



27 FEB 21

Team Number: DC21055

Data Set: VeoRide E-scooter Transportation

Cleaning and Preparing the Data

1. Filter out the bike rides
2. Exclude any unreasonable data (rides greater than 10 mi or longer than 2 hrs)
3. Split into 2019 and 2020 data sets

CO `escooters.ipynb`

```
import numpy as np
import pandas as pd
from google.colab import drive
drive.mount('/content/drive')
path = "drive/MyDrive/Colab Notebooks/data challenge

import csv
data = pd.read_csv(path)

from google.colab import drive
drive.mount('/content/drive')

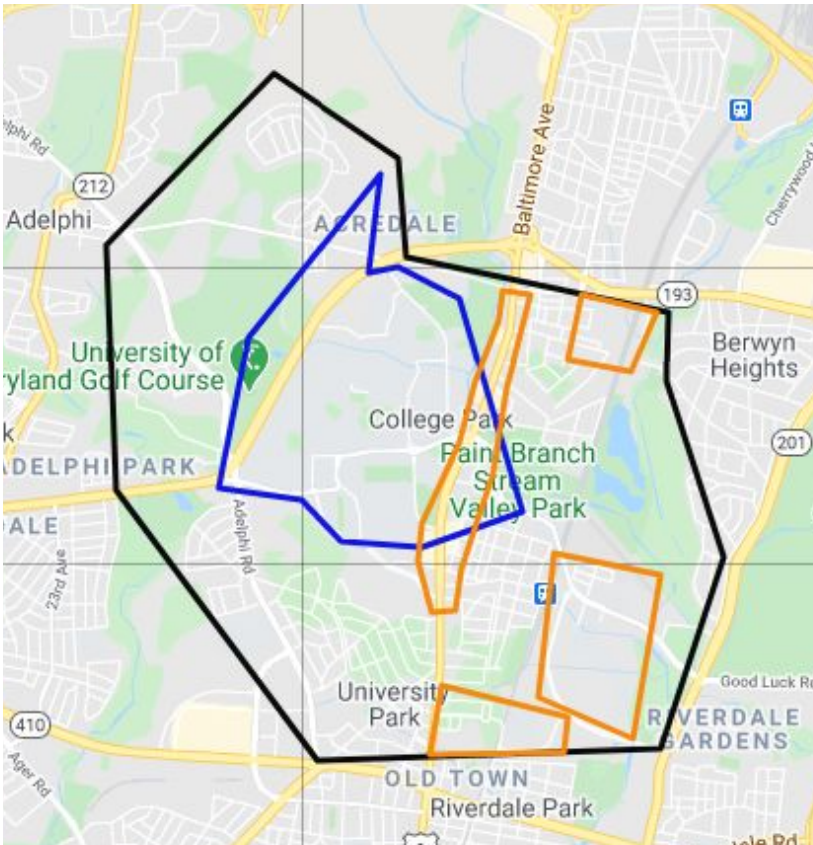
import sys
!{sys.executable} -m pip install turfpy

import json
```

Questions to Address

- ▶ What was the average length of many main travel types?
- ▶ Which routes were most common?
- ▶ Do the rides mostly stay on campus, off campus, or a mix of both?
- ▶ Are the destinations mostly in residential areas or commercial areas?
- ▶ How does the October 2019 data compare to the October 2020 data?
- ▶ What other factors impact E-scooter usage?

Data Classification Zones



Black: VeoRide service area

Blue: UMD campus

Orange: commercial areas

Note: all other areas inside the service zone are considered residential

Overall Ride Split

	October 2019	October 2020
Total Share of Rides	40.477	59.523
On Campus Rides	36.168	24.073
Residential Rides	1.591	2.189
Commercial Rides	1.783	1.783

Note that the share of rides increased in all categories between 2019 and 2020.

We suggest that this was a result of COVID lockdowns and an effort to socially distance.

*Measured as percent of total rides

Type of Travel Zones

Start End	Campus	Residential	Commercial
Campus	59.47%	4.96%	8.00%
Residential	4.52%	3.93%	2.35%
Commercial	8.67%	5.88%	2.16%

Percent of rides in 2019

Start End	Campus	Residential	Commercial
Campus	60.76%	4.13%	8.14%
Residential	4.02%	3.68%	1.89%
Commercial	8.50%	5.88%	3.00%

Percent of rides in 2020

*Note that the general distribution is roughly the same across both years

Average Length of Rides

Start End	Campus	Residential	Commercial
Campus	0.820	0.962*	0.898
Residential	1.011	0.987*	0.956*
Commercial	0.873	0.832	1.075*

Average distances in 2019 (miles)

Start End	Campus	Residential	Commercial
Campus	0.758	1.060*	1.060
Residential	1.027	0.809*	0.815*
Commercial	0.900	0.870	0.793*

Average distances in 2020 (miles)

*Note significant differences between the years

Distance Conclusions

Significant changes in average distance between 2019-2020 (miles)

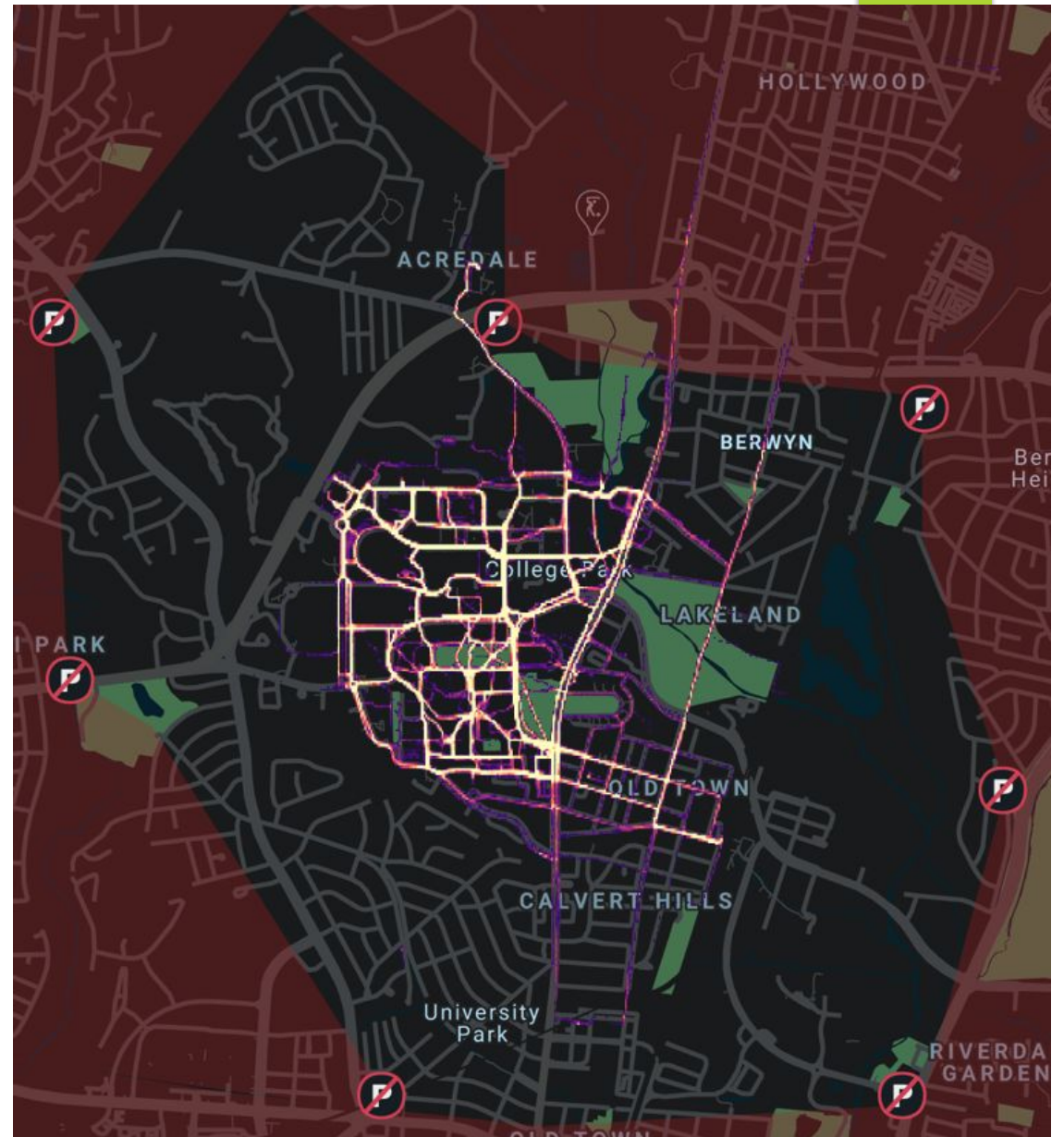
Type of Travel	Difference
Commercial only	-0.282
Commercial > Residential	-0.141
Residential > Campus	0.098
Residential only	-0.177

Potential Causes

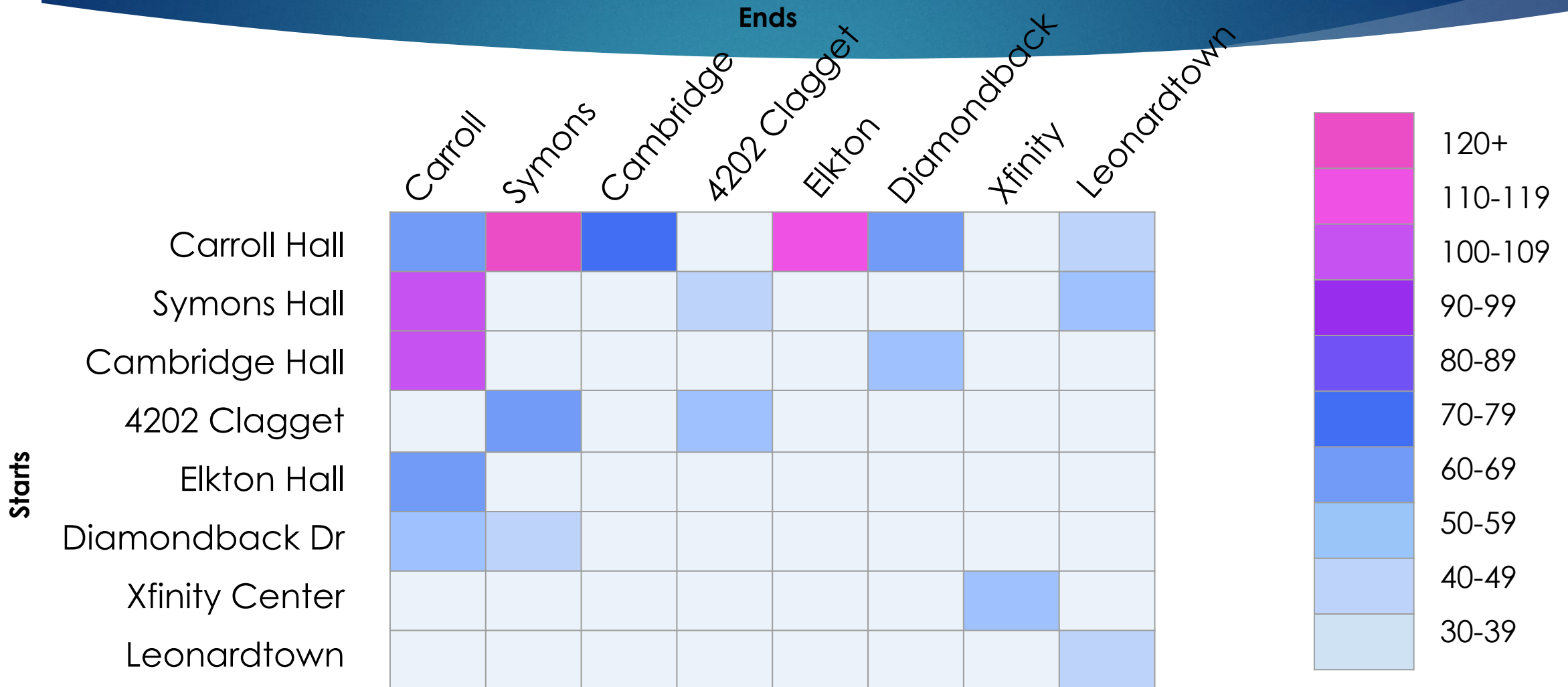
- COVID lockdowns caused a decrease in shopping
- Fewer people left their house for retail or dining
- More people used scooters as a socially distant method of travel to class
- Many users stayed close to home due to COVID restrictions

Popular routes

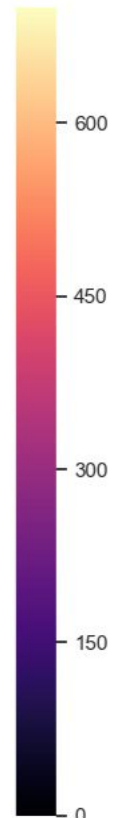
Scaled to 200 rides as lightest points



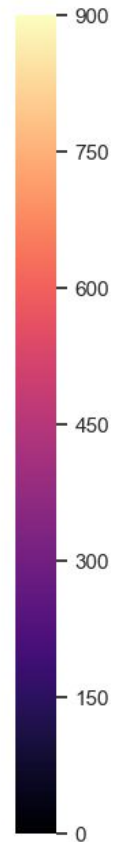
Popular Starting and Ending Points



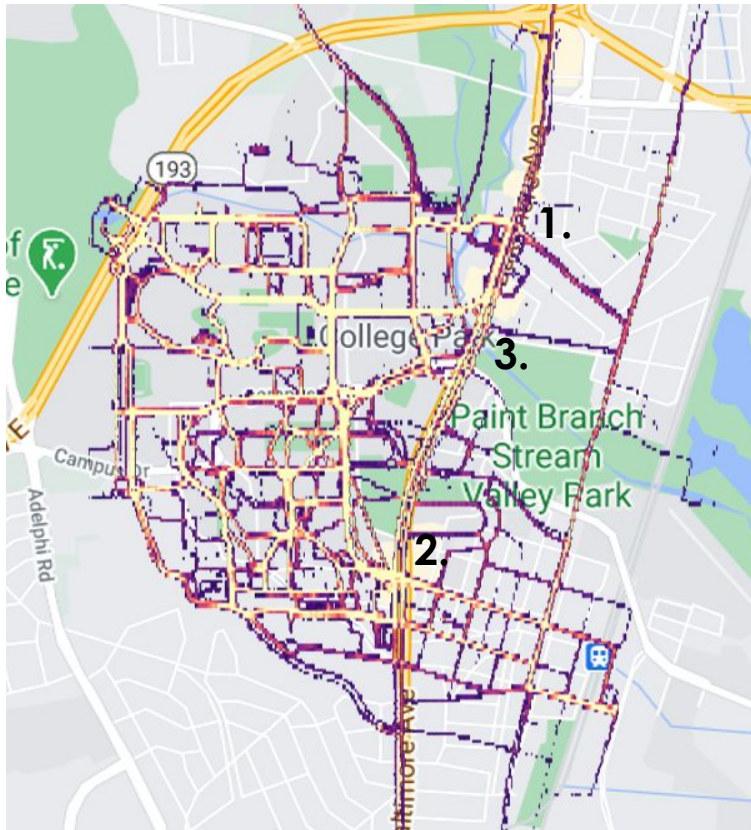
Finding Common Access Points



Finding Common Access Points



Common Access Points

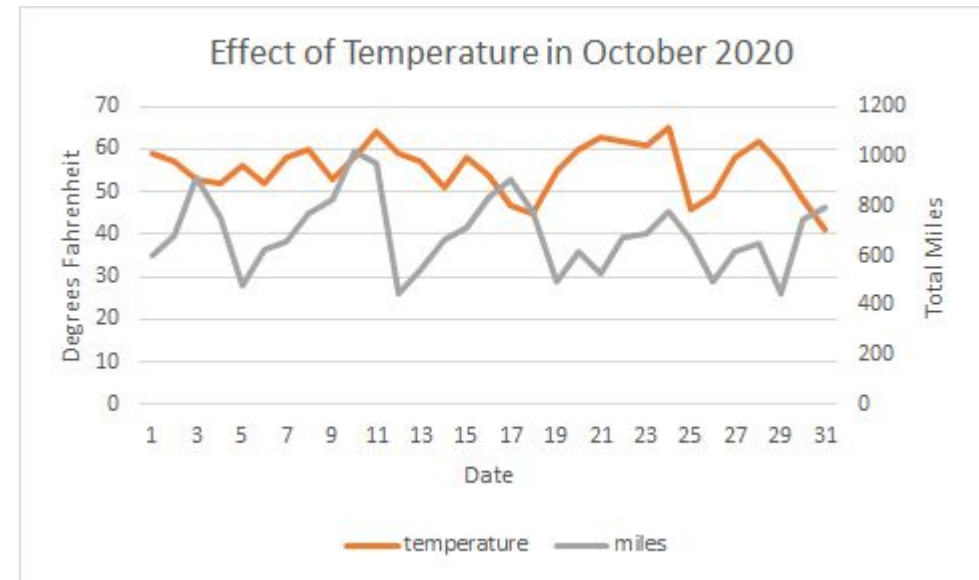
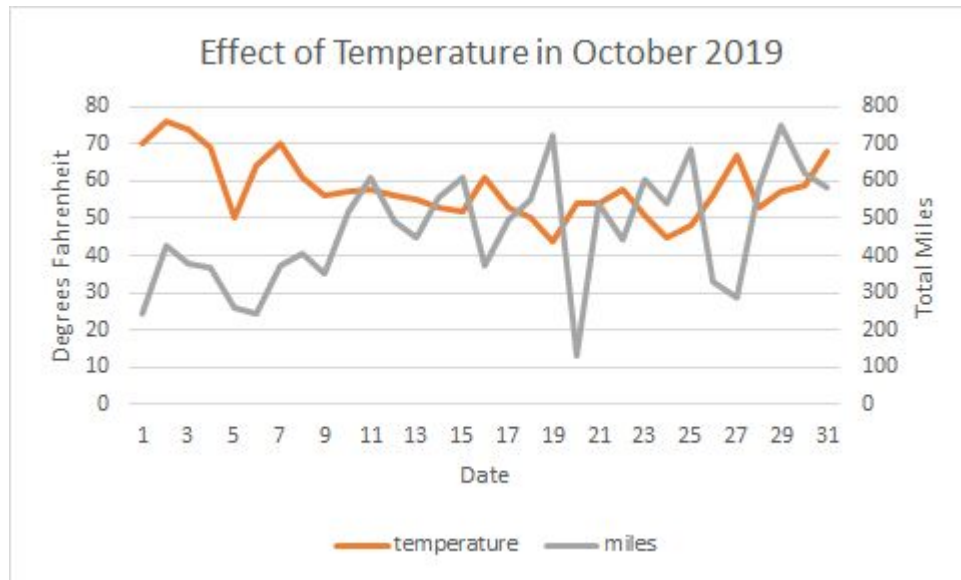


1. XFINITY Center Shuttle Bus
2. Regents Drive South Gate
3. Computer Science Instructional Center



What else might affect
ride patterns?

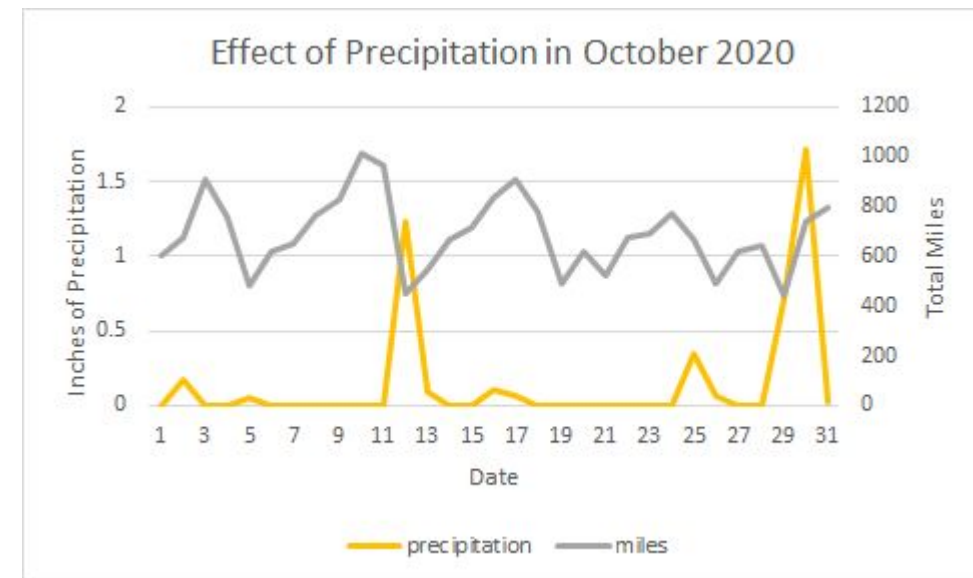
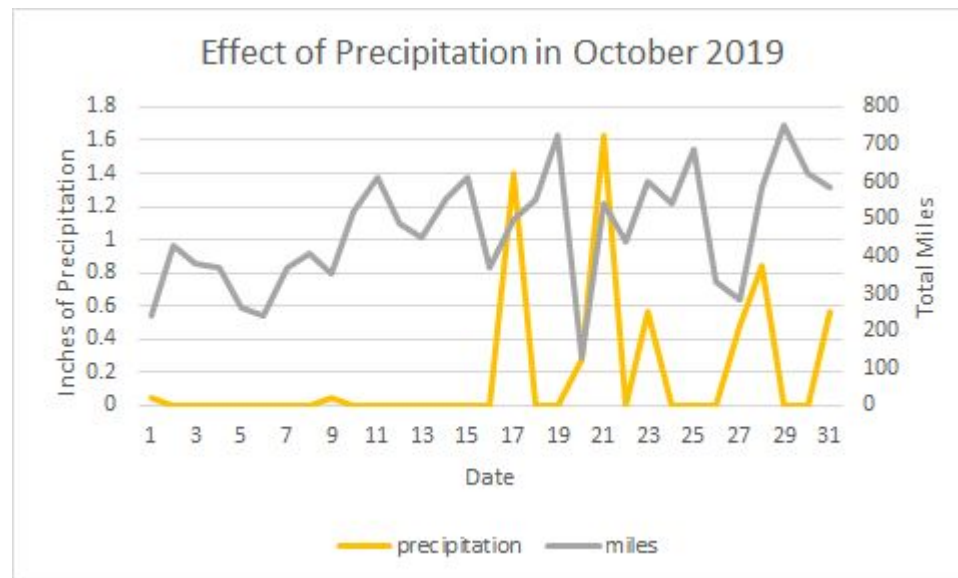
Temperature



The general trend across both years shows more/longer rides when the temperature is cooler. This is more apparent in 2019 than in 2020.

*Weather data from NOAA's website Climate.gov

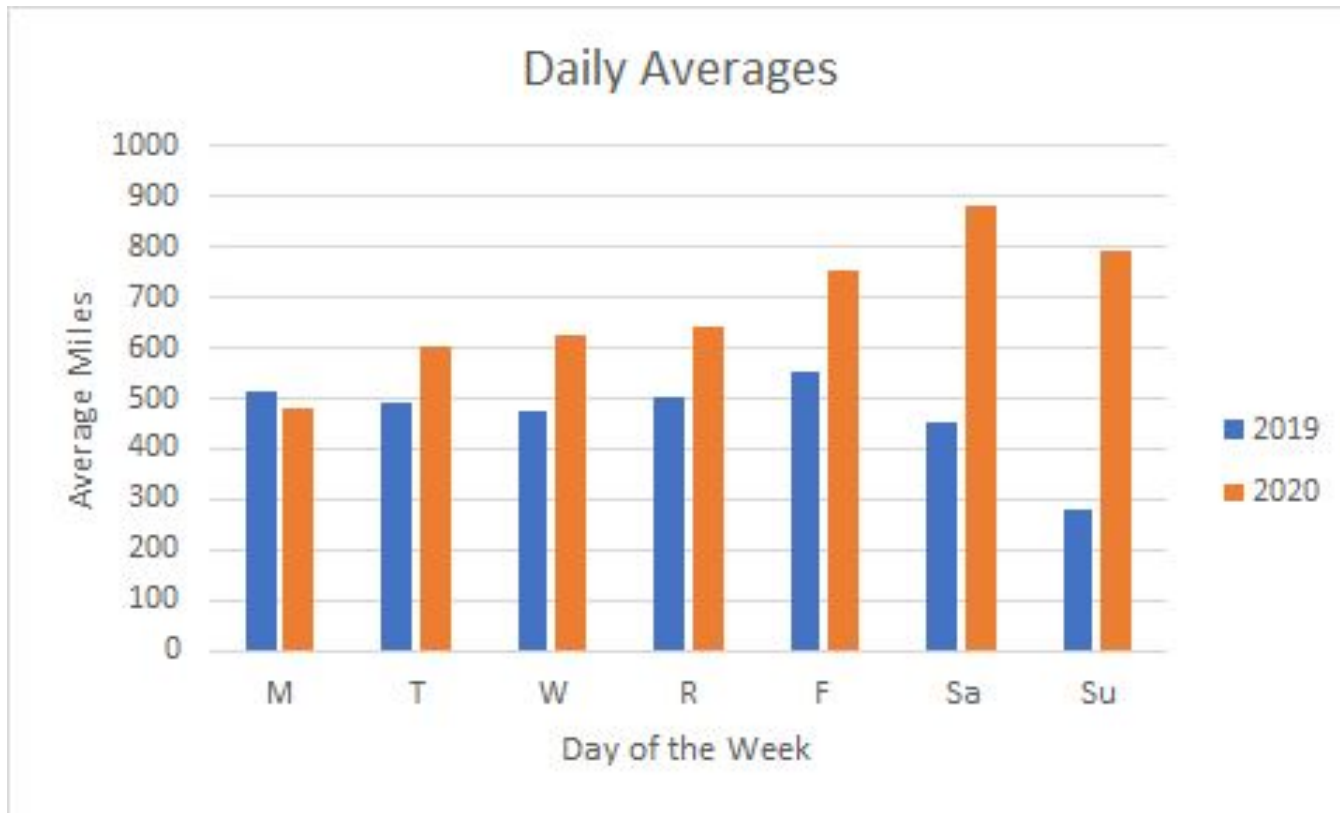
Precipitation



Rainy days show a decrease in total miles but there are exceptions to this trend.

*Weather data from NOAA's website [Climate.gov](https://climate.gov)

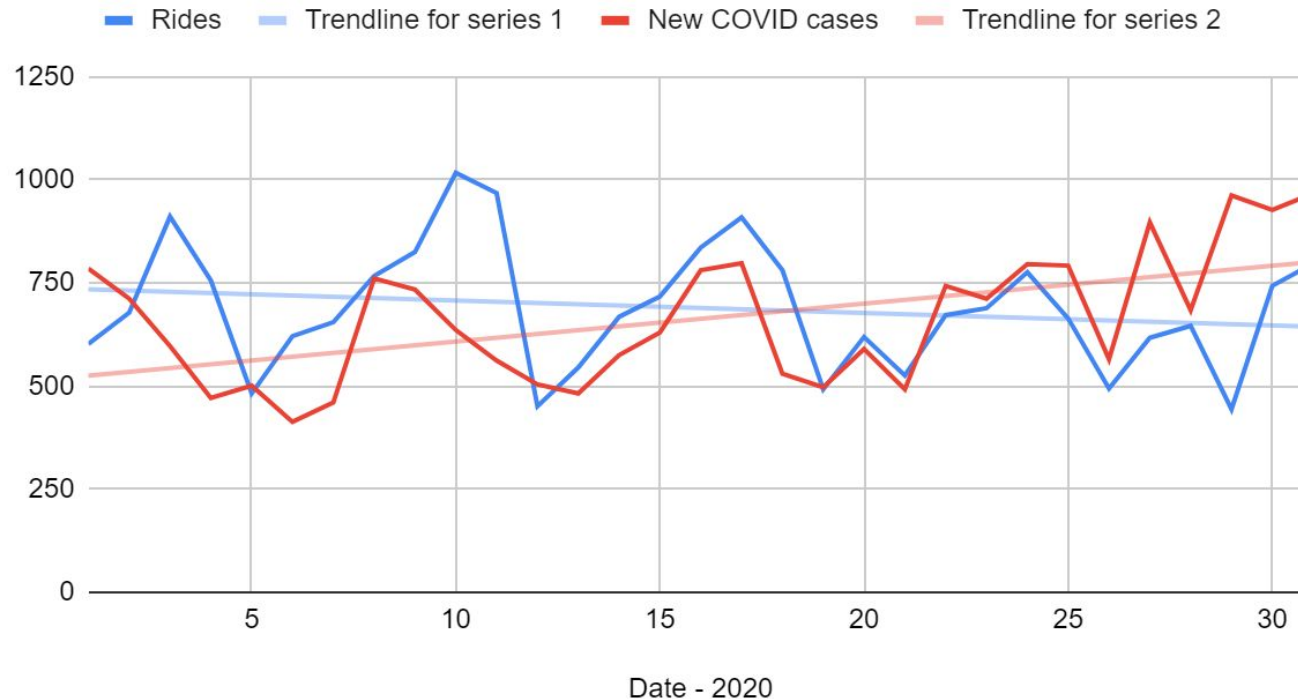
Day of the Week



- In 2019 the average miles were similar across weekdays and decreased on the weekend, particularly Sunday.
- In 2020 the average miles increased throughout the week and were highest on Saturday.
- We suggest that the COVID-19 pandemic led to less work-related travel (weekdays) but encouraged people to spend more time outdoors on the weekend.

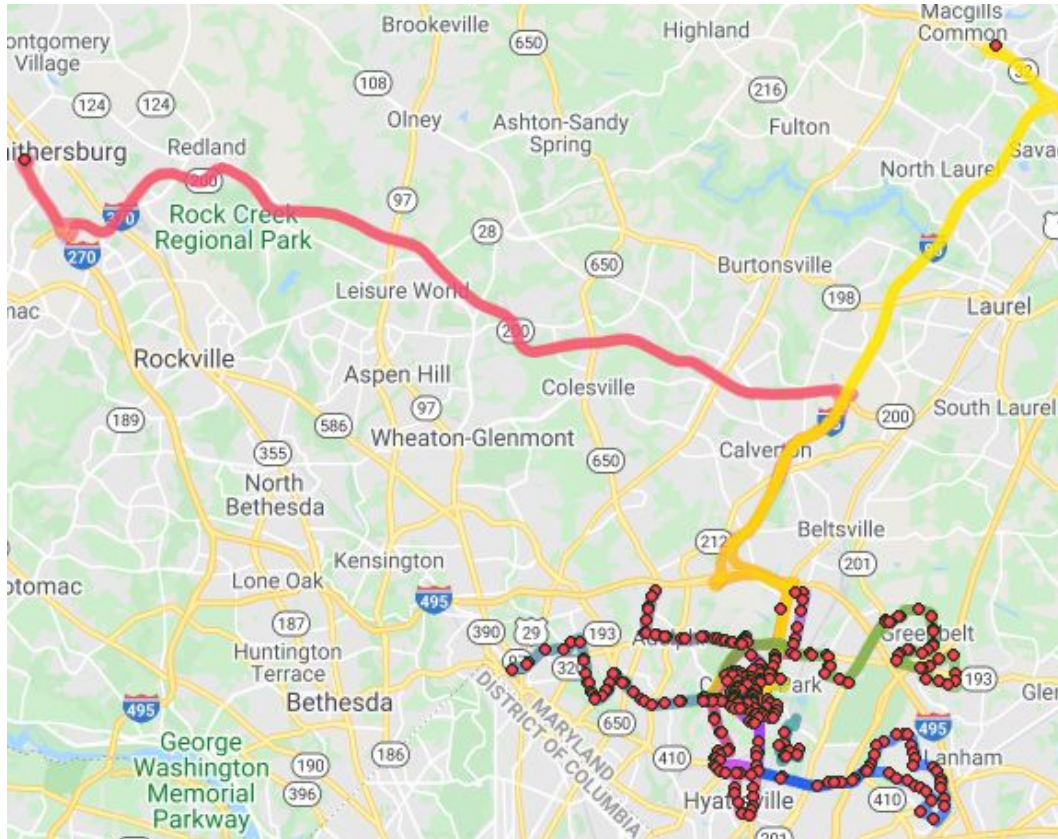
COVID Transmission

Relationship Between Travel and Transmission



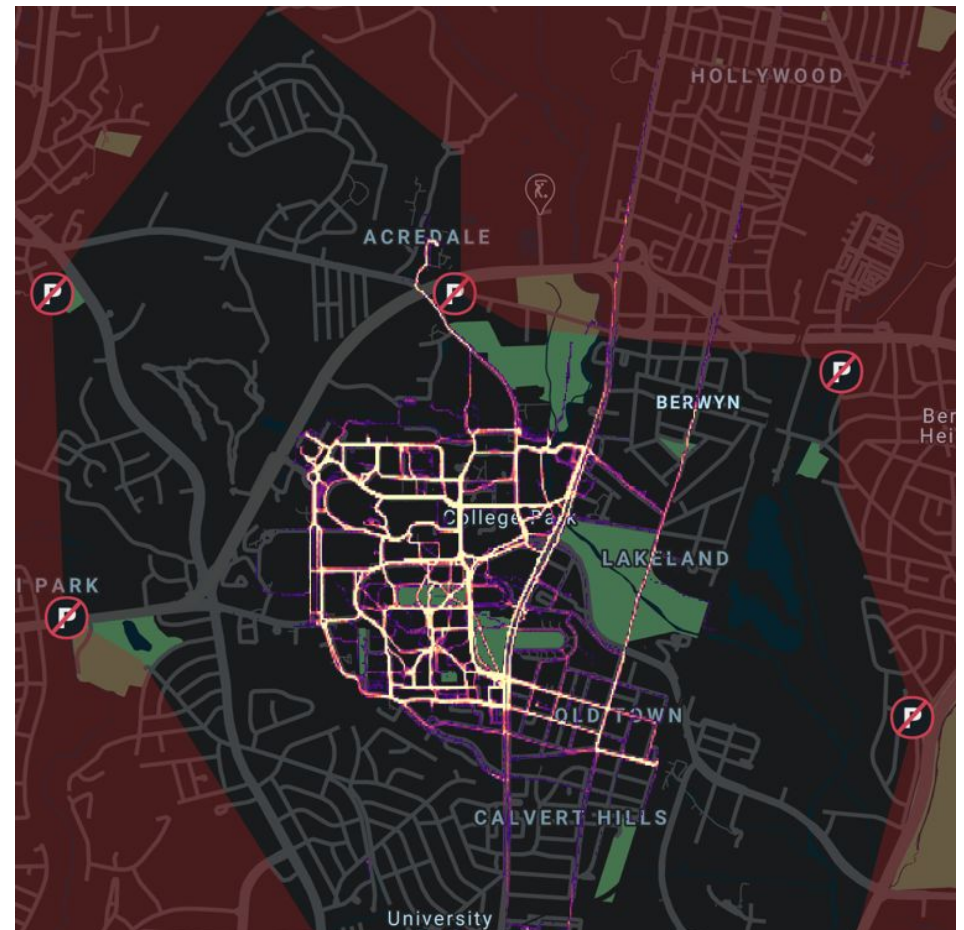
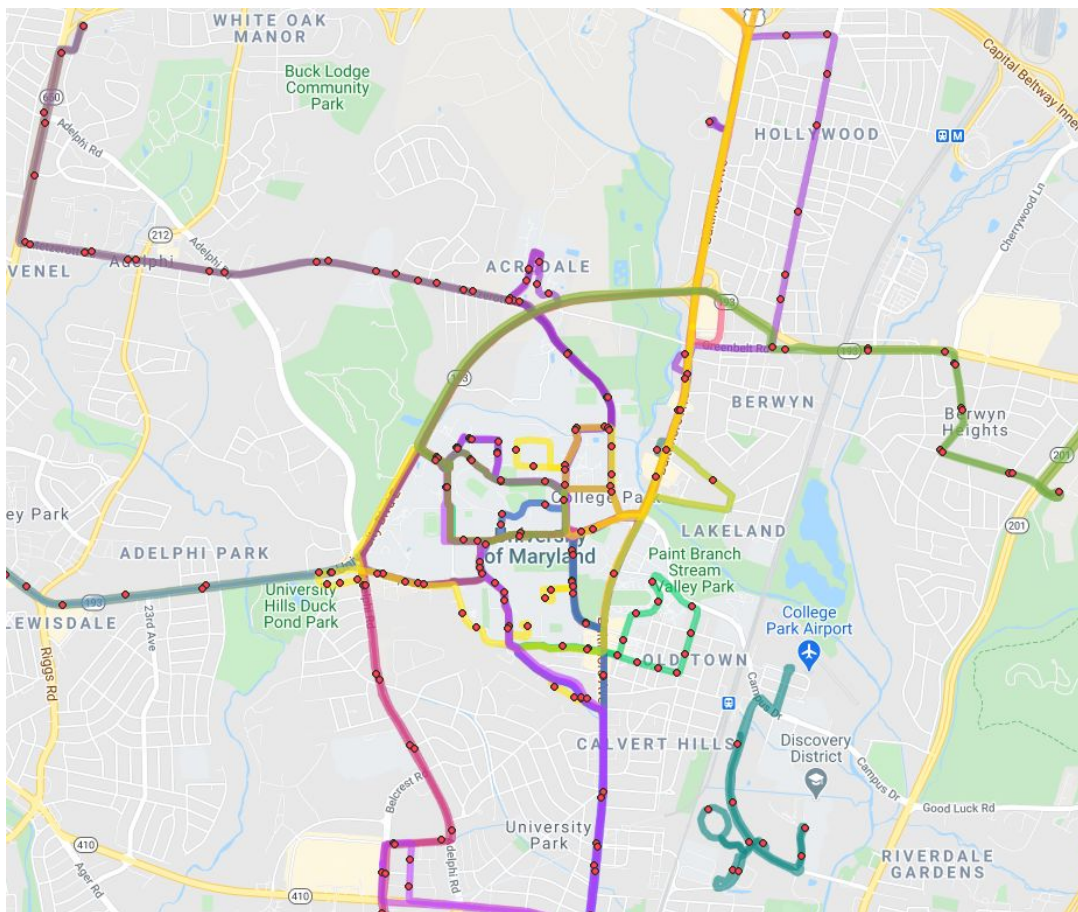
- ▶ Assuming travel rates fluctuate evenly across different travel platforms:
- ▶ Higher travel lines up with high transmission of COVID
- ▶ Not enough data to be significant

Integration with UMD Transportation



- ▶ Busses serve a much larger area than the scooters
- ▶ Average scooter trip is less than a mile and less than 9 minutes
- ▶ Bus system serves the whole area for a range of services

Different Trip Types



Summary

- ▶ More rides were recorded in 2020 than 2019
- ▶ The distribution of the type of rides remained relatively constant between the years (about 60% on-campus)
- ▶ Students use these scooters to commute to/from class, and to get food
- ▶ Average ride distances to commercial areas decreased in 2020
- ▶ More people ride on cooler days, fewer ride on rainy days
- ▶ From 2019-2020, the ride distribution shifted from weekdays to weekends
- ▶ Traveling and COVID transmission seem to be related
- ▶ The Veoride Escooters are a necessary supplement to the UMD bus system