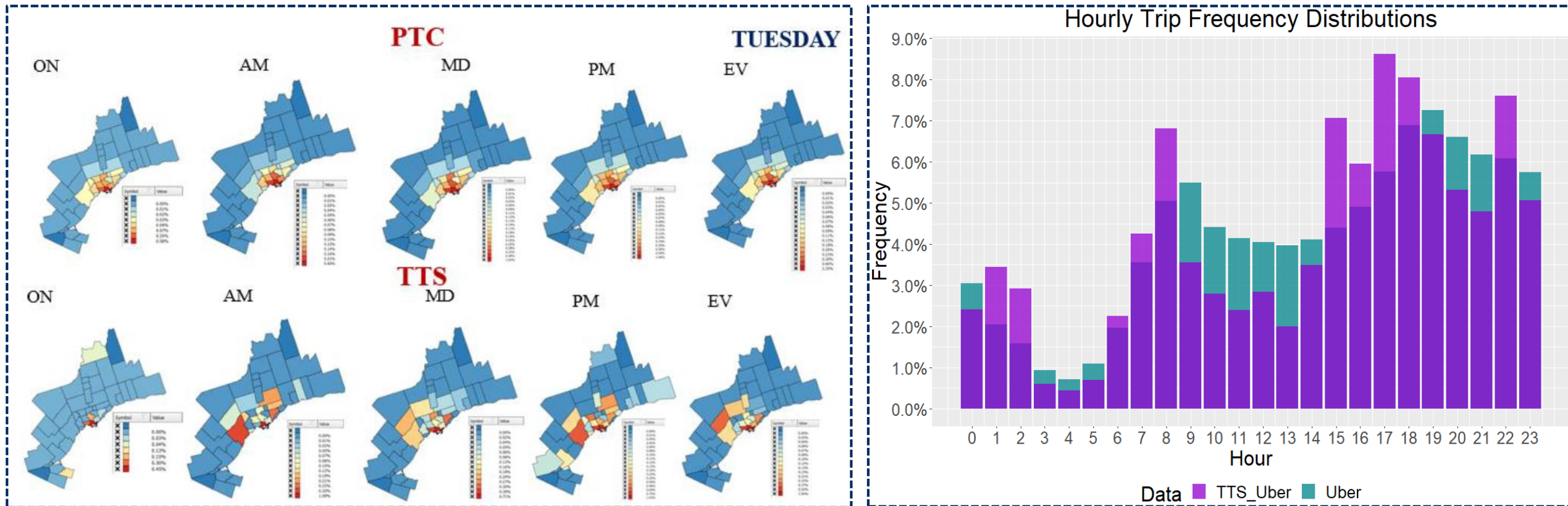
- Supervised machine learning algorithms
- Use “recursive partitioning” heuristic



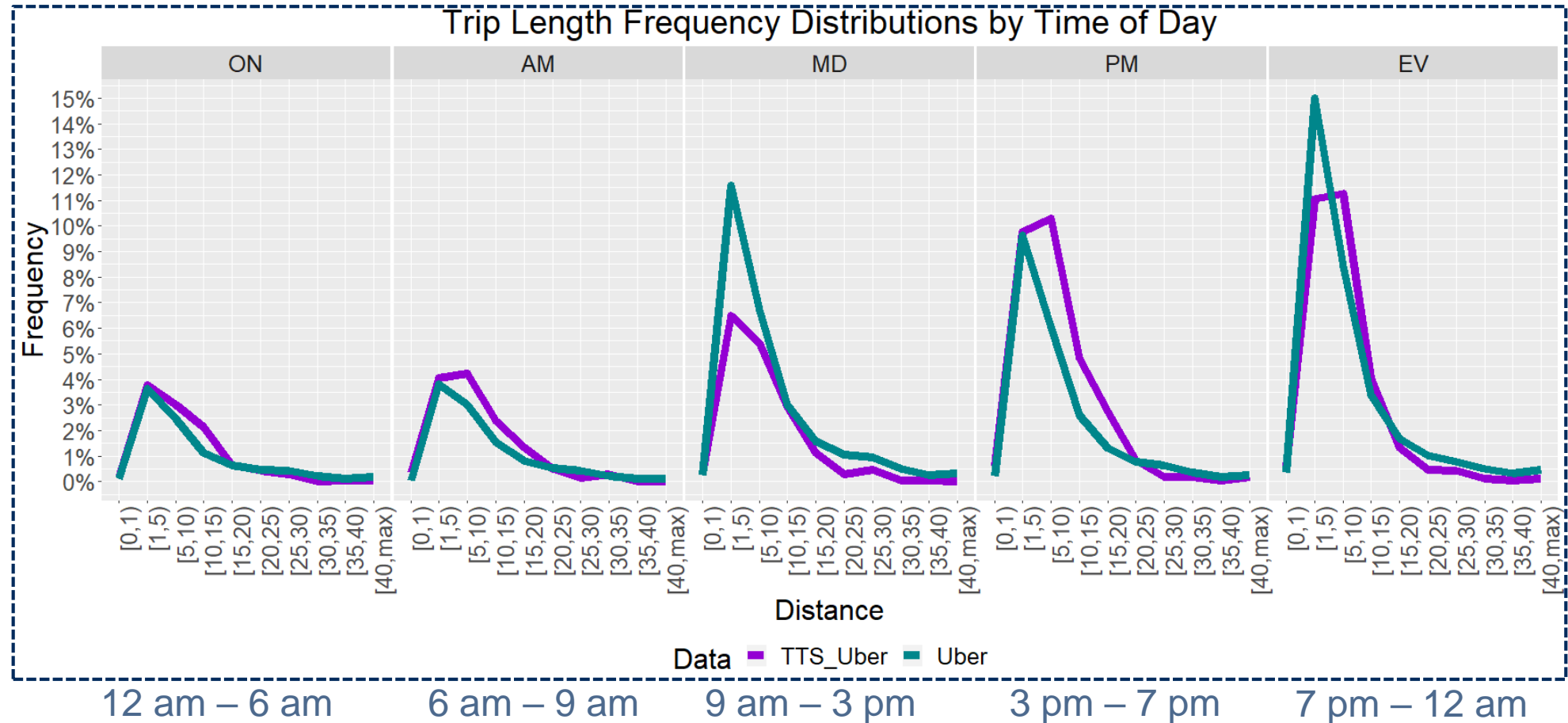
Survey vs Actual Uber Trips



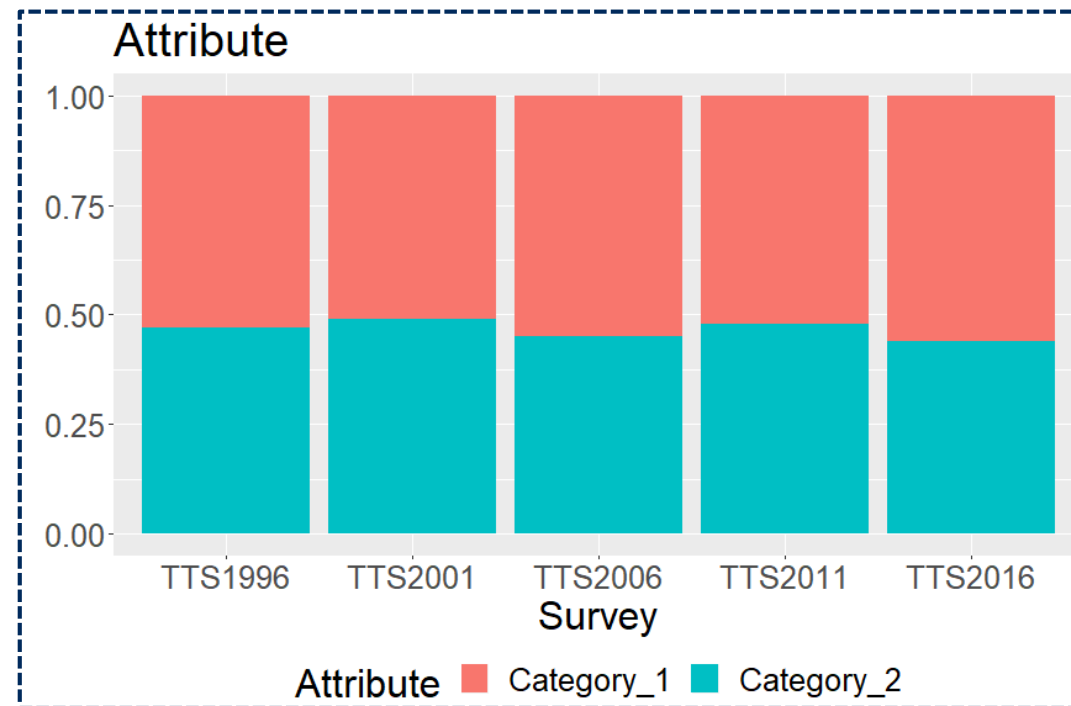
Survey vs Actual Uber Trips (1/2)



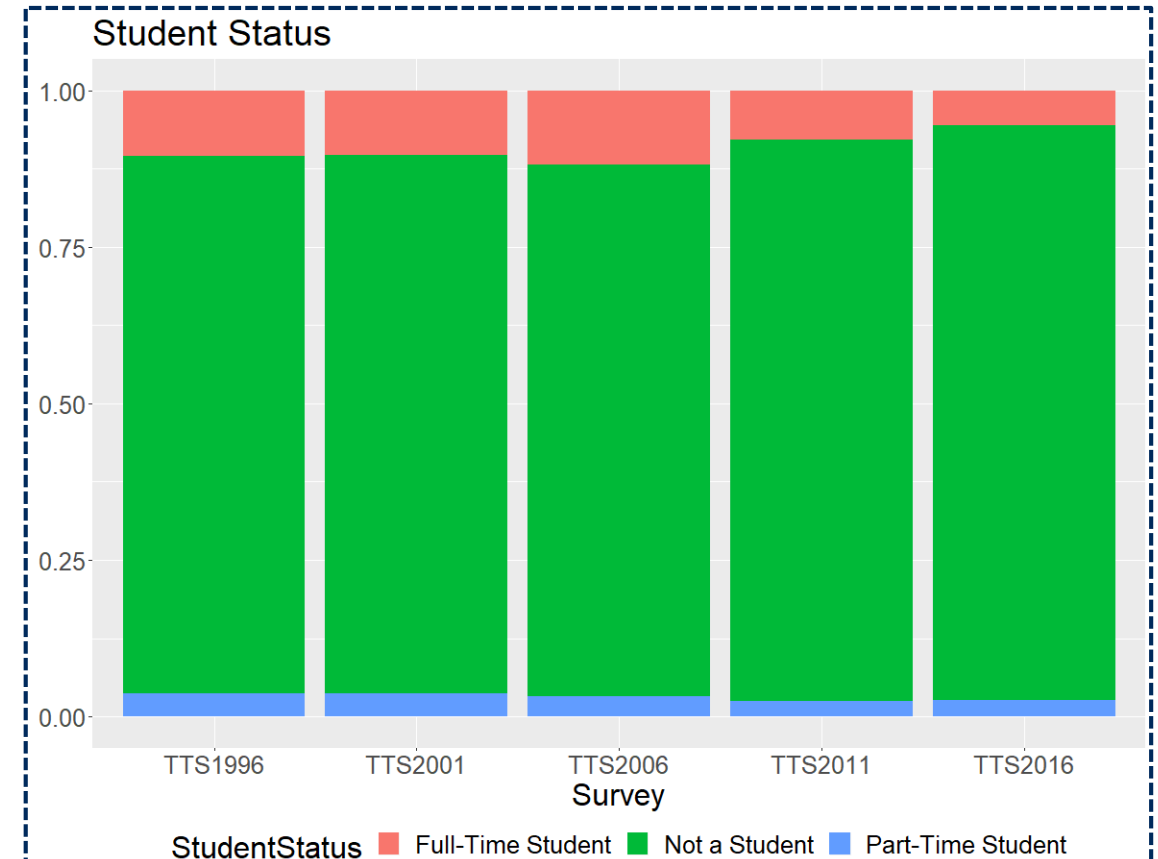
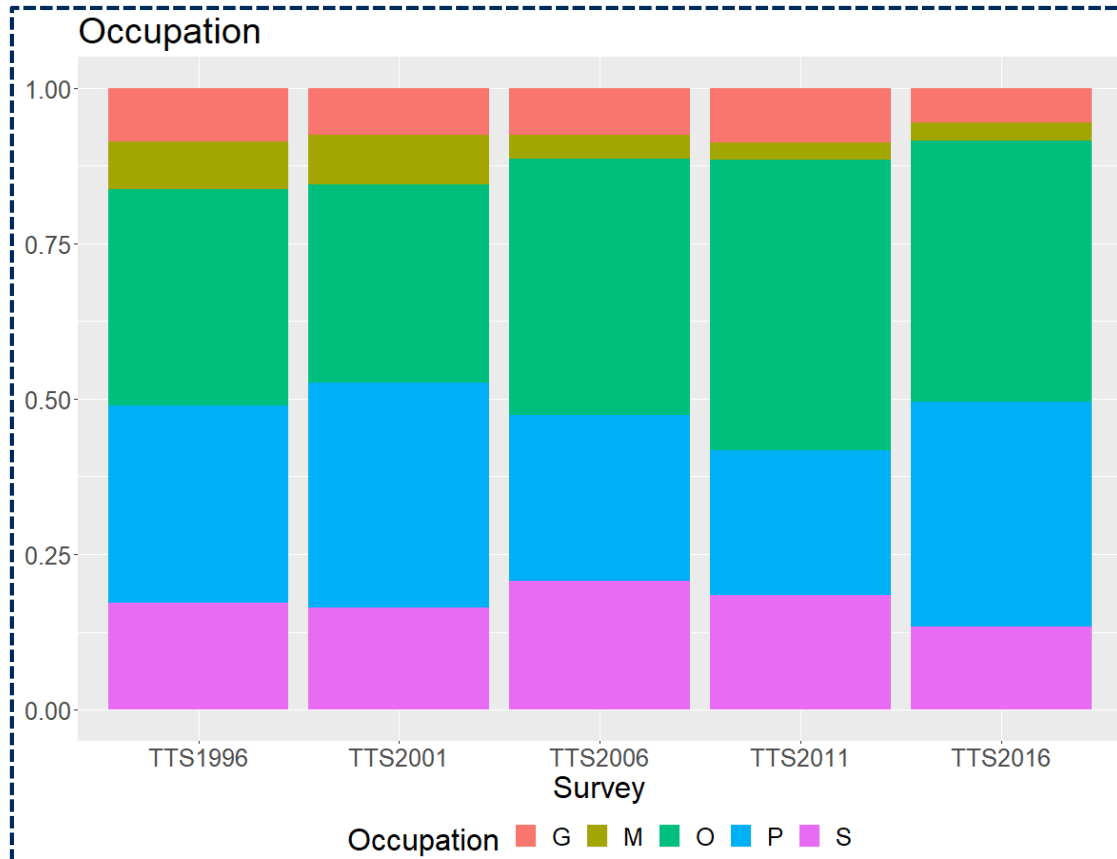
Survey vs Actual Uber Trips (2/2)



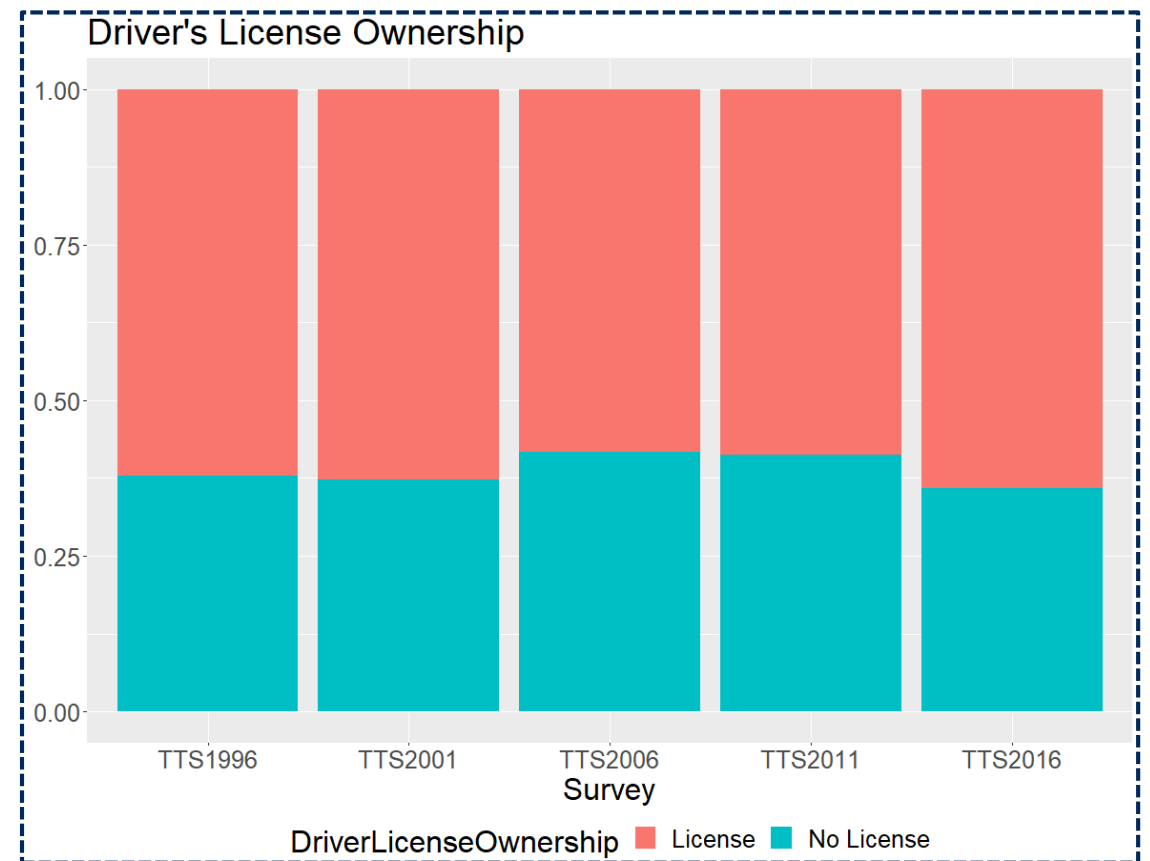
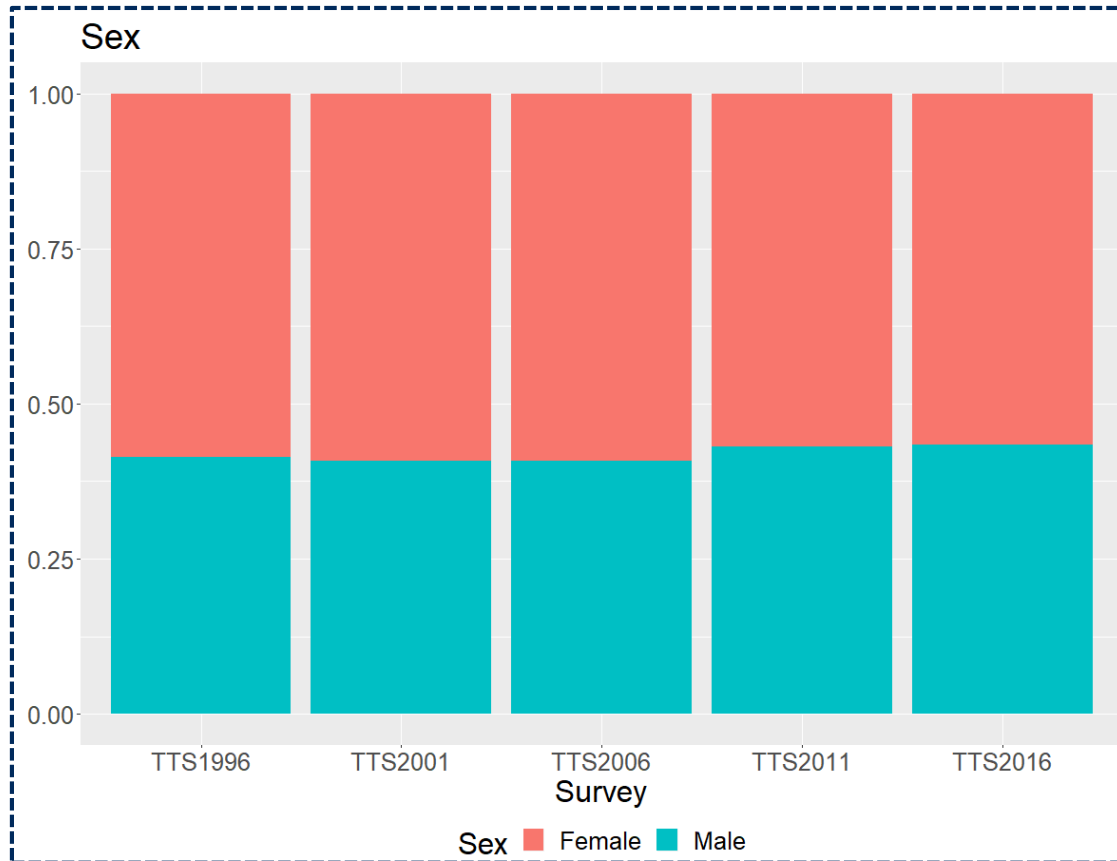
Taxi Users & Trips [1996-2016]



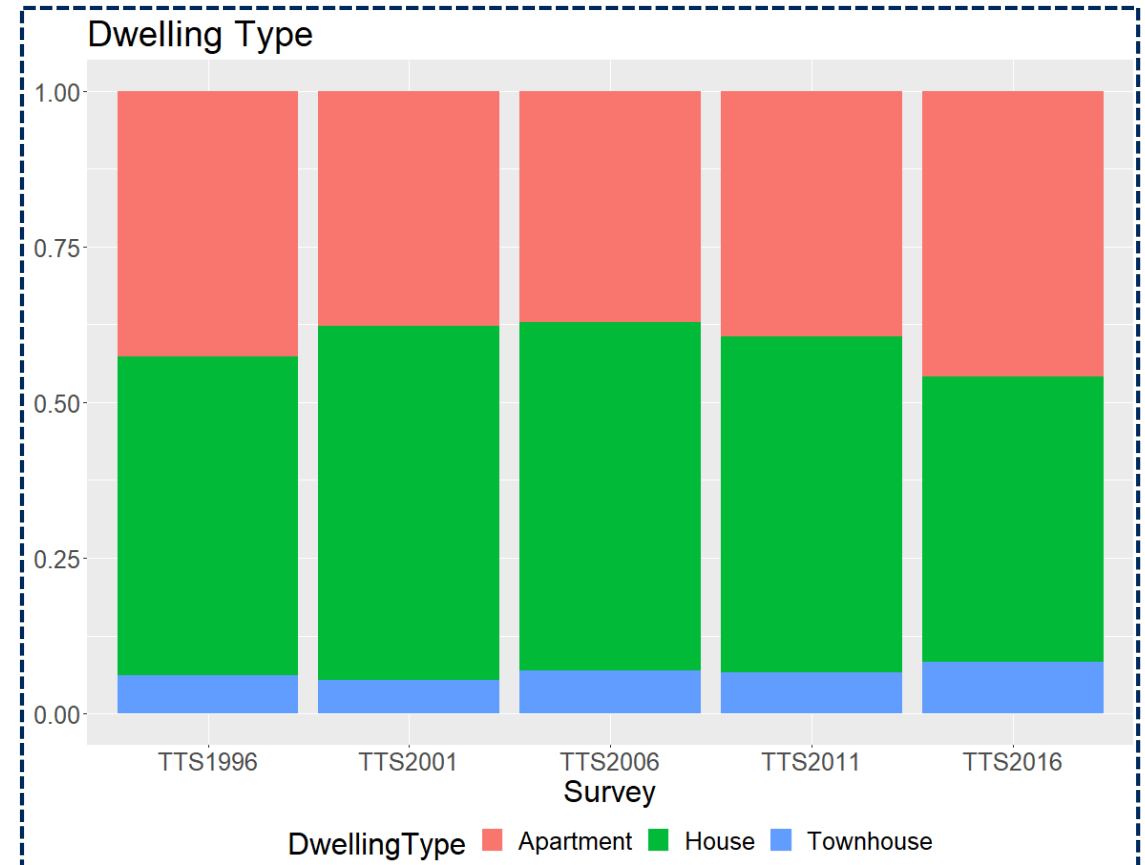
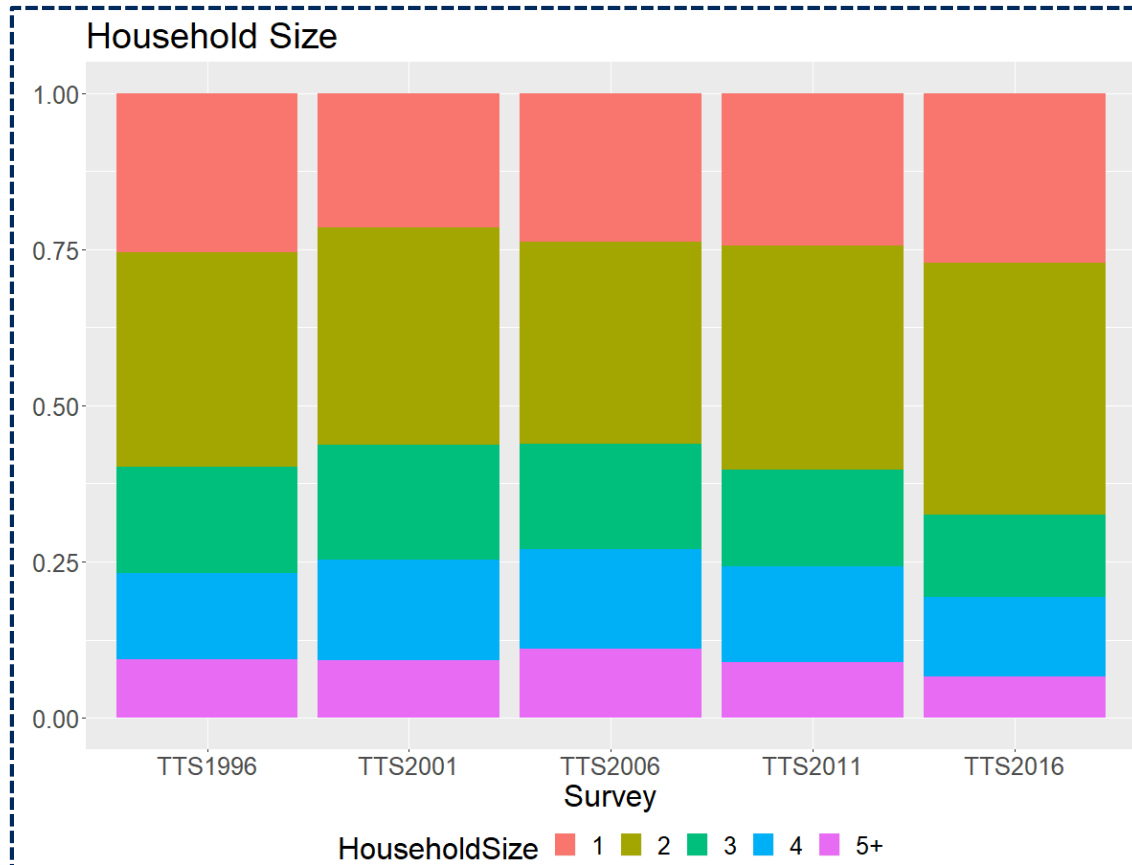
Taxi Users & Trips [1996-2016] (1/5)



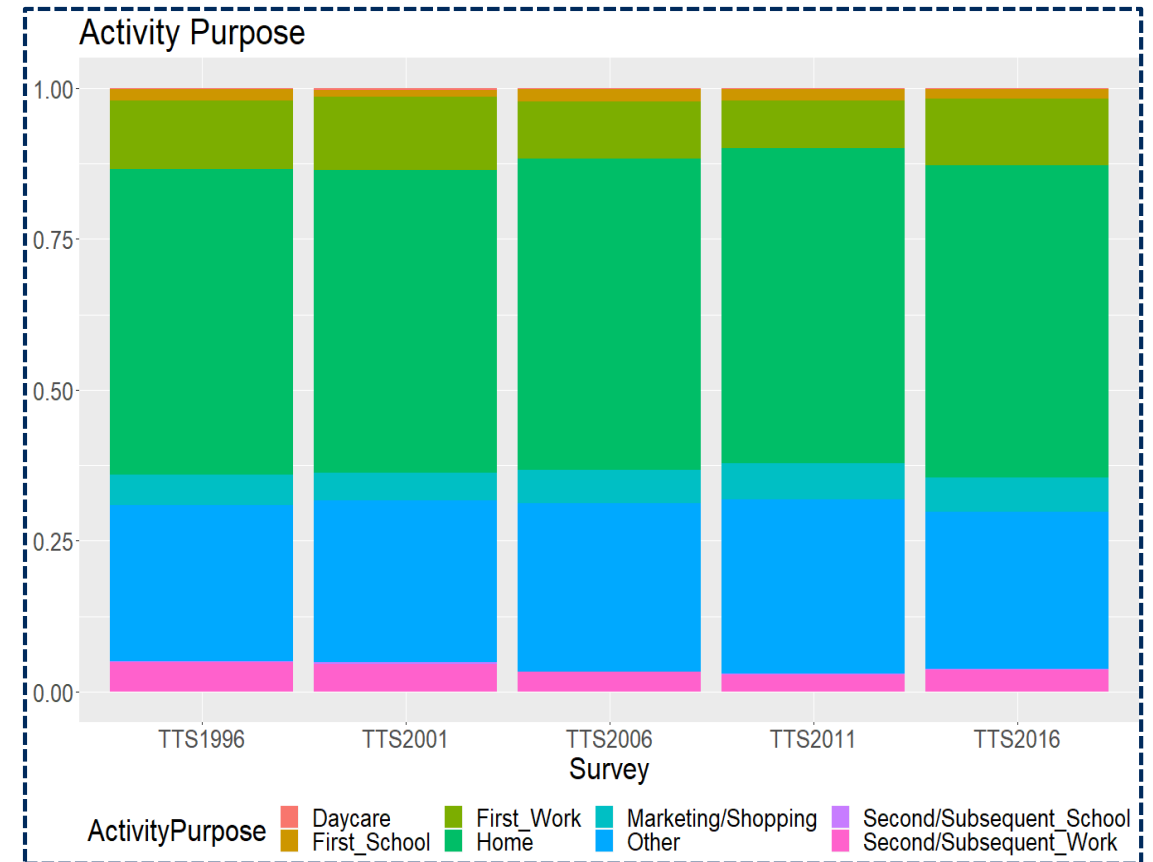
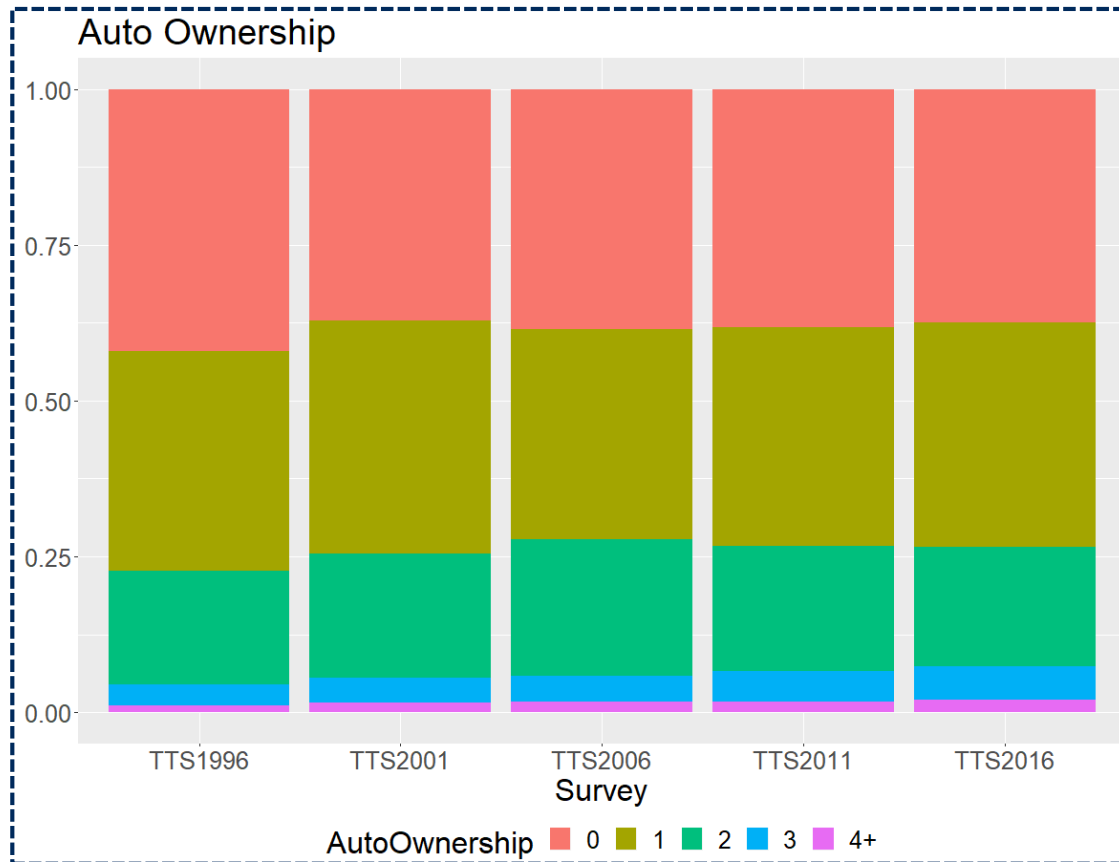
Taxi Users & Trips [1996-2016] (2/5)



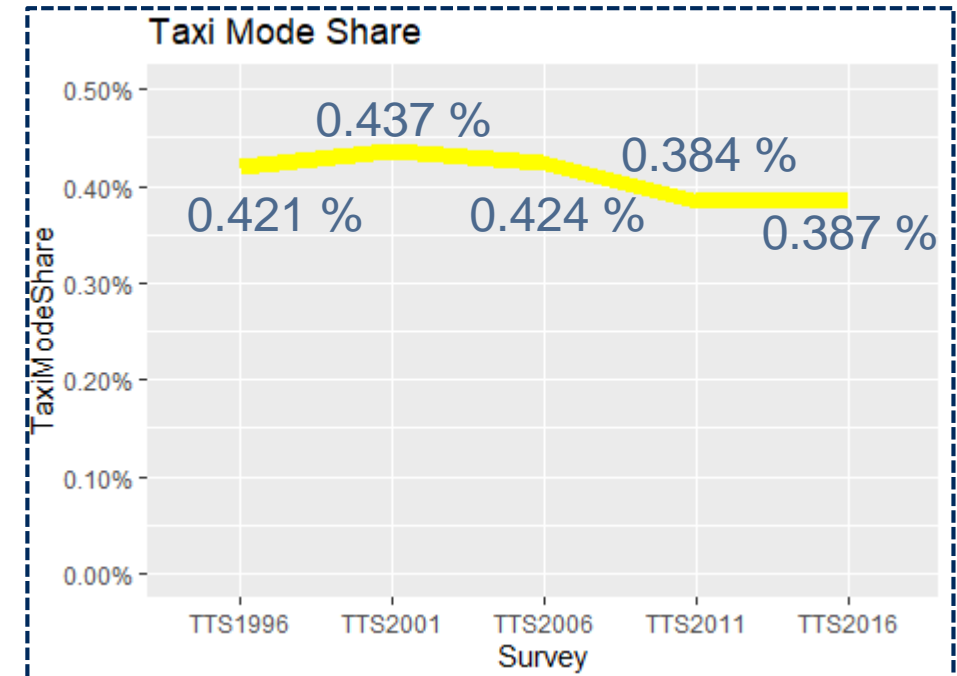
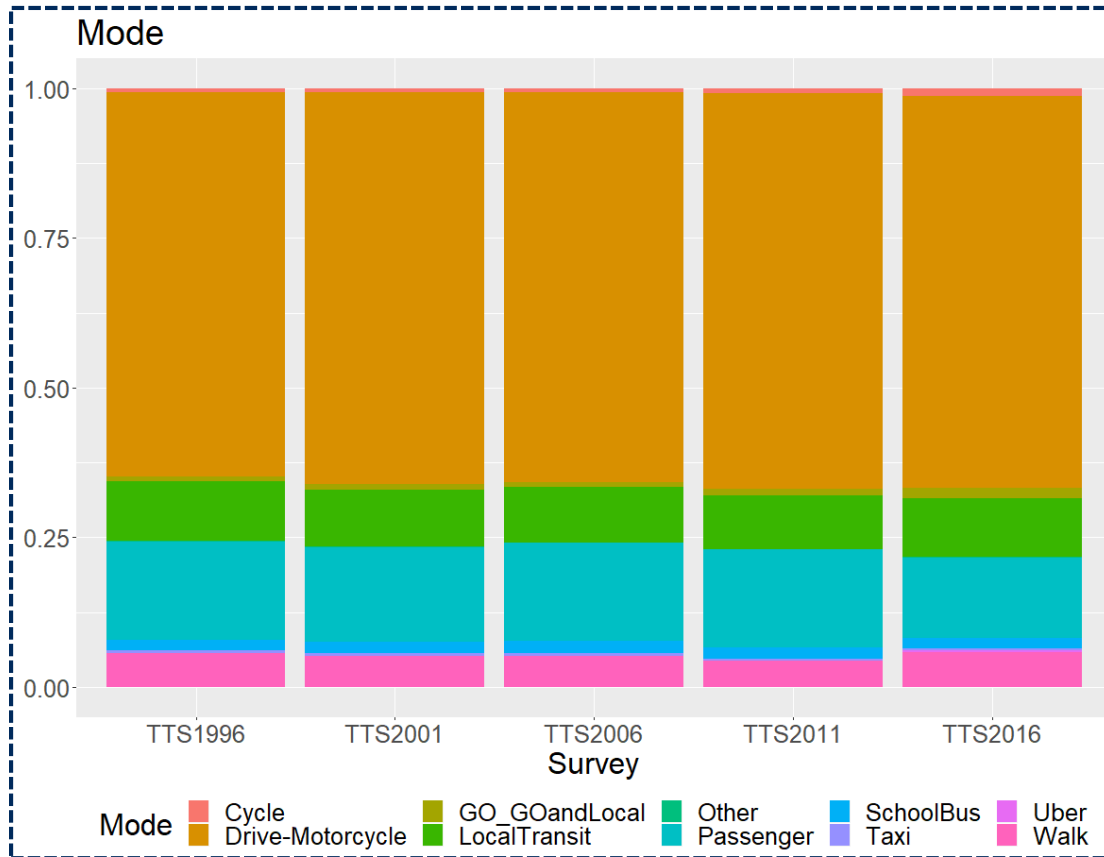
Taxi Users & Trips [1996-2016] (3/5)



Taxi Users & Trips [1996-2016] (4/5)



Taxi Users & Trips [1996-2016] (5/5)



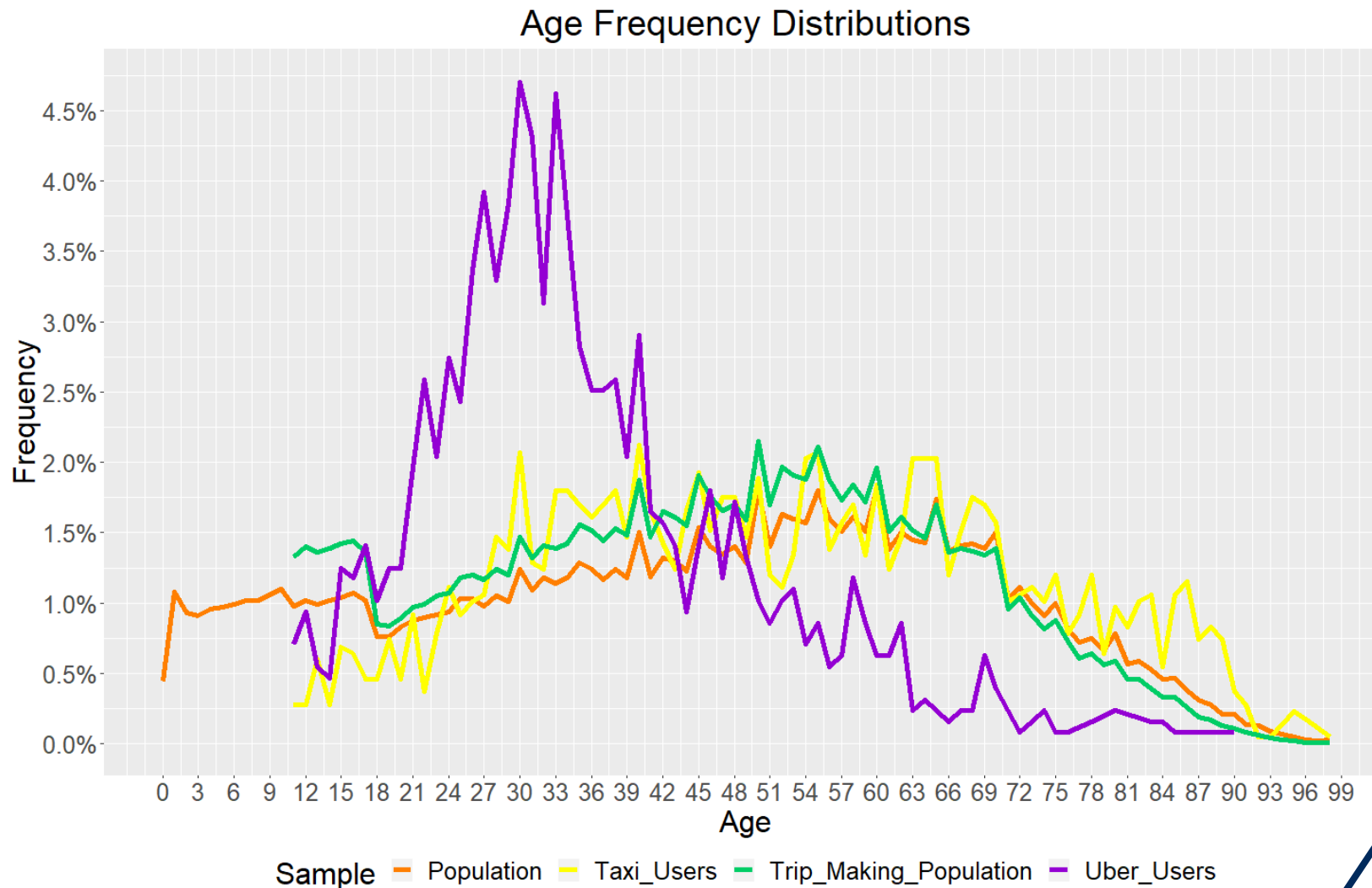
2016 Uber Mode Share: 0.23%



User Profiles



User Profiles (1/5)



Younger people

App-based service?

Tech-savvy?

Smartphones?

Uber:

Mode = 30

Median = 33

Mean = 35

Taxi:

Mode = 40

Median = 51

Mean = 52

Older people

Poor vision?

Less tech-savvy?

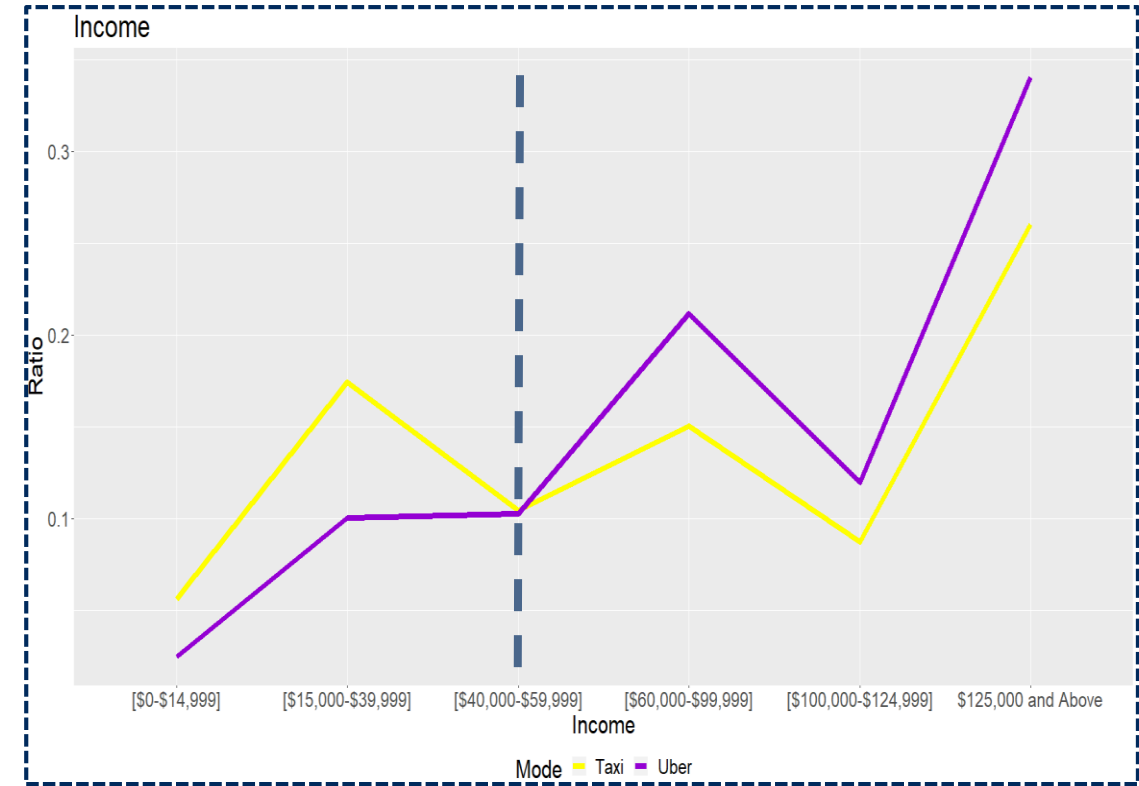
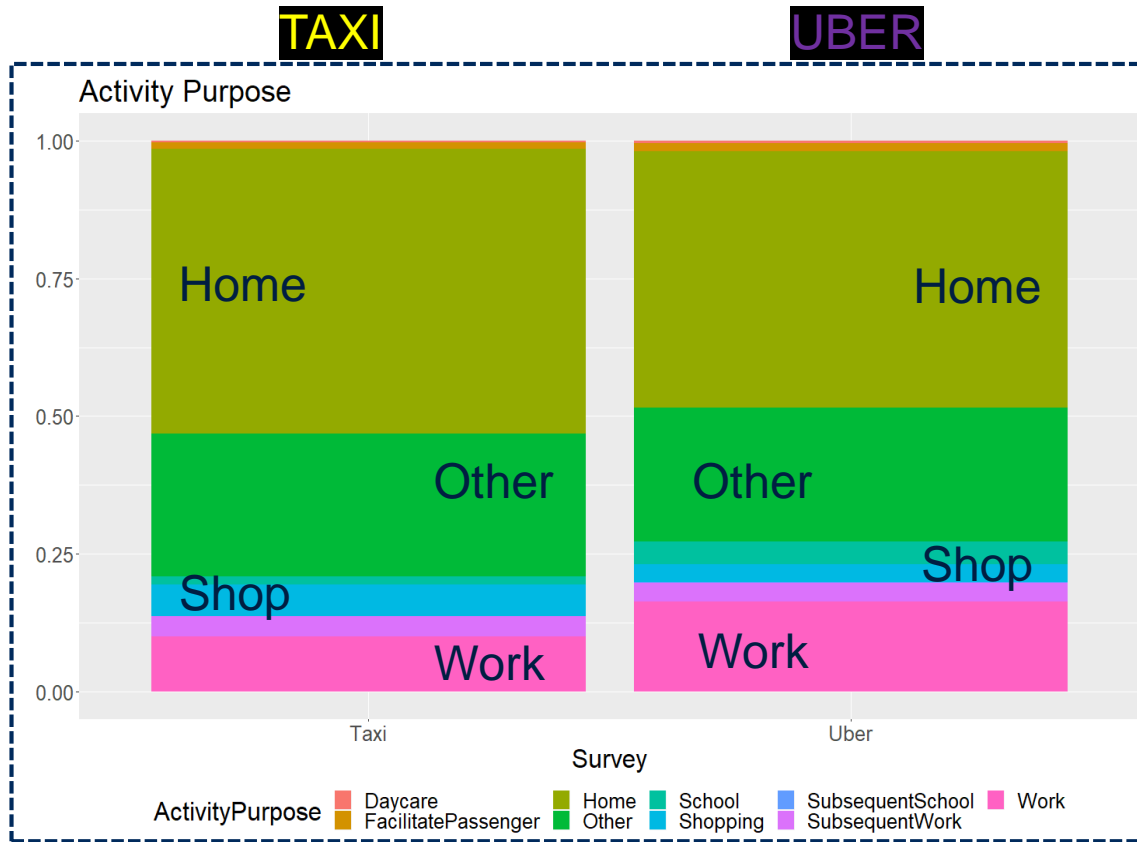
Reluctant to change habits?



User Profiles (2/5)



- Both: Home & “Other”
- Uber > Taxi: Work
- Taxi > Uber: Shopping



- Taxi > Uber when $0 \leq \text{Income} < \$60\text{K}$
- Uber > Taxi when $\$60\text{K} \leq \text{Income}$

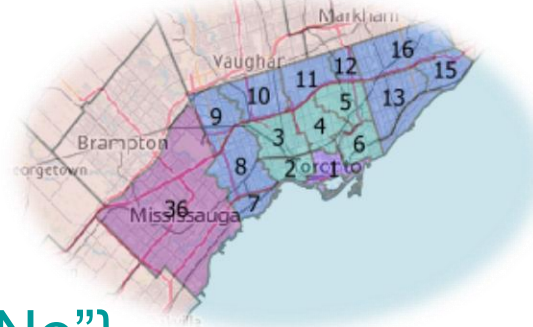
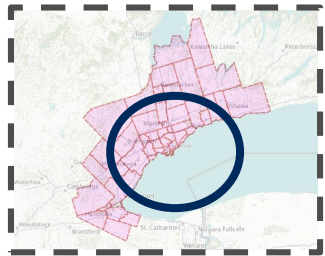


User Profiles (3/5)



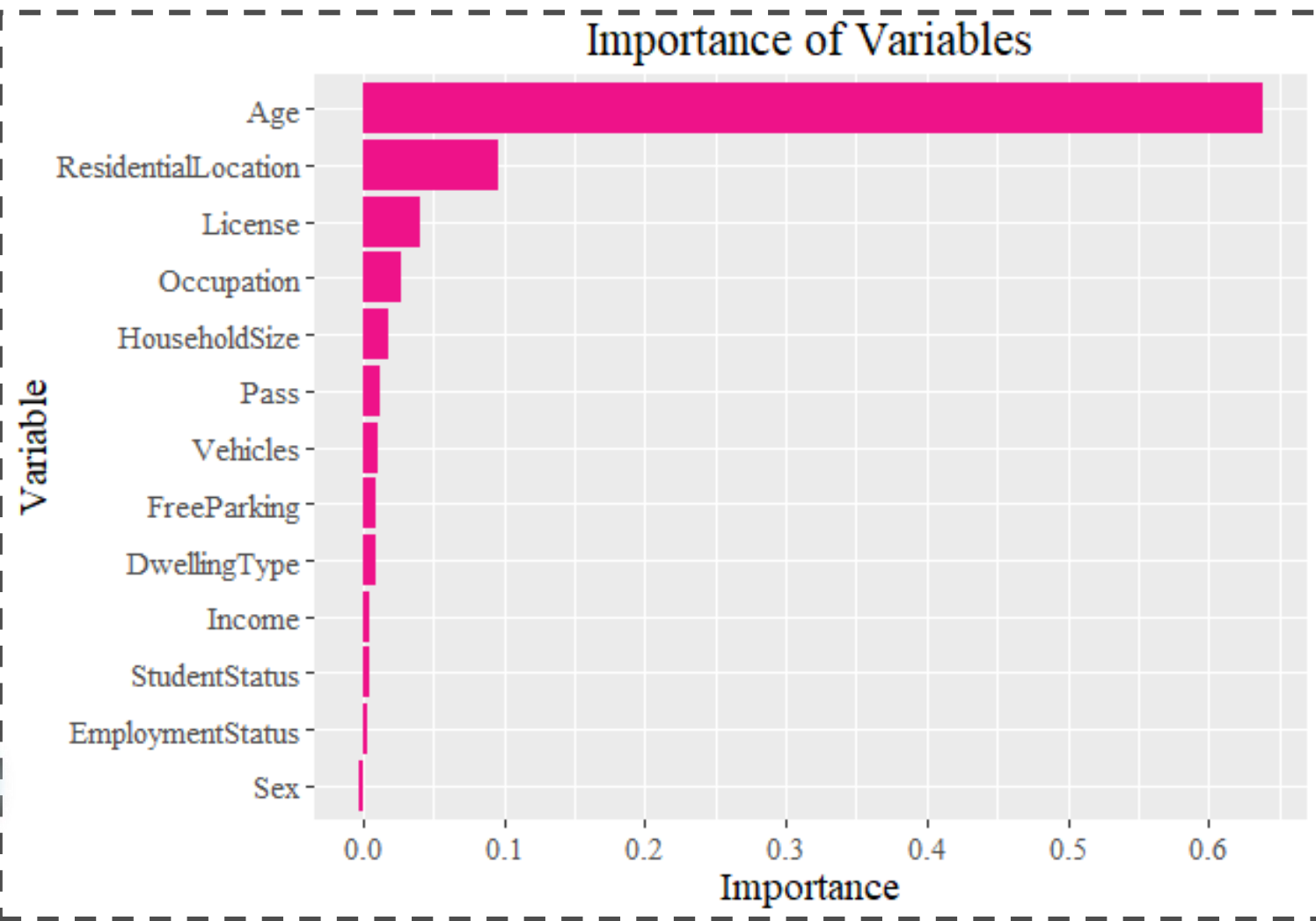
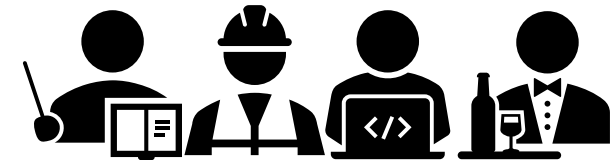
{11, 12, ..., 98}

{Downtown Toronto (PD1);
Neighboring PDs (PD2-6);
Rest of Toronto (PD7-16);
Mississauga (PD36); Others}



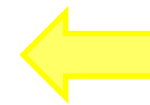
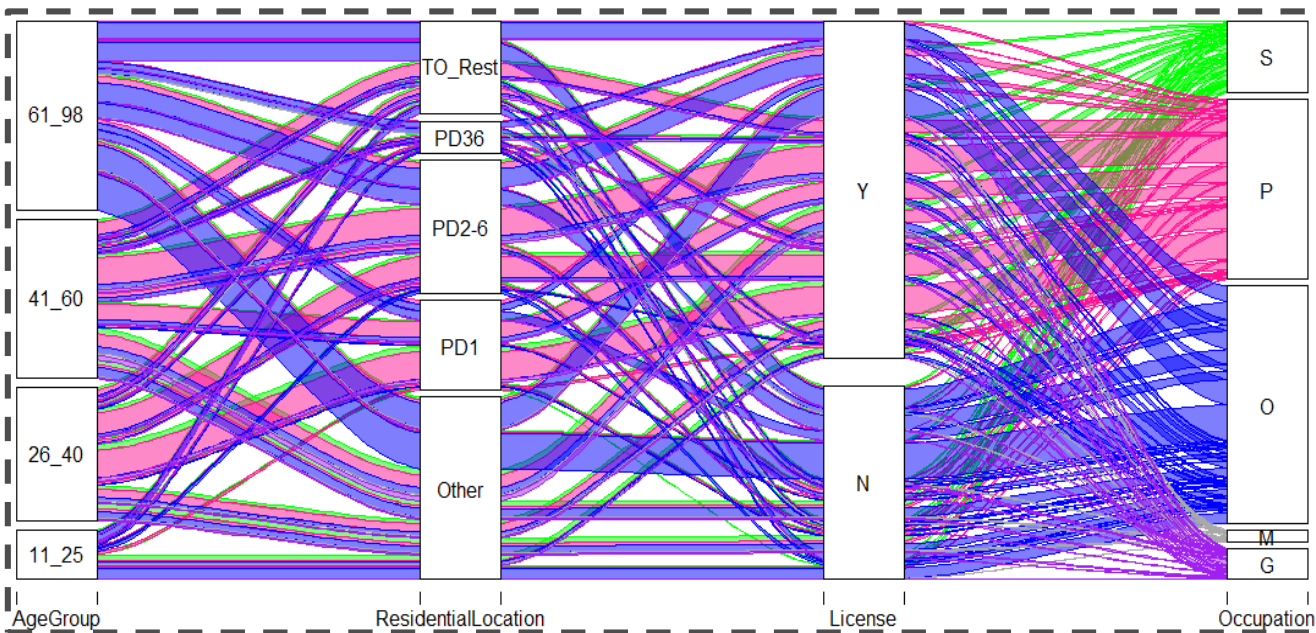
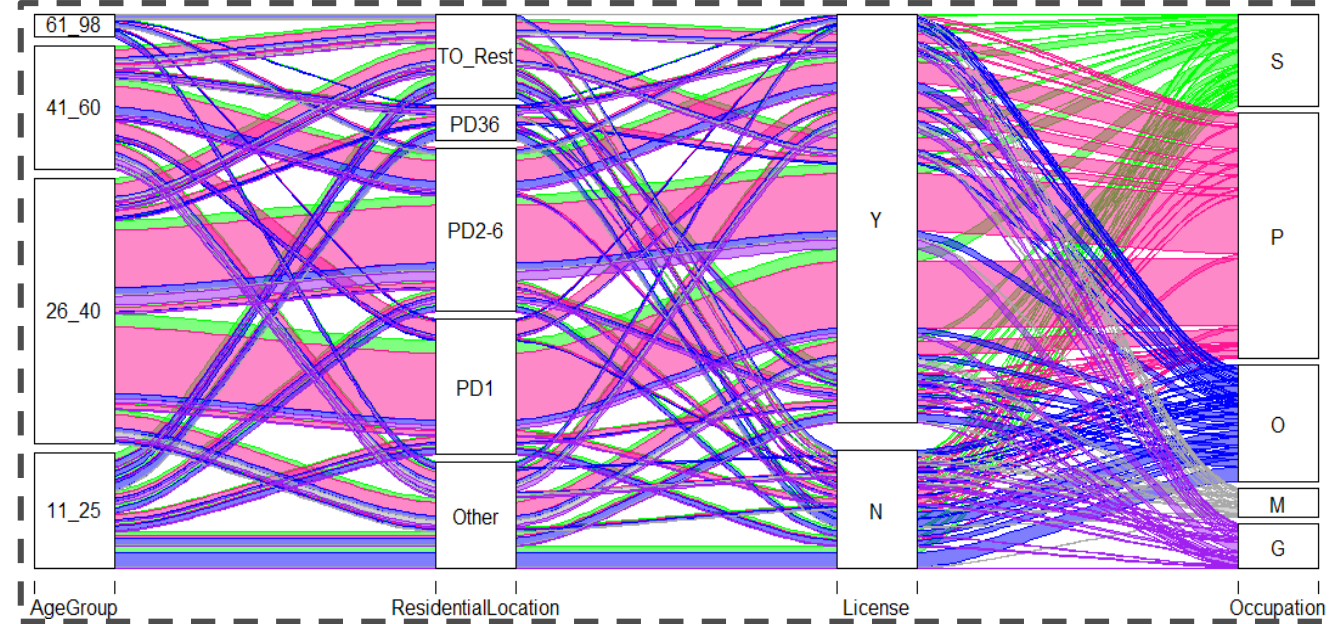
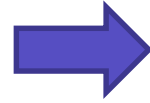
{“Yes”, “No”}

{General Office, Clerical; Manufacturing, Construction, Trades;
Professional, Management, Technical; Retail Sales and Service; Unemployed}



User Profiles (4/5)

UBER
USERS



TAXI
USERS



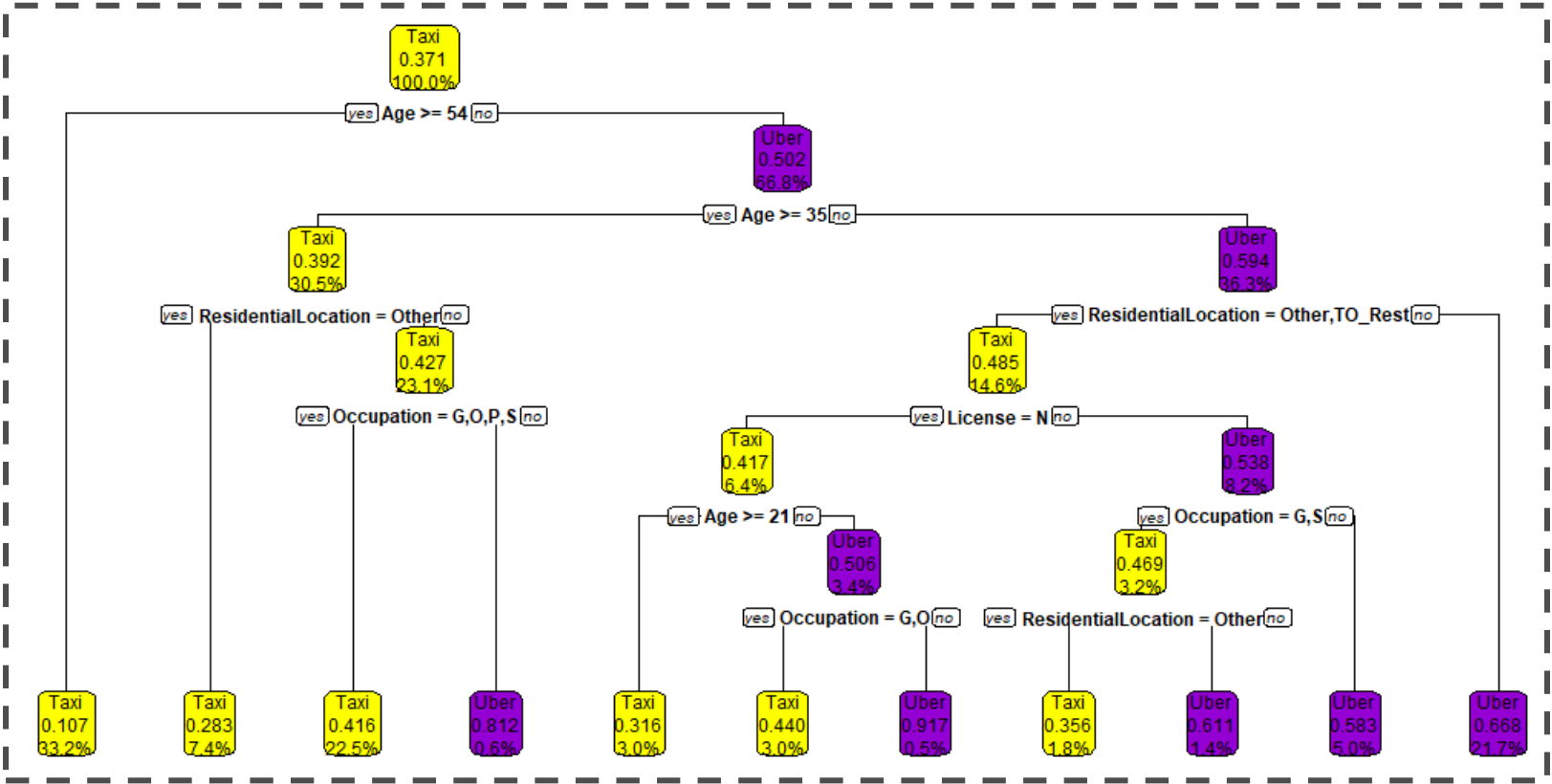
User Profiles (5/5)



Emily: 54 & older, taxi user.



Nick: 35 & older, lives outside the City of Toronto but not in Mississauga, taxi user.



Leonard: 35 & younger, lives outside the core of the City (outside PD1-6), but not in Mississauga, owns a driver's license, is either unemployed or employed in sector "P" or "M", Uber user.



Kyle: 35 & older, lives in the City or in Mississauga, is either unemployed or works in a sector other than "M", taxi user.



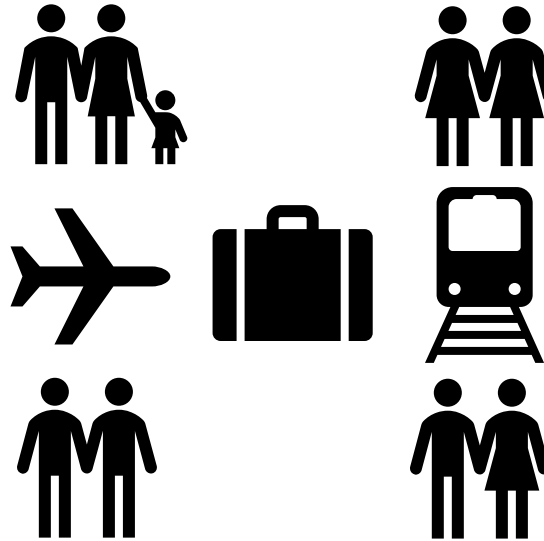
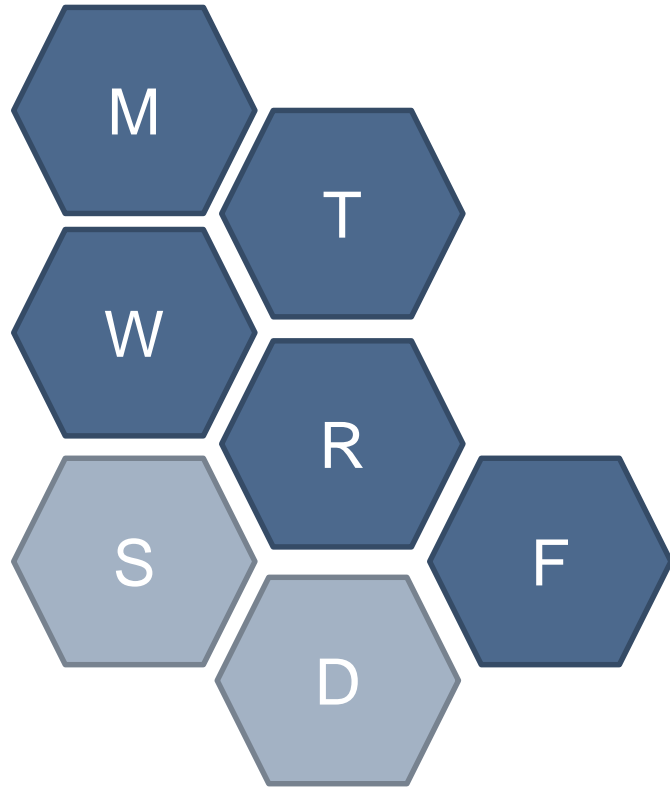
Lorelai: 35 & younger, lives in downtown Toronto, its neighboring PDs, or in Mississauga, Uber user.

Findings

- Representative Uber trips by the latest regional travel survey
 - Strong stability in taxi user profile & trip patterns (20-year period)
 - Different profiles of Uber & taxi users
 - Pivotal Attributes: age & residential location
- In general in the GTHA:
- 54 ↑ → taxi
 - 35 ↓, residing in downtown Toronto/surrounding areas/Mississauga → Uber

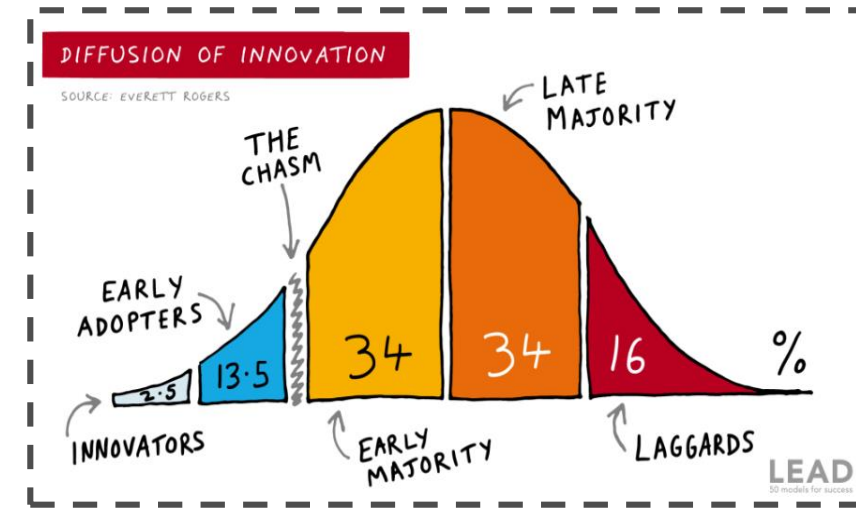
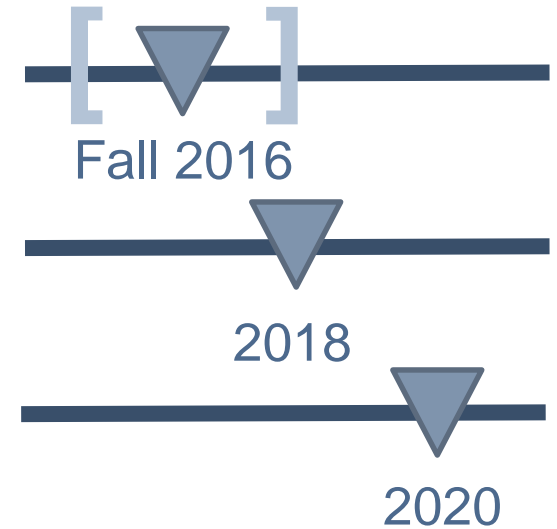
Caveats

- Weekend trip-making (missing!!!)



- Behavior of the visitors to the region (not captured!!!)

- Relatively early days of Uber in Toronto



Credit: <https://leadworklife.com/illustrations/diffusion-of-innovation/>



Thank You!

Questions/Comments

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Transportation Research Institute



Credit: https://www.reddit.com/r/BeAmazed/comments/6041sn/aerial_view_of_Toronto