Team Number :
    DC21058
Dataset:
    University of Maryland DOTS
    VeoRide E-scooter Transportation


Midshipman 3/C Jeff Peters

Slide 2: Presentation Agenda

➢ The Problem
➢ The Data
➢ Data Preparation and Cleanup
➢ Analysis
➢ Recommendations
➢ Future Work

# Slide 3: The Problem

➢ How has student behavior changed as a result of the COVID-19 pandemic?
  ○ Common campus entry/exit points
  ○ Popular locations
➢ How can UMD and VeoRide Inc. adapt their transportation services to meet student needs?
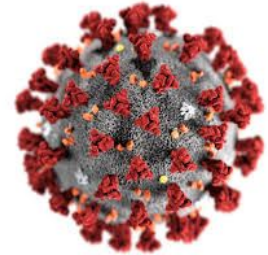
Slide 4: The Data

➤ 40,325 e-Scooter trips each with unique ride ID and customer ID

➤ Coordinates with time stamps of each route taken

➤ Total time and distance

➤ Manually drawn map of campus

➤ Service map from VeoRide website
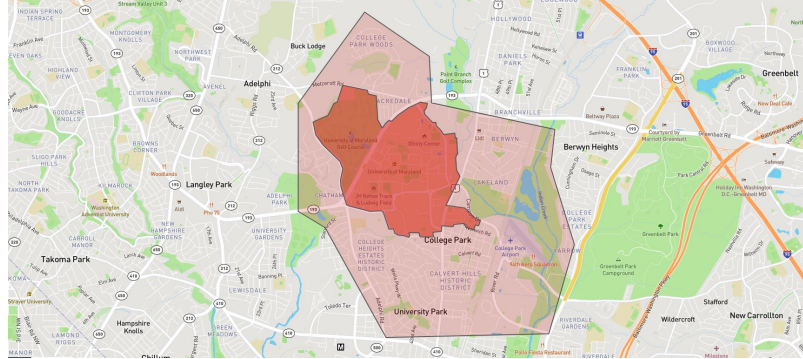
All maps generated via geojson.io

Slide 5: Data Prep and Cleanup

- ➤ Added data columns to more accessible database
  - ○ Used ride ID, customer ID for quick lookup
- ➤ Used geojson.io to visualize coordinate data
- ➤ GPS Errors
  - ○ Removed coordinates east of 76°W or south of 38°N
  - ○ Manually re-calculated distances in these 79 cases

Slide 6A: Exits and Entrances

Blue - Paint Branch Gate
- Distant from center of campus
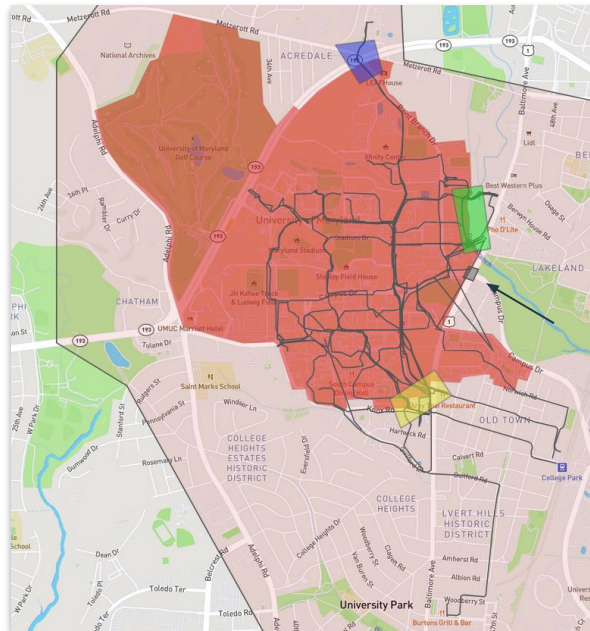- Limited food options

Gray - Main Entrance
- Similar to Point Branch Trail
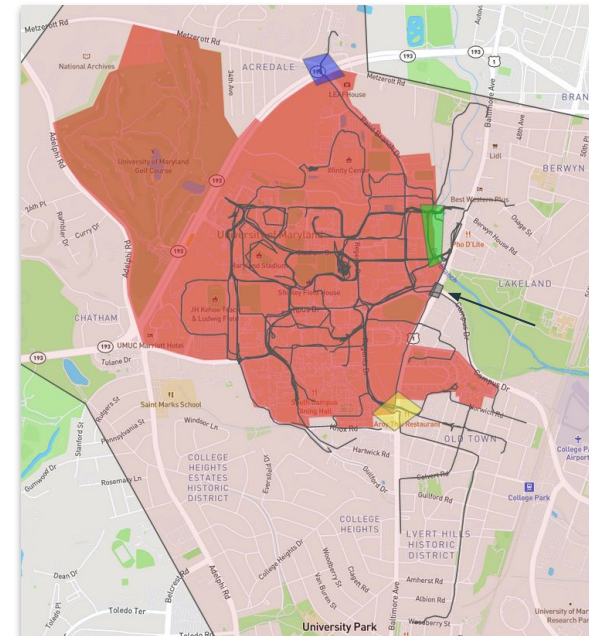- Heavier car traffic

Green - Paint Branch Trail:
- Close to fast food restaurants
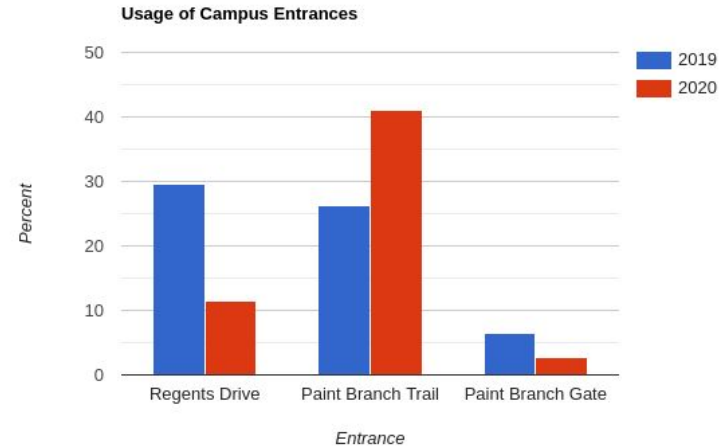- Close to residence halls
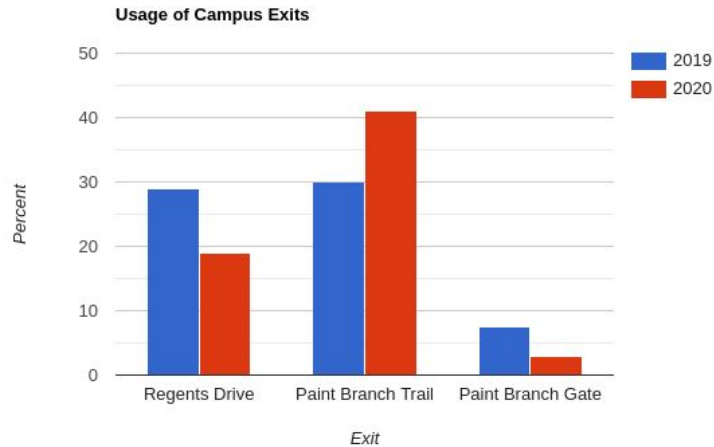
Yellow - Regent Drive:
- Close to fast food restaurants
- Close to classrooms

2019

2020

Slide 6B: Exits and Entrances - Comparison

Usage of Campus Exits

Percent / Exit — 2019, 2020 — Regents Drive, Paint Branch Trail, Paint Branch Gate

Usage of Campus Entrances

Percent / Entrance — 2019, 2020 — Regents Drive, Paint Branch Trail, Paint Branch Gate
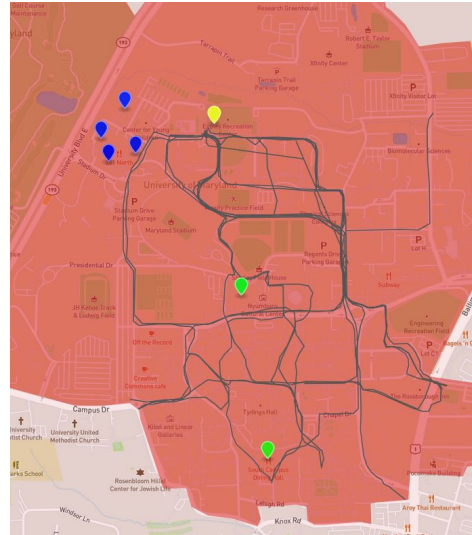
Slide 7A: Popular Spots on Campus
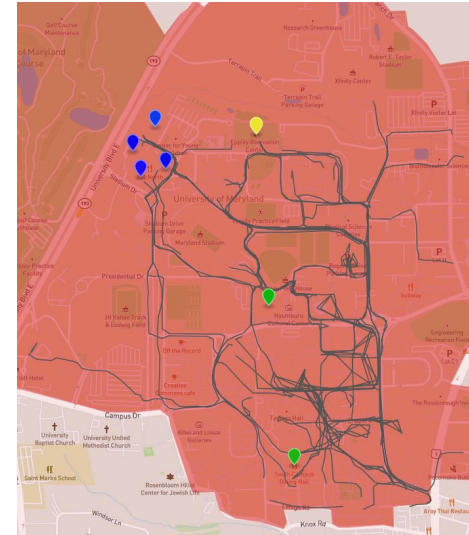
Blue - Residence Halls

Green - Food Areas

Yellow - Recreation Center
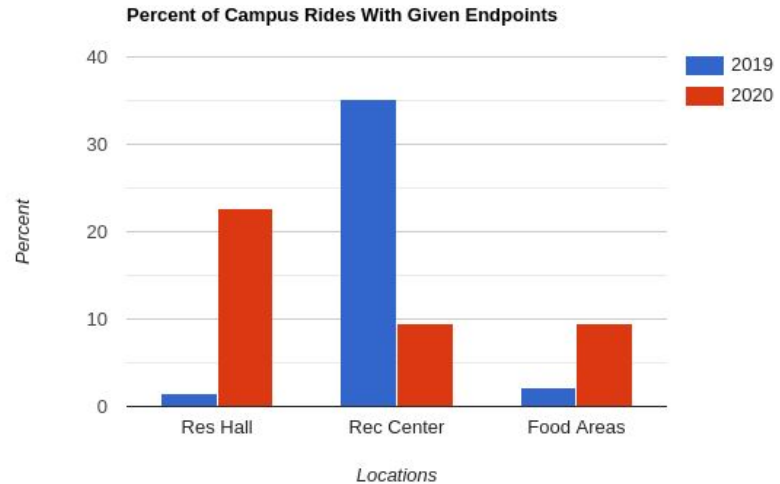– Notice less traffic in 2020

2019

2020

Slide 7B: Popular Spots on Campus - Comparison

➤ Rec Center limited by COVID
➤ Increased time spent in dorms
➤ Food is further from dorms
  ○ Greater demand for wheels
  ○ Average in-campus travel distance increased by 10% (0.614 miles -> 0.679 miles)

Percent of Campus Rides With Given Endpoints

Slide 8: Recommendations

➢ Currently 3 stations servicing the Rec Center
➢ For the duration of the pandemic:
  ○ Move excess stations to food and residence areas
  ○ Increase stations at commercial areas near dorms
➢ Expand service area to include more food centers
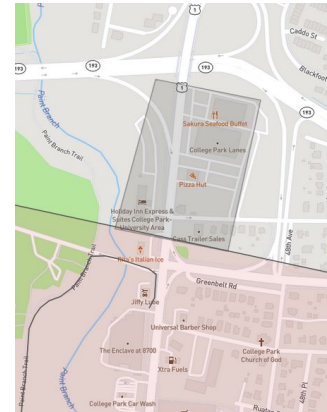
Slide 9: Future Work

➢ Polling of UMD students
➢ Do 2019 patterns return post-pandemic?

Questions?

Extra Slides

```python
def calc_distance(lat1, lon1, lat2, lon2): # all inputs must be in decimal
degrees, data type float or integer
    lat1_rd = deg2rad(lat1)  # convert all inputs to radians in order to find
    distance in radians (d_rad)
    lon1_rd = deg2rad(lon1)
    lat2_rd = deg2rad(lat2)
    lon2_rd = deg2rad(lon2)

    d_rad =
    math.acos(math.sin(lat1_rd)*math.sin(lat2_rd)+math.cos(lat1_rd)*math.cos(lat
    2_rd)*math.cos(lon1_rd-lon2_rd)) # distance formula, output is in radians

    d_nm = rad2nm(d_rad) # function to convert distance in radians to distance
    in nautical miles, data type float or integer

    return d_nm # output of the calc_distance function, data type float or
    integer
```