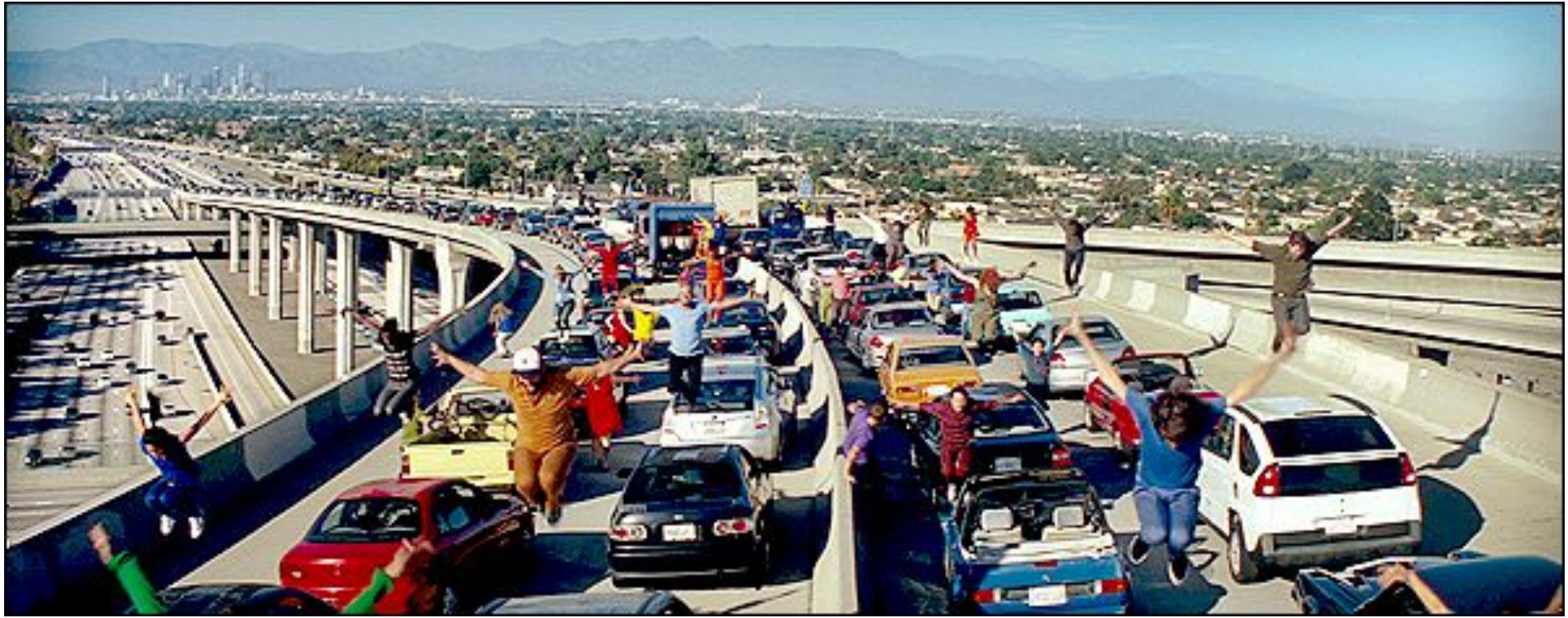
Analyzing Regional Traffic Count

Team : DC20017

Haoning Deng
Junfei Hao
Mit Lalitbhai Patel
Qinyu Wei



But in reality...the horrible series...

Truth about DC traffic

CONGESTION LEVEL NOW

47%

↓ 9% less than average at this time

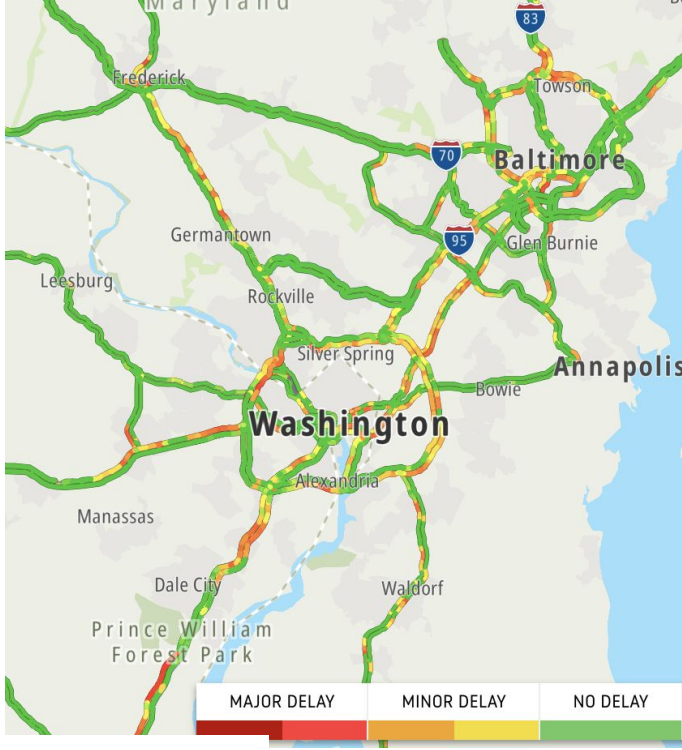
TRAFFIC JAMS NOW

423

total count

475.8 km

total length



WORLD RANK 2019

141

TIME LOST IN RUSH HOUR - PER TRIP

How much extra time was spent driving in rush hour?

+14 min

per **30 min** trip in the morning

+18 min

per **30 min** trip in the evening

TIME LOST IN RUSH HOUR - PER YEAR

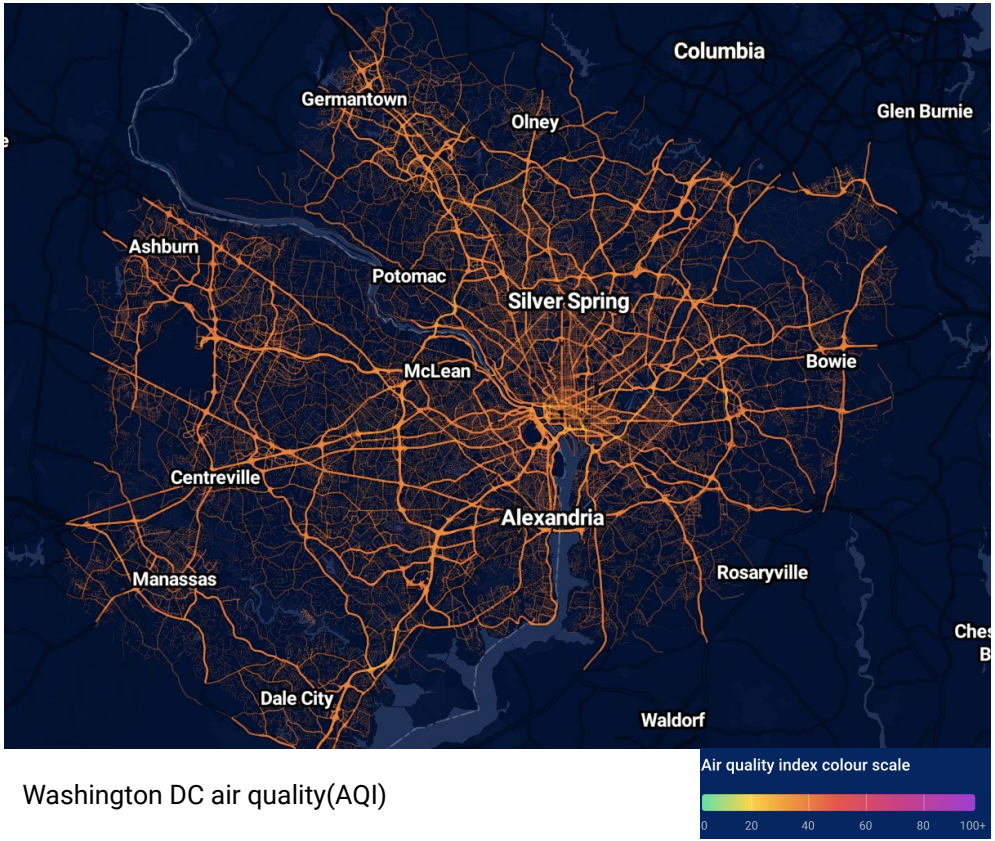
How much extra time was spent driving in rush hours over the year?

126 hours = 5 days 6 hours

Traffic congestion leads to

Air pollution

- Vehicle emissions have become the dominant source of air pollutants, including carbon monoxide (CO), carbon dioxide (CO2), nitrogen oxides (NOx), and particulate matter (PM).

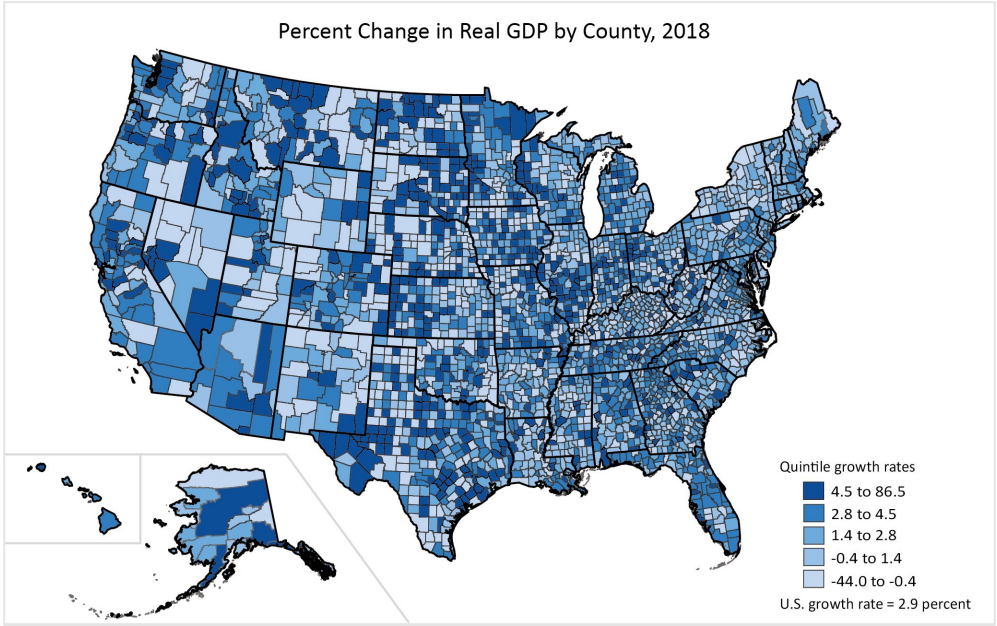


Washington DC air quality(AQI)

Traffic congestion leads to

Economic effects

- In the US, the total cost of lost productivity caused by congestion is $87 billion in 2019.
- The average DC driver lost 126 hours last year thanks to traffic, which cost the local economy $4.1 billion[2].



U.S. Bureau of Economic Analysis

Traffic congestion leads to

Health risks

- Public health cost of mortality attributable to congestion in 83 U.S. cities in was $31 billion.[1]
- Harvard School of Public Health predicts that by 2020:
  - 1,600 premature deaths
  - $13 billion in total social costs.

Metropolitan Washington Council of Governments (MWCOG)

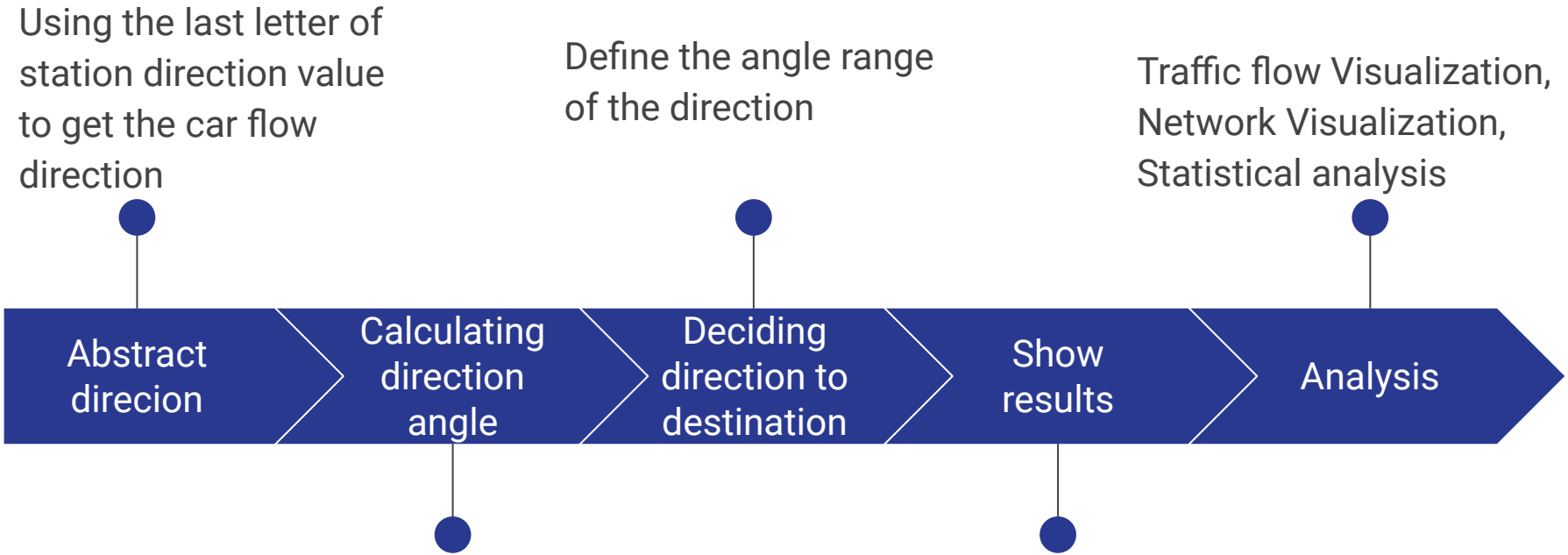
Regional Traffic Count Dataset

Column Name	Column Description
OBJECTID	Object ID
STATION	Traffic count station ID
COMMENTS	Location description of the station
COUNTY	County
ABPair	Link A-B Pair ID in the TPB road network
Sta_Dir	Direction of the station
Motorcycles	Motorcycle count
PassCars	Passenger car count
Buses	Bus count
SUTrucks	Single unit truck count
CTrucks	Cargo truck count
TOD	Time of day
TotVol	Total volume
StartDate	Start date
EndDate	End date
TimeLabel	Time label
AllTrucks	All truck count
IsPerm	Flag whether the station is permanent
PickupsPanelVans	Pick-ups and panel vans
XCOORD	latitude
YCOORD	longitude

Exploring the Data gives insights

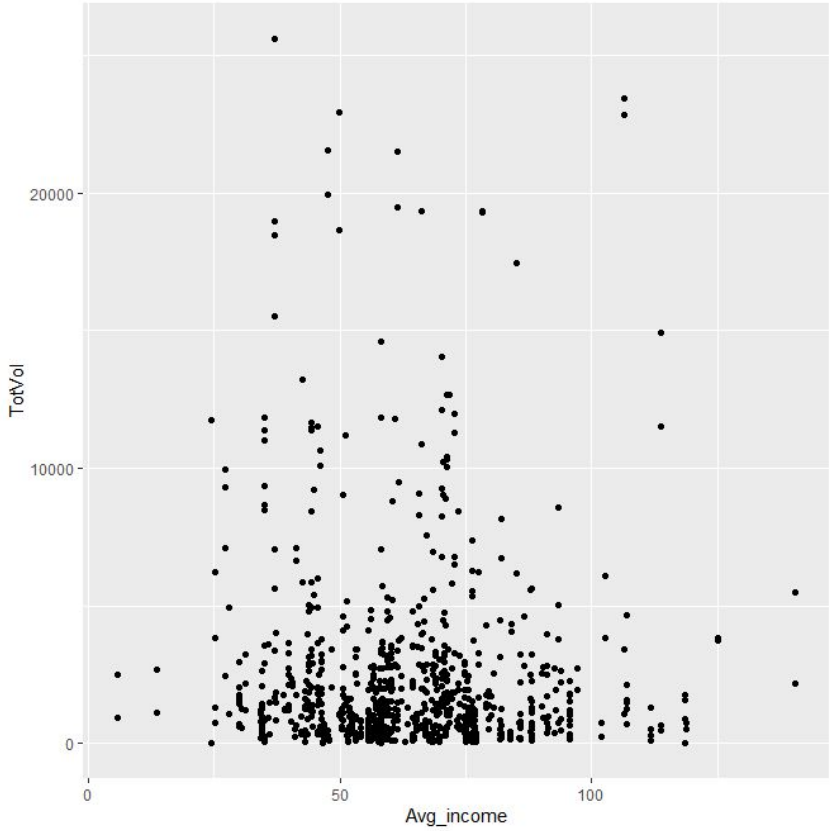
In this challenge, we are trying to understand the traffic patterns and effects of different external factors on the patterns.

Analysing the car flow

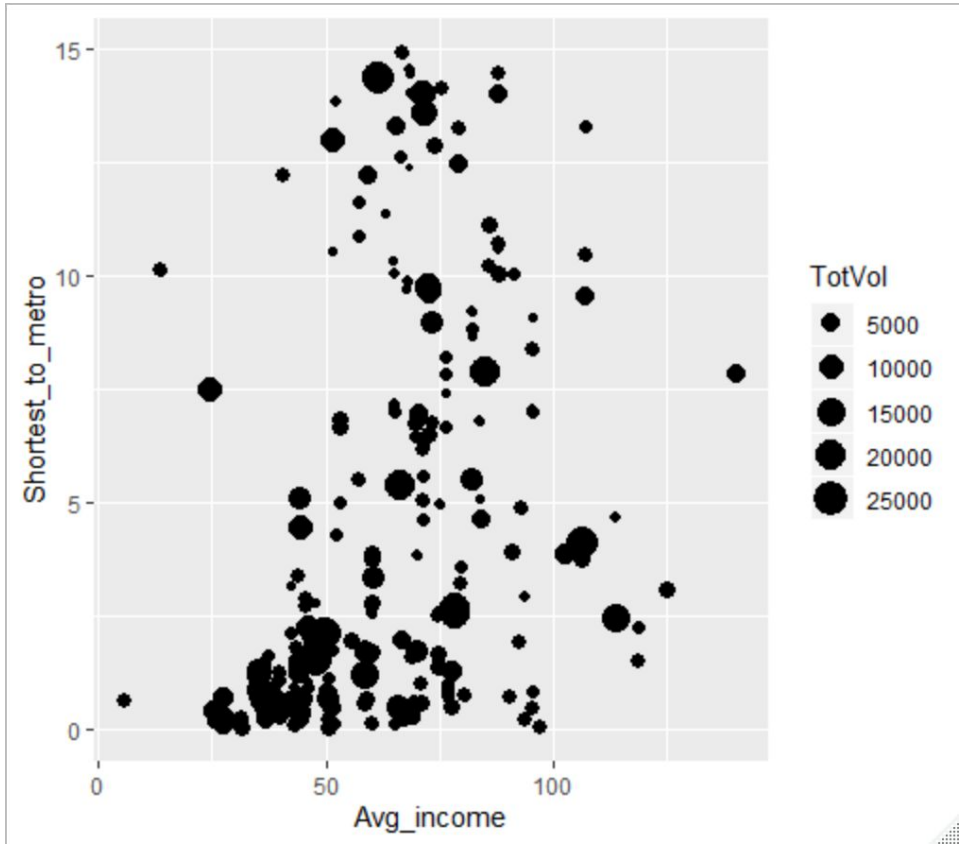


Using statistical techniques explains our data

We use Poisson regression to explain vehicle counts at traffic stations by several external factors



*Relationship between **average household income** (ten thousands dollars) and total traffic volume (count)*

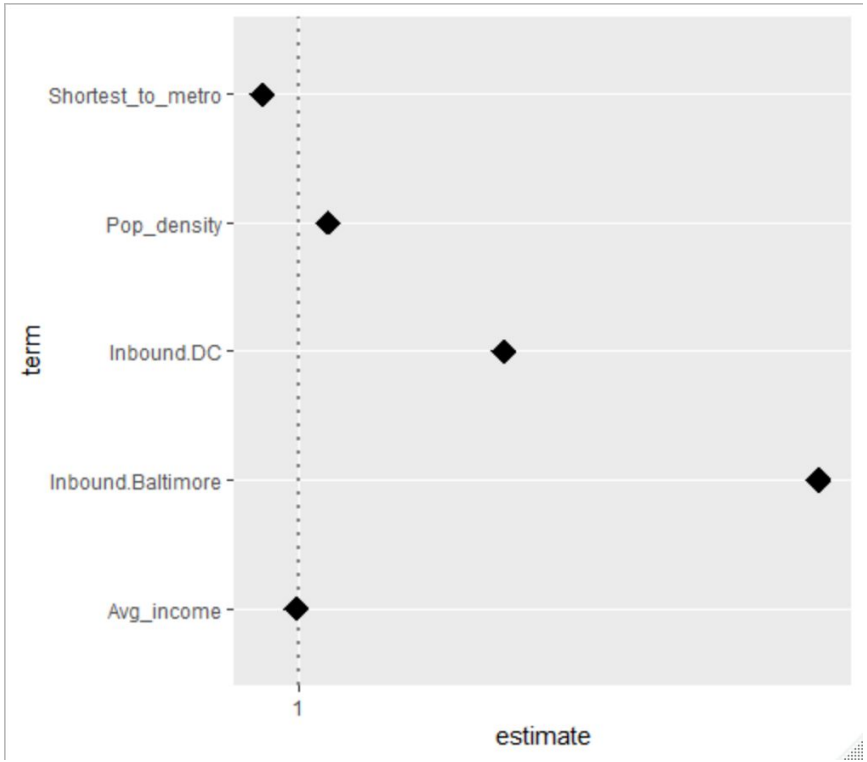


*Relationship between **average household income** (thousand dollars), **shortest distance to metro station** (miles) and total traffic volume (count)*

Here are our predictors:

- **Average household income (ten thousand dollars)**
- **Population density (people per square miles)**
- **Distance to the nearest metro station (miles)**
- **Direction of the traffic flow**
  - Inbound DC
  - Inbound Baltimore
  - Neither inbound DC nor Baltimore

Poisson - ONE MODEL



Coefficient plots for Poisson model

POSITIVE INFLUENCE

Inbound-Baltimore direction ~ Vol **44.92%↑**

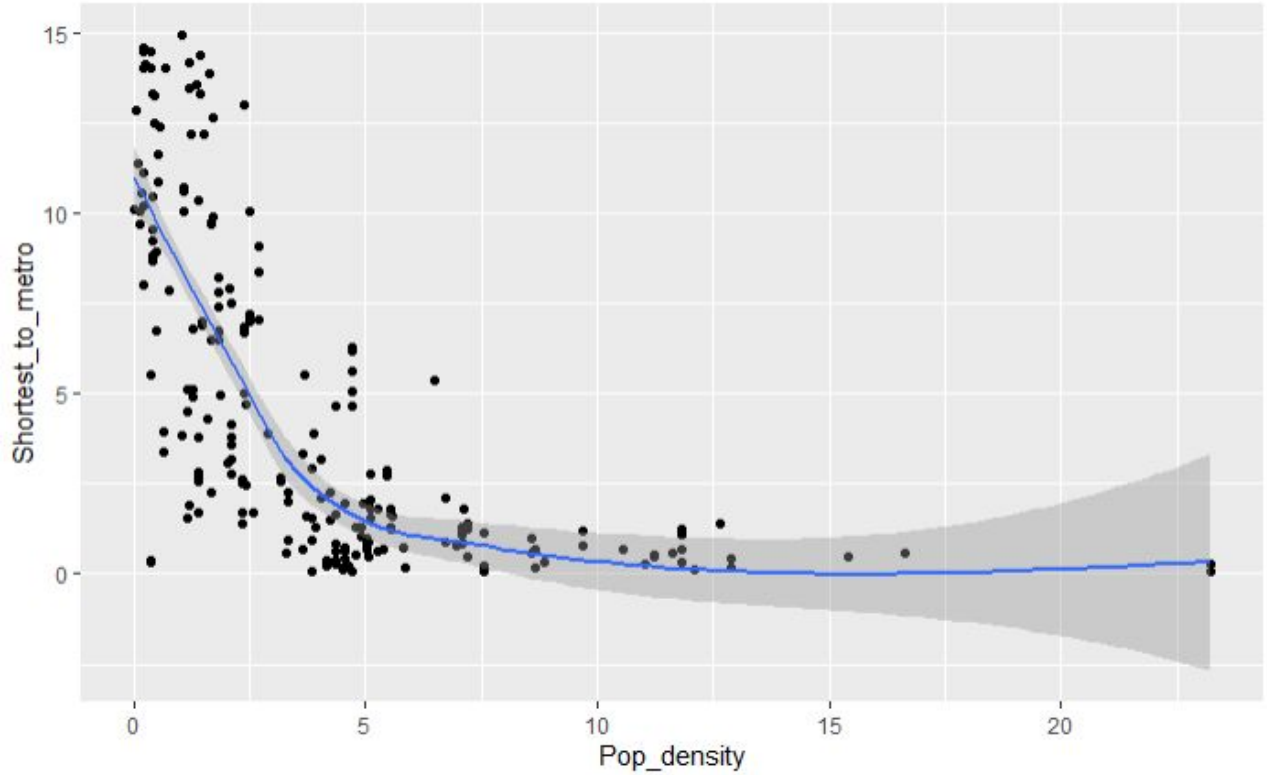
Inbound-DC direction~ Vol **15.78%↑**

People per square miles 1k↑ ~ Vol **2.08% ↑**

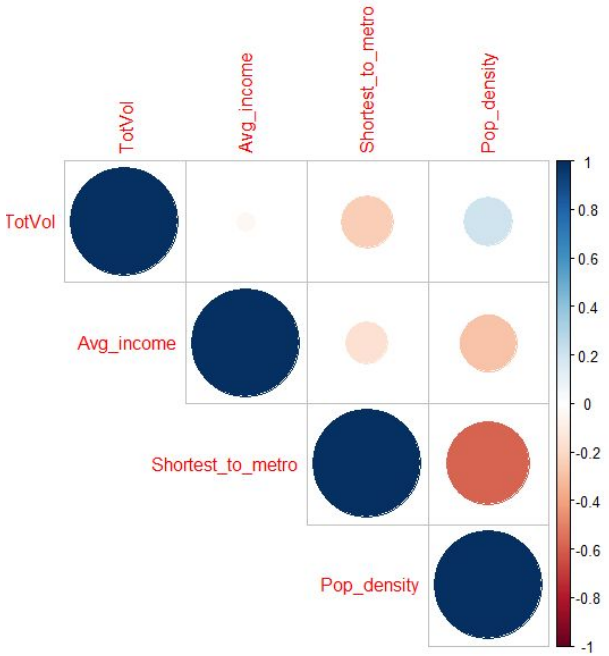
NEGATIVE INFLUENCE

Avg Household income $10k↑ ~ Vol **1.80%↓**

Distance to the nearest metro 1 mile↑ ~ Vol **2.59% ↓**

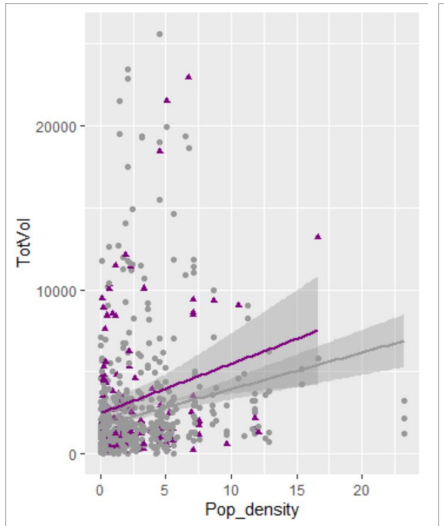


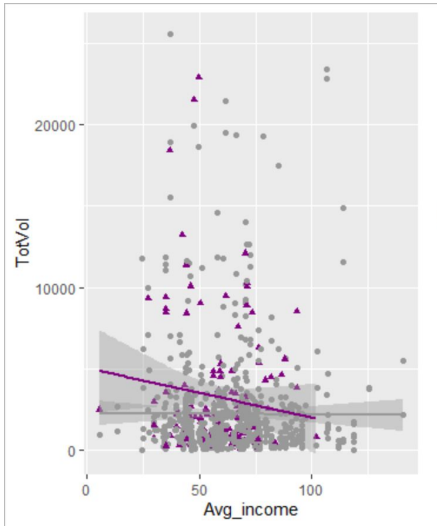
Relationship between population density (thousand people) and shortest distance to metro station (miles)

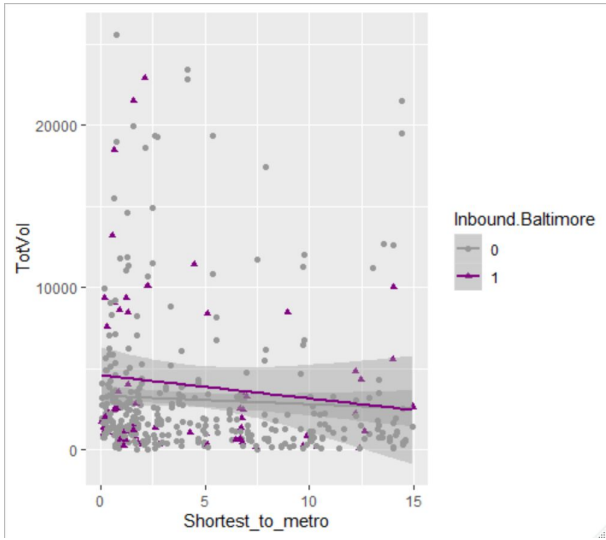


Correlation matrix

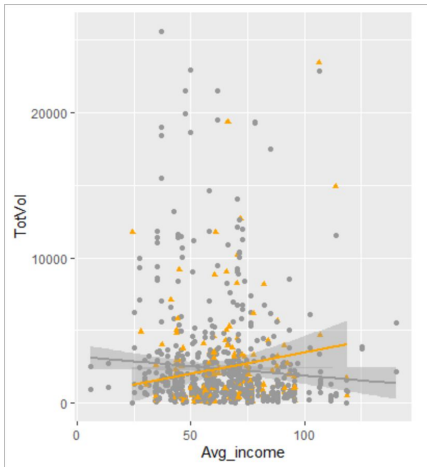
Direction matters a lot.

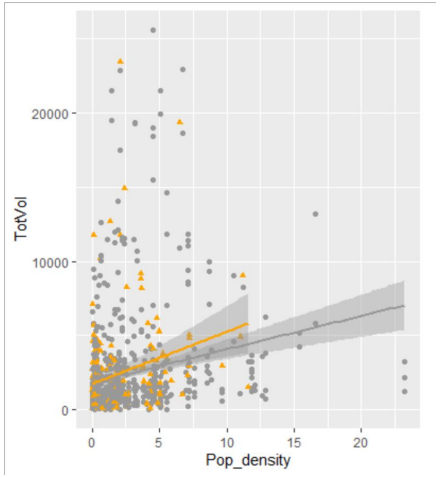


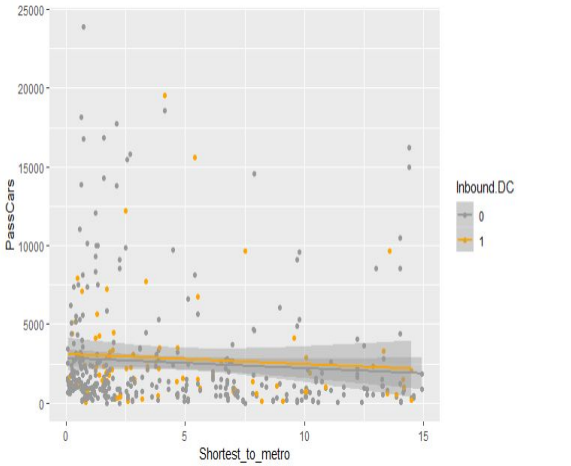




What if we take direction of traffic flowing as a filter?

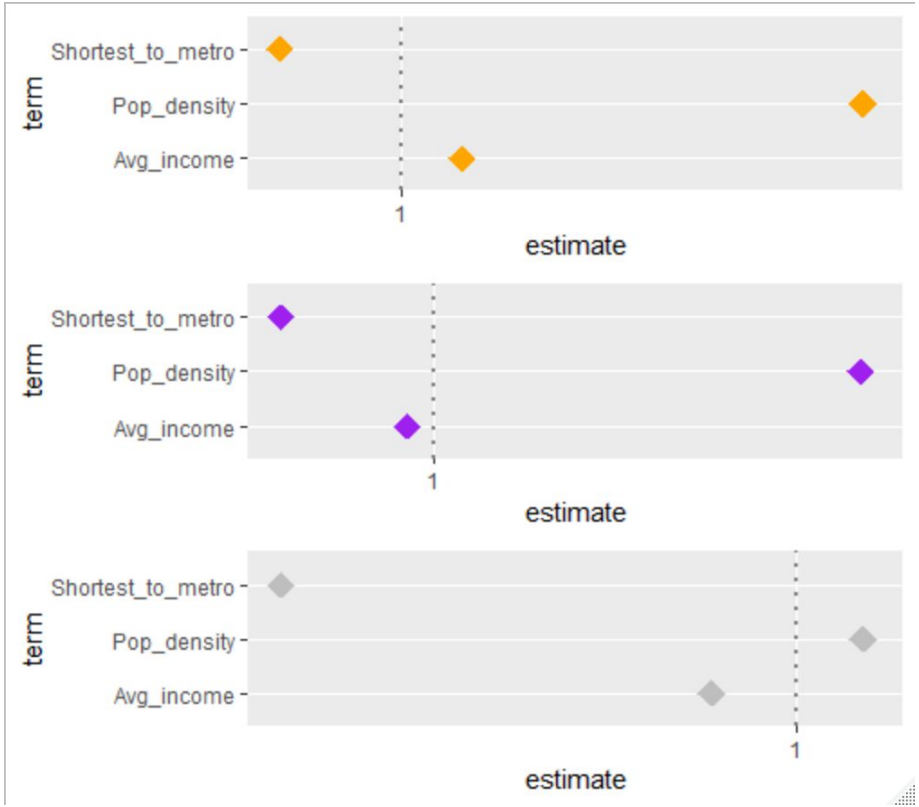






THREE MODELS

We divide our data into three segments by their directions:



To DC only

To Baltimore only

Neither DC nor Baltimore

Suggestions

For City Road

1. **Tidal lane**
   According to the flow map, tidal lane should be set more during morning rush hour towards main cities like Washington DC and Baltimore.

2. **Traffic lights control**
   To duration of green light at interactions that near most busy traffic station sites.

Suggestions

For Highway:

3. Charge more during morning rush hour
   For highways towards Washington D.C. or Baltimore, like the roads we mentioned in the car flow graphes, we can charging more fees to reduce traffic.

4. Add carpool lane

References:

1) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4243514/
2) https://www.weforum.org/agenda/2019/03/traffic-congestion-cost-the-us-economy-nearly-87-billion-in-2018/
3) https://www.tomtom.com/en_gb/traffic-index/washington-traffic