

# **Maps / Data / GIS**

## **GGR424 - Transportation Geography & Planning**

Jeff Allen

University of Toronto

February 14, 2022

## **Announcements**

- ▶ In-person class moved to SS2125
- ▶ Transportation data analysis assignment due March 3
- ▶ Project proposal due March 10

## Today

- ▶ Travel behaviour data
  1. Travel Surveys
  2. Observation/Sensor Data (e.g. GPS)
- ▶ Demoing a few things in GIS / chat about the next assignment

## Travel Behaviour Data: 1. Travel Surveys

Travel surveys typically ask for two types of information:

- ▶ Individual / household information, e.g.
  - ▶ age
  - ▶ income
  - ▶ home address
  - ▶ car ownership
  - ▶ preferences
  - ▶ etc.
- ▶ A travel diary, a trip-by-trip record of daily travel. For each trip, asking..
  - ▶ where (origin and destination)
  - ▶ when (time of day)
  - ▶ how (travel mode)
  - ▶ why (trip purpose, e.g. to go to work)

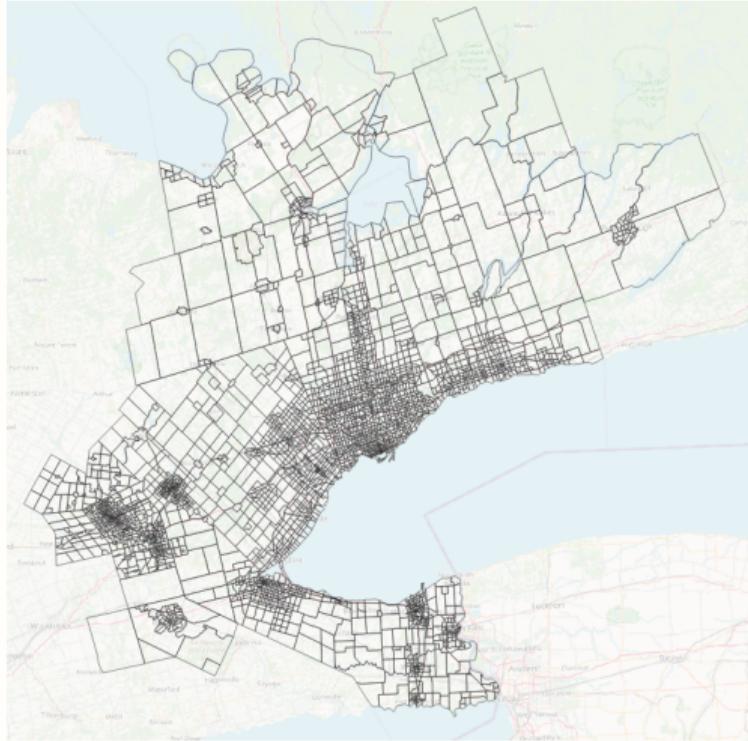
These two data tables can be 'joined' to answer a number of questions

## Transportation Tomorrow Survey

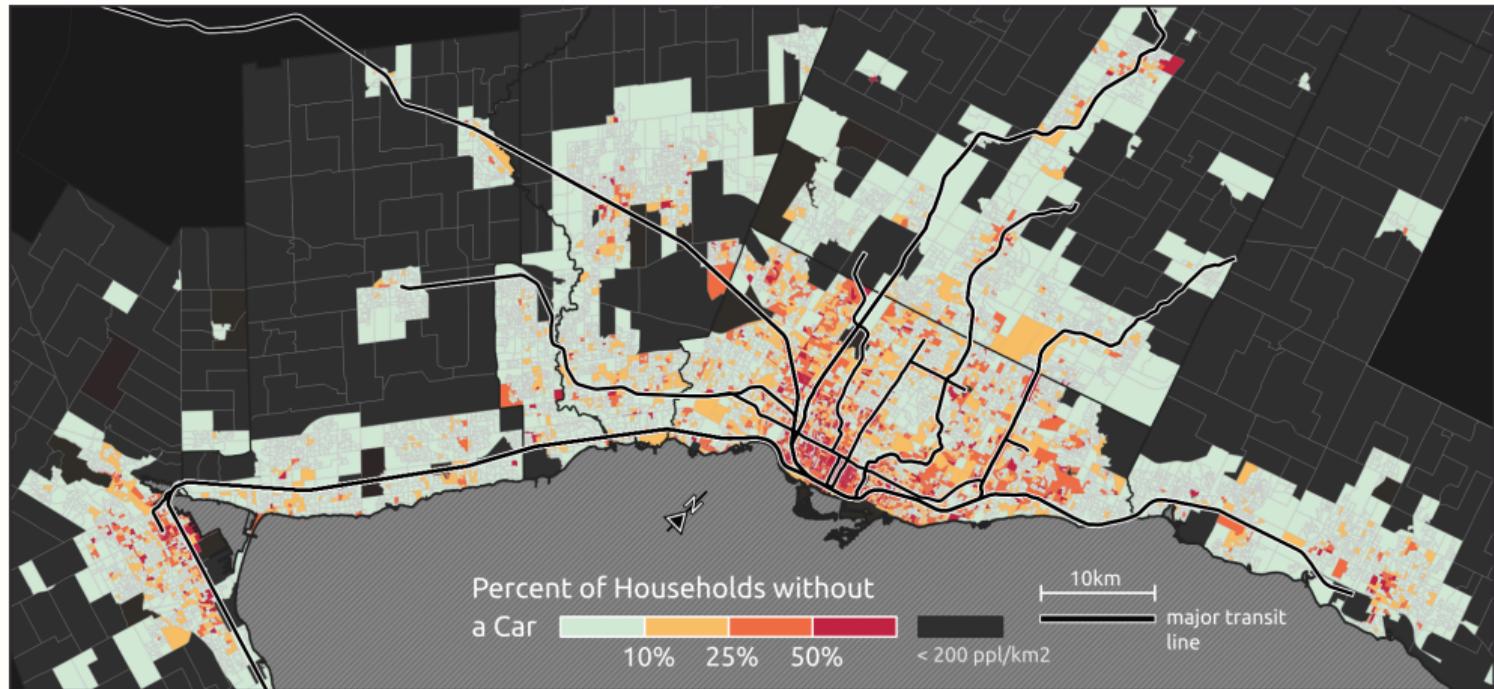
- ▶ Largest travel survey in the GGH (Greater Golden Horseshoe)
- ▶ 5% sample, every 5 years
- ▶ Includes a 1-day travel diary
- ▶ Used as a basis for travel demand modelling and forecasting future travel demand
- ▶ Used for a variety of research
- ▶ Funded by MTO, Metrolinx, TTC, etc.

Info: <http://dmg.utoronto.ca/transportation-tomorrow-survey/tts-introduction>

Data Access: <http://dmg.utoronto.ca/drs-access>

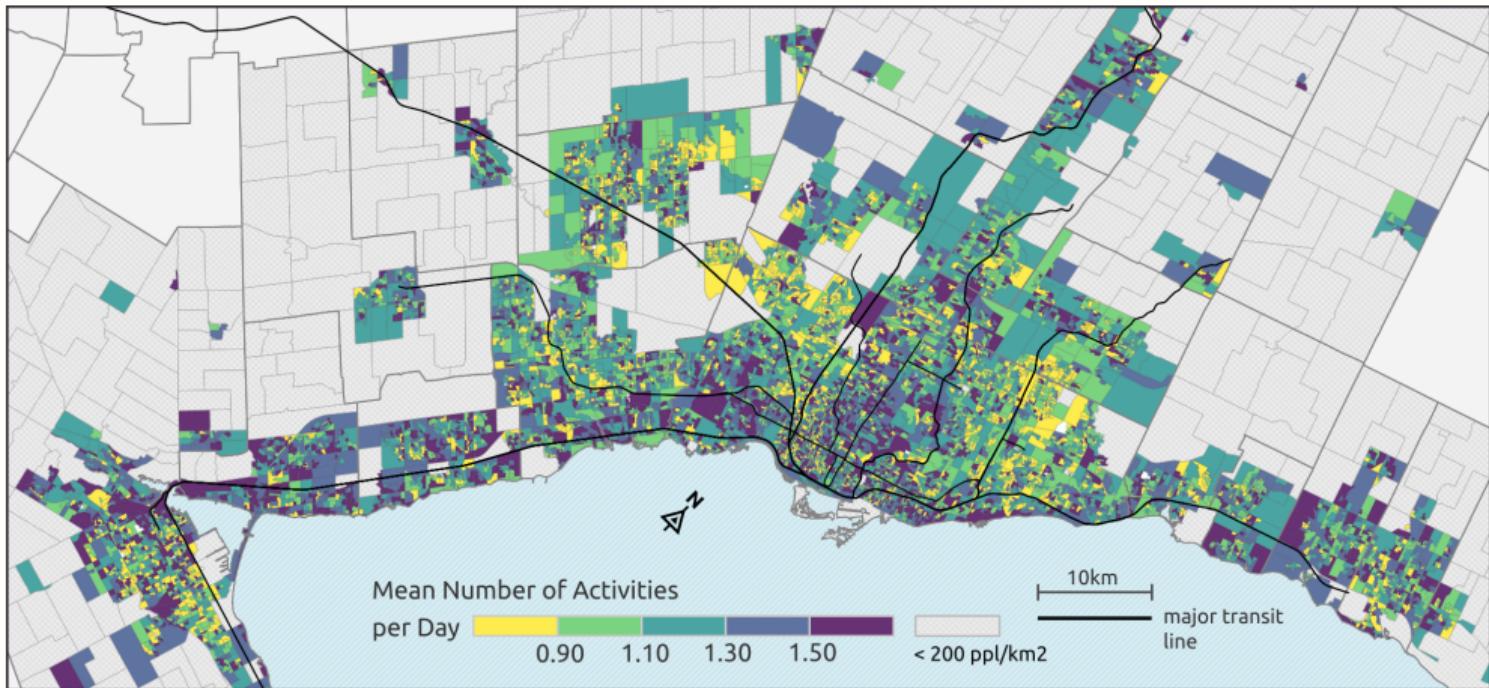


## TTS maps - e.g. car ownership

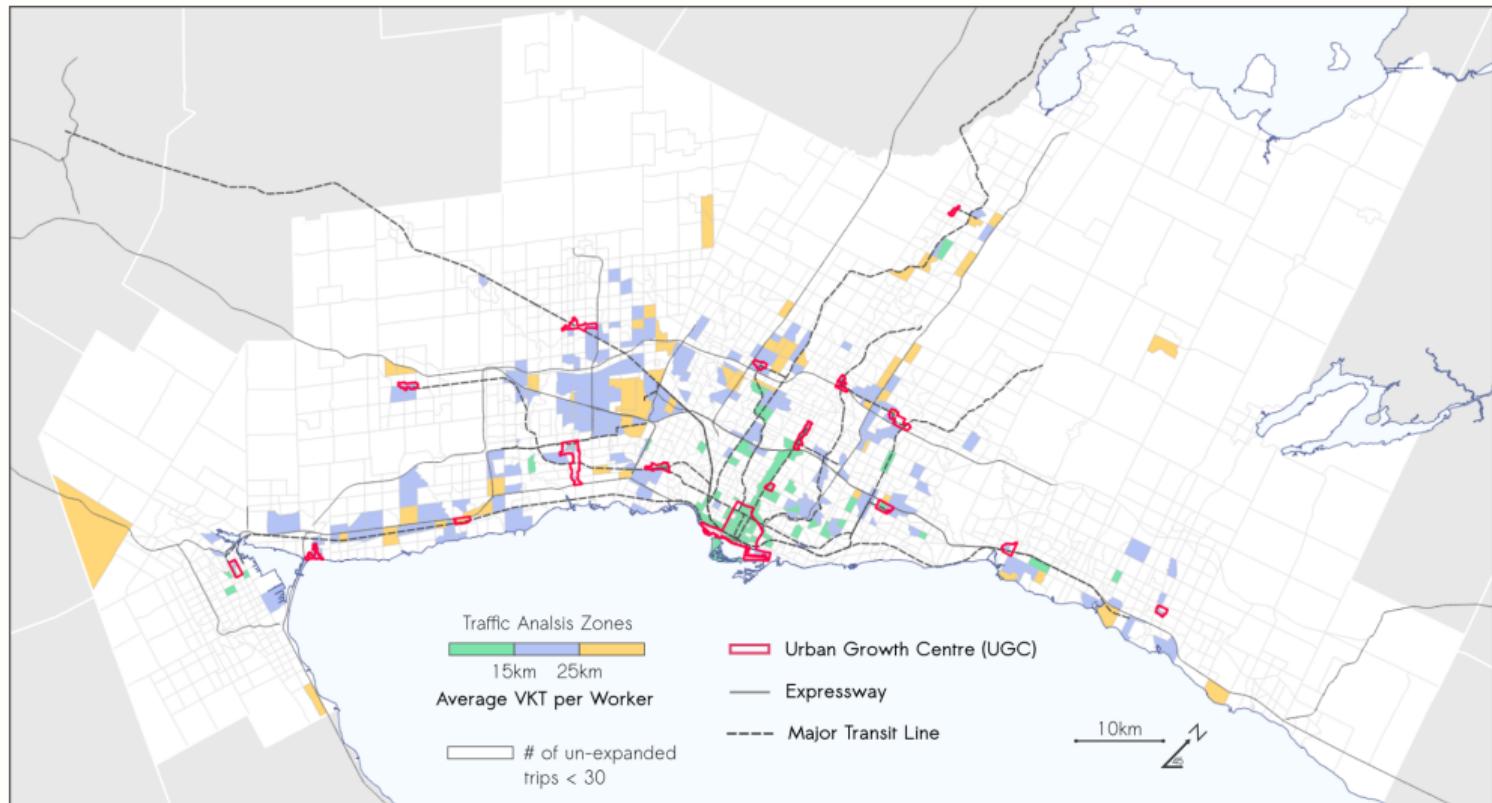


Source, me! sorry for the ugly colours

## TTS maps - e.g. activity participation



## TTS maps - e.g. VKT (Vehicle Kilometres Travelled) by workplace



## **Statistics Canada Survey Data**

e.g. the long-form Census asks a few questions about commuting

- ▶ Usual travel mode
- ▶ Departure time
- ▶ Travel time
- ▶ Travel distance
- ▶ Location of employment

# Summary of 2016 Census

## Employed labour force by main mode of commuting, Toronto, Ontario, Canada, 2016

Main mode of commuting	Toronto		Ontario		Canada	
	Number	Percentage	Number	Percentage	Number	Percentage
Total employed labour force with a usual place of work or no fixed workplace address	1,251,055	100.0	6,092,715	100.0	15,878,940	100.0
Car, truck, van – as a driver	575,255	46.0	4,375,215	71.8	11,748,095	74.0
Car, truck, van – as a passenger	57,170	4.6	372,475	6.1	868,920	5.5
Public transit	463,000	37.0	888,925	14.6	1,968,220	12.4
Walked	107,665	8.6	320,015	5.3	877,985	5.5
Bicycle	34,355	2.7	75,460	1.2	222,130	1.4
Other method	13,605	1.1	60,625	1.0	193,590	1.2

<https://www12.statcan.gc.ca/census-recensement/2016/as-sa/fogs-spg/Facts-cd-eng.cfm?LANG=Eng&GK=CD&GC=3520&TOPIC=12>

# Summary of 2016 Census

## Average commuting duration for the employed labour force, Toronto, Ontario, Canada, 2016

Average commuting duration for the employed labour force with a usual place of work or no fixed workplace address	Toronto	Ontario	Canada
Average in minutes	34.2	28.8	26.2

## Employed labour force by time leaving for work, Toronto, Ontario, Canada, 2016

Time leaving for work	Toronto		Ontario		Canada	
	Number	Percentage	Number	Percentage	Number	Percentage
Total employed labour force with a usual place of work or no fixed workplace address	1,251,055	100.0	6,092,710	100.0	15,878,940	100.0
Between 5 a.m. and 5:59 a.m.	56,240	4.5	413,510	6.8	1,073,685	6.8
Between 6 a.m. and 6:59 a.m.	162,440	13.0	1,039,255	17.1	2,814,750	17.7
Between 7 a.m. and 7:59 a.m.	305,355	24.4	1,571,225	25.8	4,458,830	28.1
Between 8 a.m. and 8:59 a.m.	335,835	26.8	1,354,870	22.2	3,349,975	21.1
Between 9 a.m. and 11:59 a.m.	200,780	16.0	740,335	12.2	1,756,265	11.1
Between 12 p.m. and 4:59 a.m.	190,405	15.2	973,510	16.0	2,425,435	15.3

# Summary of 2016 Census

## Employed labour force by place of work status, Toronto, Ontario, Canada, 2016

Place of work status	Toronto		Ontario		Canada	
	Number	Percentage	Number	Percentage	Number	Percentage
Total employed labour force	1,361,375	100.0	6,612,150	100.0	17,230,035	100.0
Worked at home	101,275	7.4	480,290	7.3	1,272,285	7.4
Worked outside Canada	9,045	0.7	39,145	0.6	78,815	0.5
No fixed workplace address	156,250	11.5	736,715	11.1	1,987,265	11.5
Usual place of work	1,094,805	80.4	5,356,000	81.0	13,891,680	80.6

<https://www12.statcan.gc.ca/census-recensement/2016/as-sa/fogs-spg/Facts-cd-eng.cfm?LANG=Eng&GK=CD&GC=3520&TOPIC=12>

**Surveys that focus on specific types of questions or sub-populations:**  
e.g. StudentMoveTO, a travel survey of University students in the GTHA

Figure 8: Average Commute Duration from Home to Campus (minutes)  
(n = 5,391 trips)

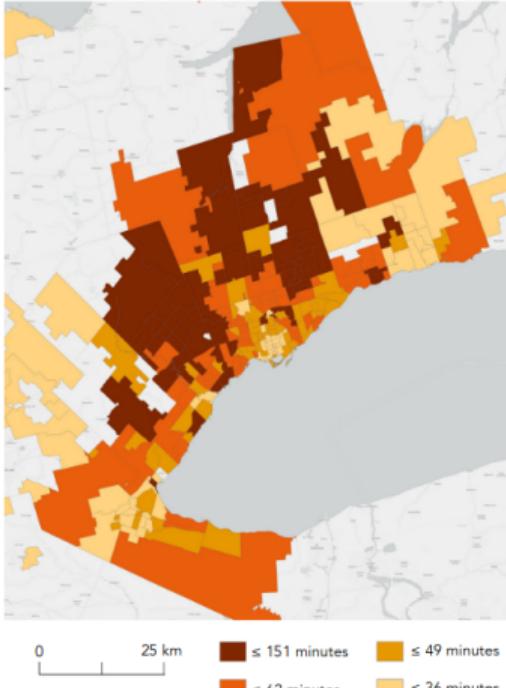


Figure 9: Average Monthly Transportation Cost (n = 16,612 students)



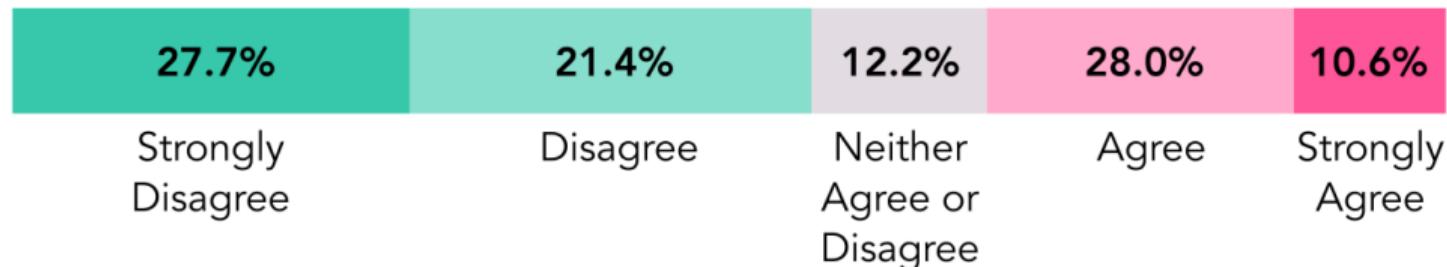
## Travel Surveys

Two types of questions

- ▶ Revealed preference
  - ▶ What did you do
  - ▶ *e.g. how did you travel to work today?*
- ▶ Stated preference
  - ▶ What would you do
  - ▶ *e.g. would you buy an electric vehicle if ... ?*

e.g. a stated preference survey question, from a survey of transit riders during COVID-19

"After the crisis ends I will probably ride transit less than I did before COVID"



*n* = 1923

[https://tspace.library.utoronto.ca/bitstream/1807/106676/1/ThePublicTransitandCOVID-19SurveyWave2Results\\_Final.pdf](https://tspace.library.utoronto.ca/bitstream/1807/106676/1/ThePublicTransitandCOVID-19SurveyWave2Results_Final.pdf)

## Travel behaviour data: 2. Observation/Sensor Data

- ▶ Instead of asking people, observing how people and vehicles move around a city
- ▶ Varying levels of technological sophistication
  - ▶ e.g. counting the number of cars in the HOV lane

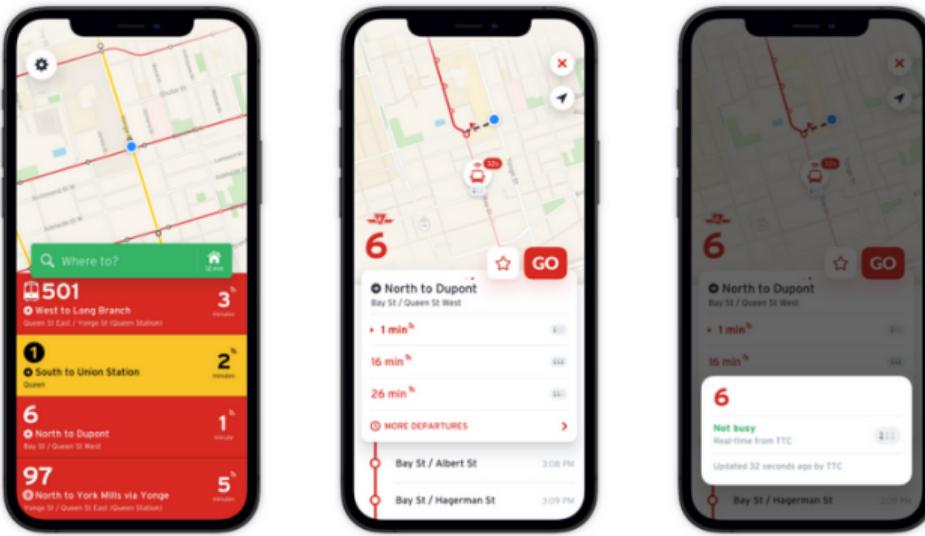


## Automatic traffic counters

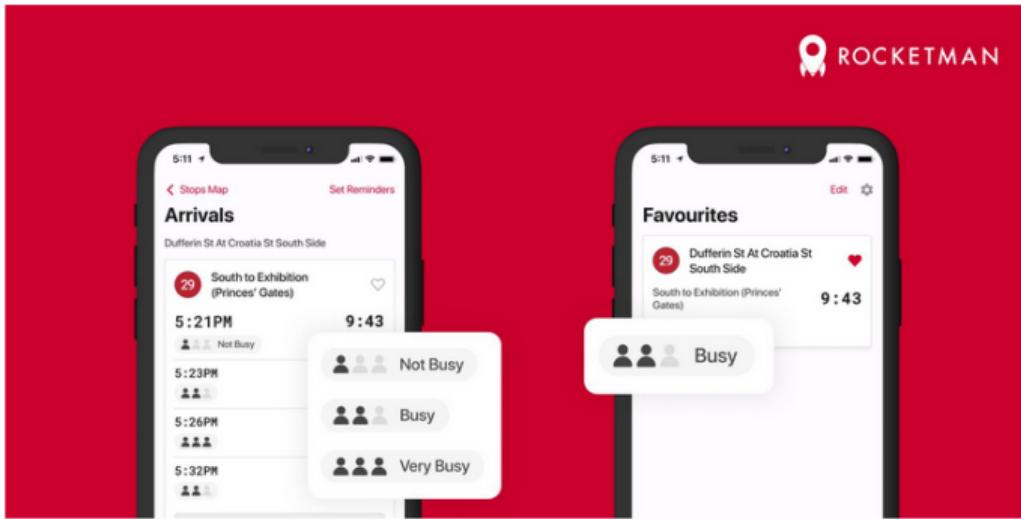
e.g. sensors counting cyclists in Copenhagen:



# GPS Tracking of vehicles

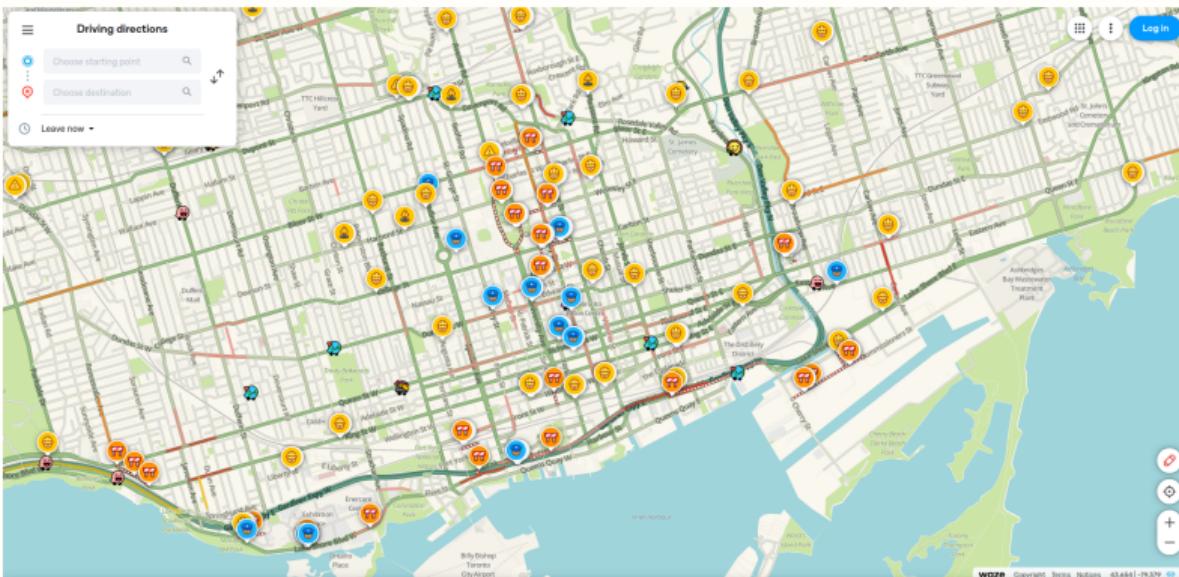


# Automatic Passenger Counters



## Smartphone GPS Tracking ("passive" data collection on mobility)

- ▶ e.g. Waze, Google Maps Traffic, etc.



<https://www.waze.com/live-map>

## Smartphone GPS Tracking ("passive" data collection on mobility)

- ▶ e.g. NY Times investigation into the smartphone tracking industry



<https://www.nytimes.com/interactive/2019/12/19/opinion/location-tracking-cell-phone.html>

## **After reading week**

- ▶ In-person class moved to SS2125
- ▶ Transportation data analysis assignment due March 3
- ▶ Project proposal due March 10