
# CAPITAL BIKESHARE STATIONS ANALYSIS

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# AGENDA

01 users’ needs

02 station density - the driving KPI

03 station graph analysis

04 demand forecasting

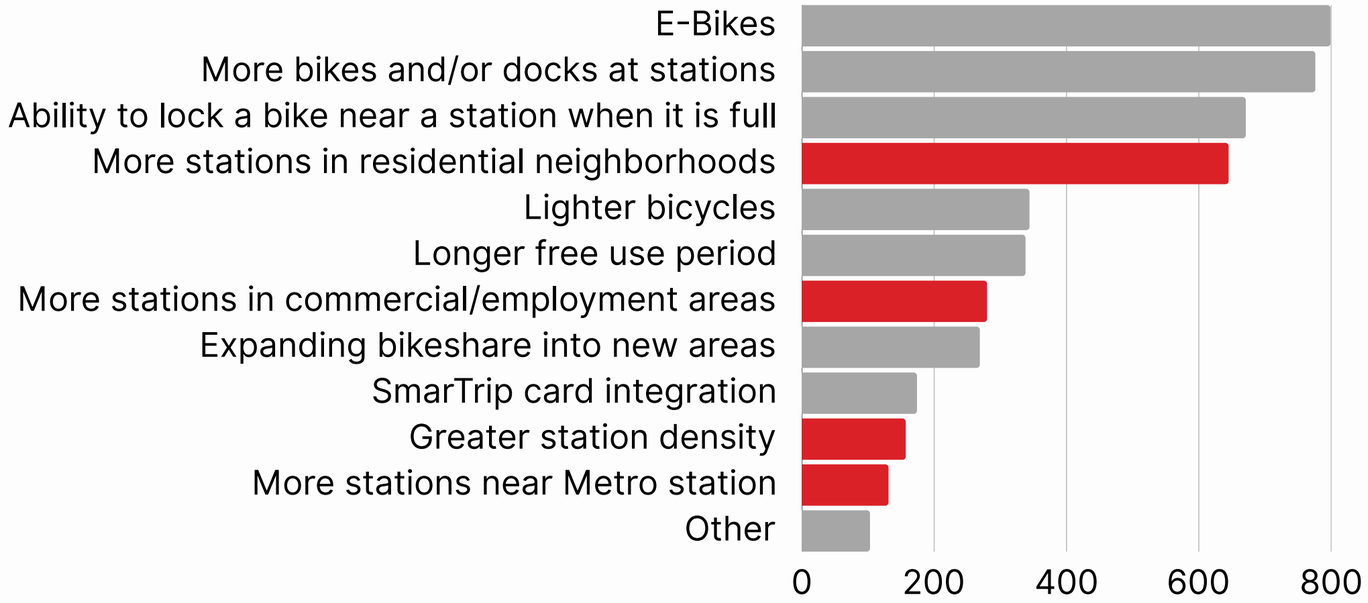
# capital bikeshare™

In 2011, Capital Bikeshare established a mission for the program:

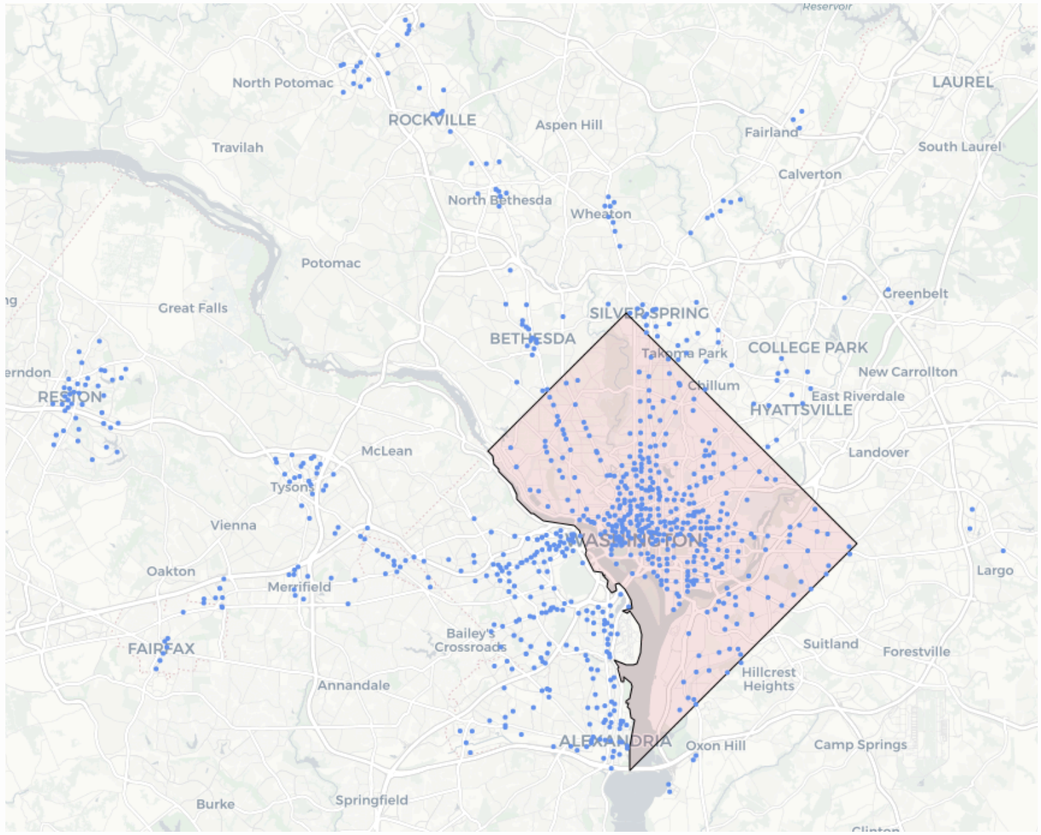
**“to transform our community by providing a high quality, convenient and affordable bicycle transit system that will connect people to more places where they live, work, and play in the region.”**

# CALL FOR MORE STATIONS

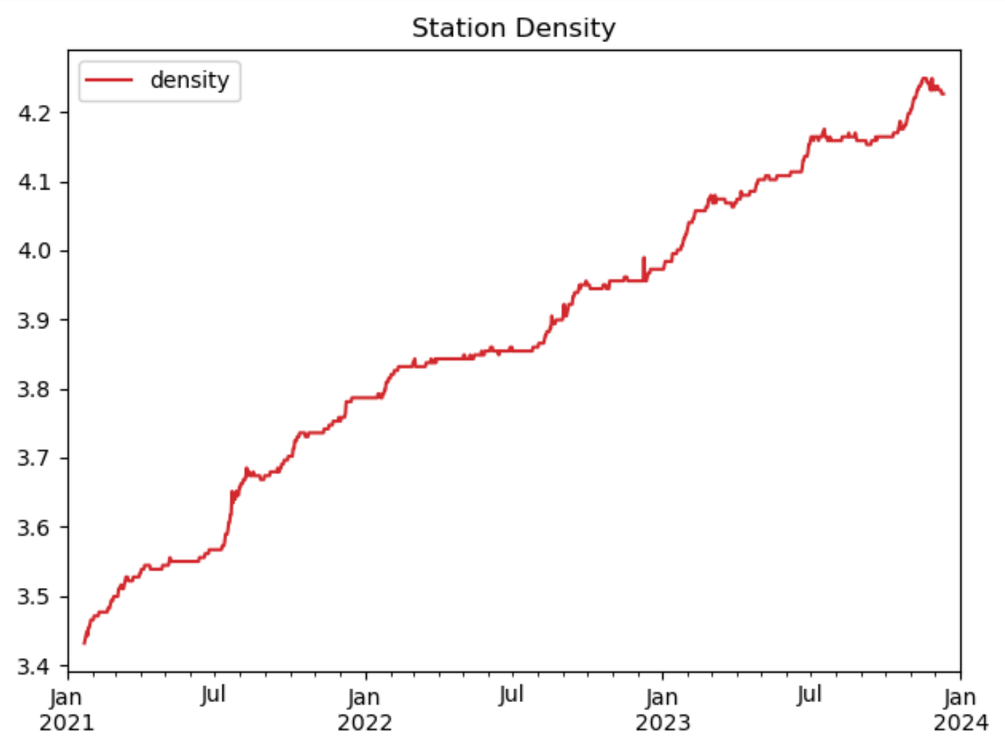
Member survey 2019, Table 4:  Improvements most likely to increse ridership



# OVERALL STATION DENSITY OVER TIME




From 2021 to 2023 the station density has steadily increased

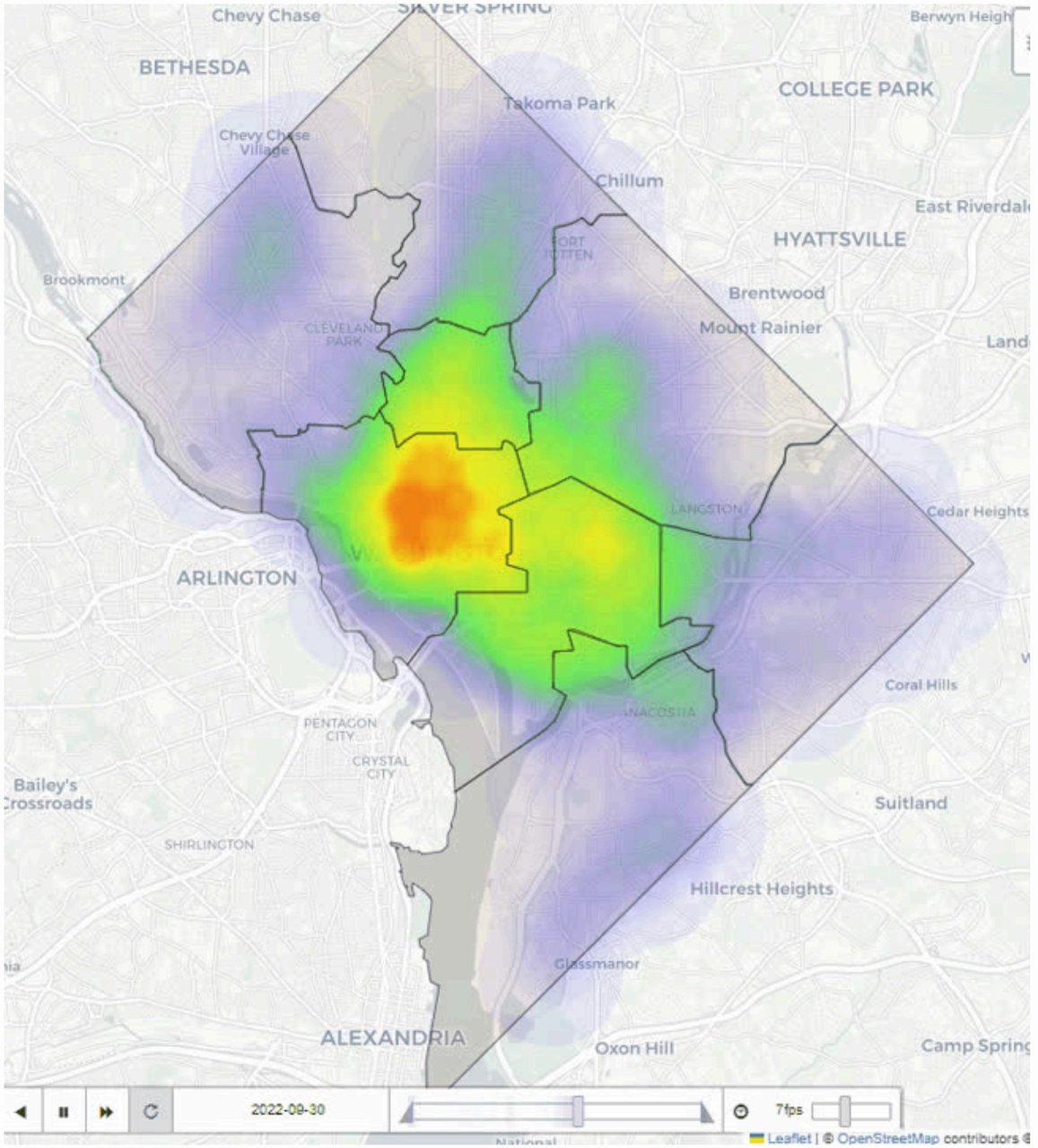



- 867 stations in the whole service area
- The following analysis will focus on Washington D.C.

# STATION DENSITY OVER TIME

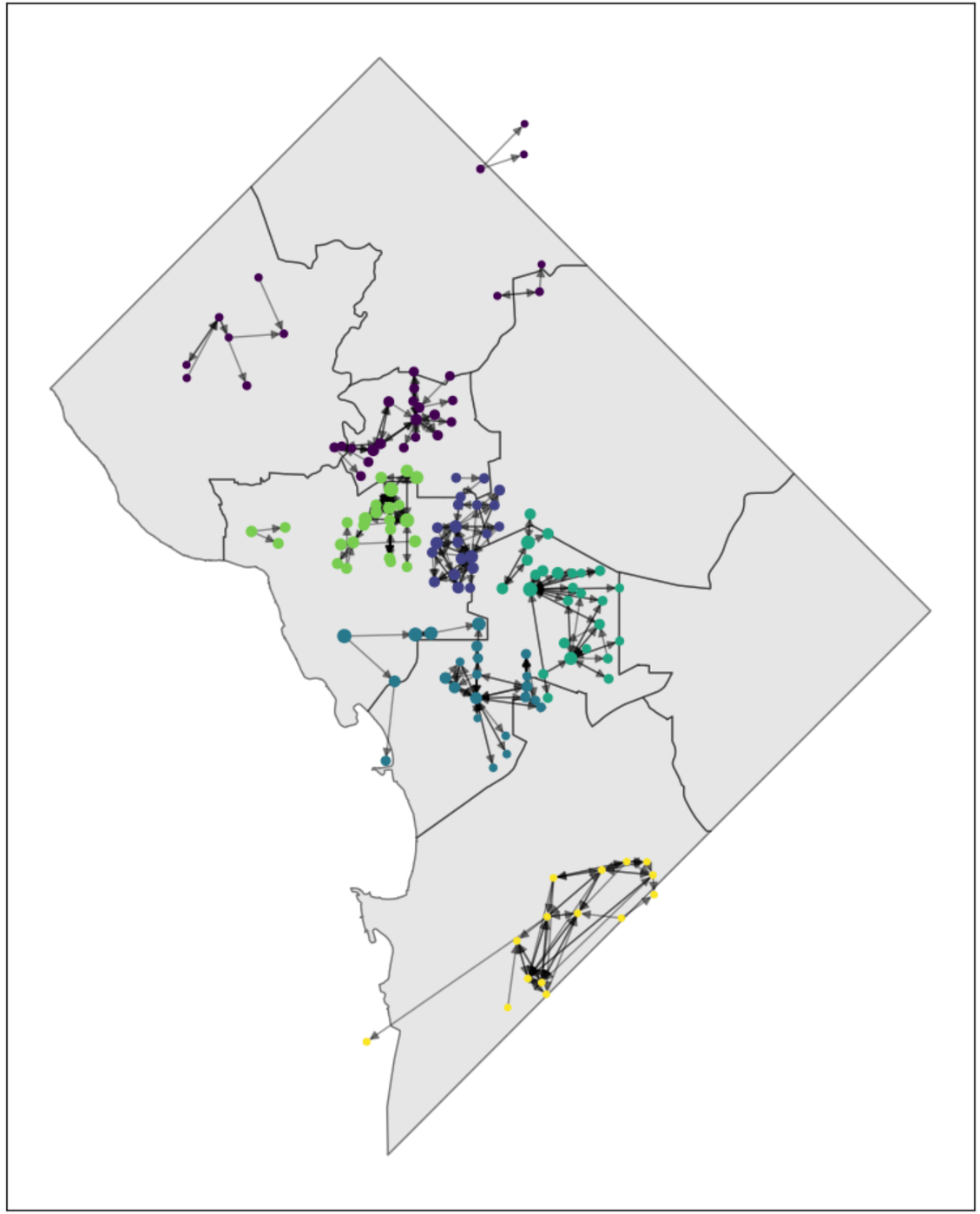
- Stations per km² in log scale from 2021 - 2023

- Non-residential districts (Wards 1, 2 and 6): The density has significantly increased
- Residential districts (Wards 3, 4, 5, 7 and 8) only a slight increase

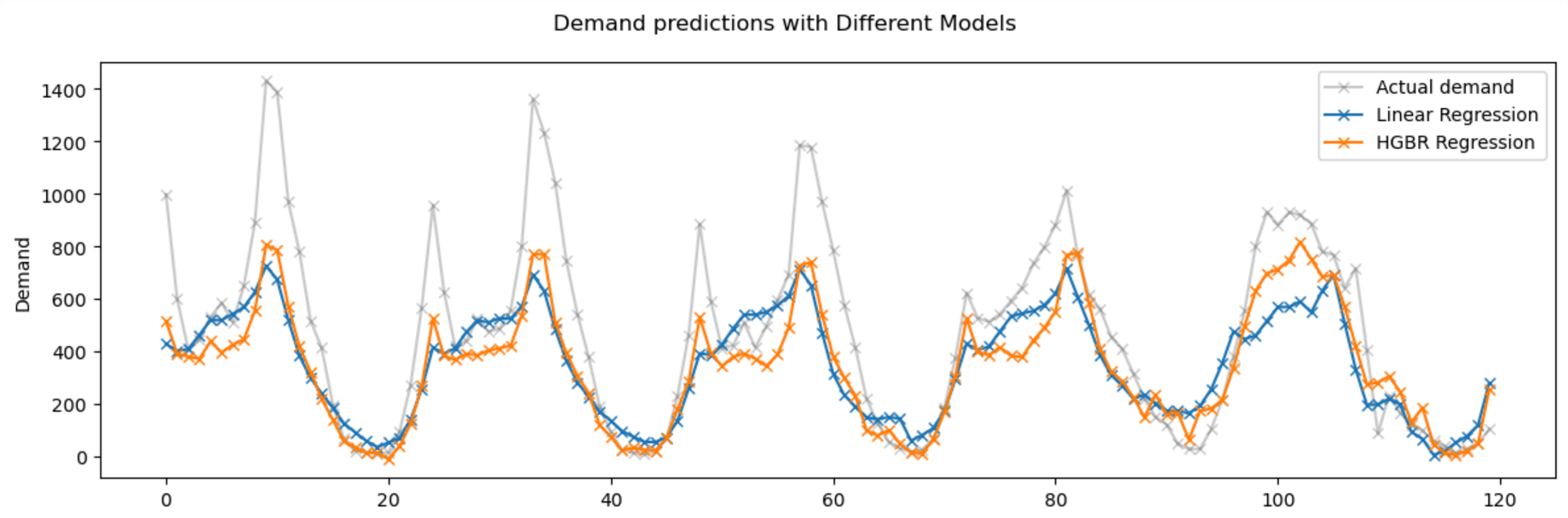


# STATION GRAPH

- Station graph with
  - 712 nodes
  - 105437 edges
  - self-loops are not considered
- Community detection
  - Communities are strongly connected nodes of a graph.
  - Stations with a high traffic between them.
- Communities form around
  - public transport
  - points of interest



# DEMAND FORECASTING




## Features

- Weather
  - Temperature, Wind, Humidity
  - WMO Code
  - Apparent Temperature
- Time
  - Holiday, Time since last holiday
  - Month, Weekday, Hour of Day
- Ride Duration

## Ridge Regression

- R2 = 0.55
- MAE = 159
- RMSE = 216

- Coefficients are not sensible

## Historic Gradient Boosting

- R2 = 0.67
- MAE = 134
- RMSE = 185

- Can predict peaks
- Minima are well predicted

# CONCLUSIONS

## Station Density

- Station network expansion is going well.
- Residential neighbourhoods have to be target even more.

## Communities

- Identified user patterns in the station network
- Operations should adapt the user’s behaviour, such as the redistribution of bikes.

## Forecasting

- Sophisticated models are needed to forecast the demand.
  - More Features
  - Network aspect
- Especially peaks are hard to detect, therefore capacity planning should be aware of this.

# THANK YOU FOR YOUR ATTENTION!