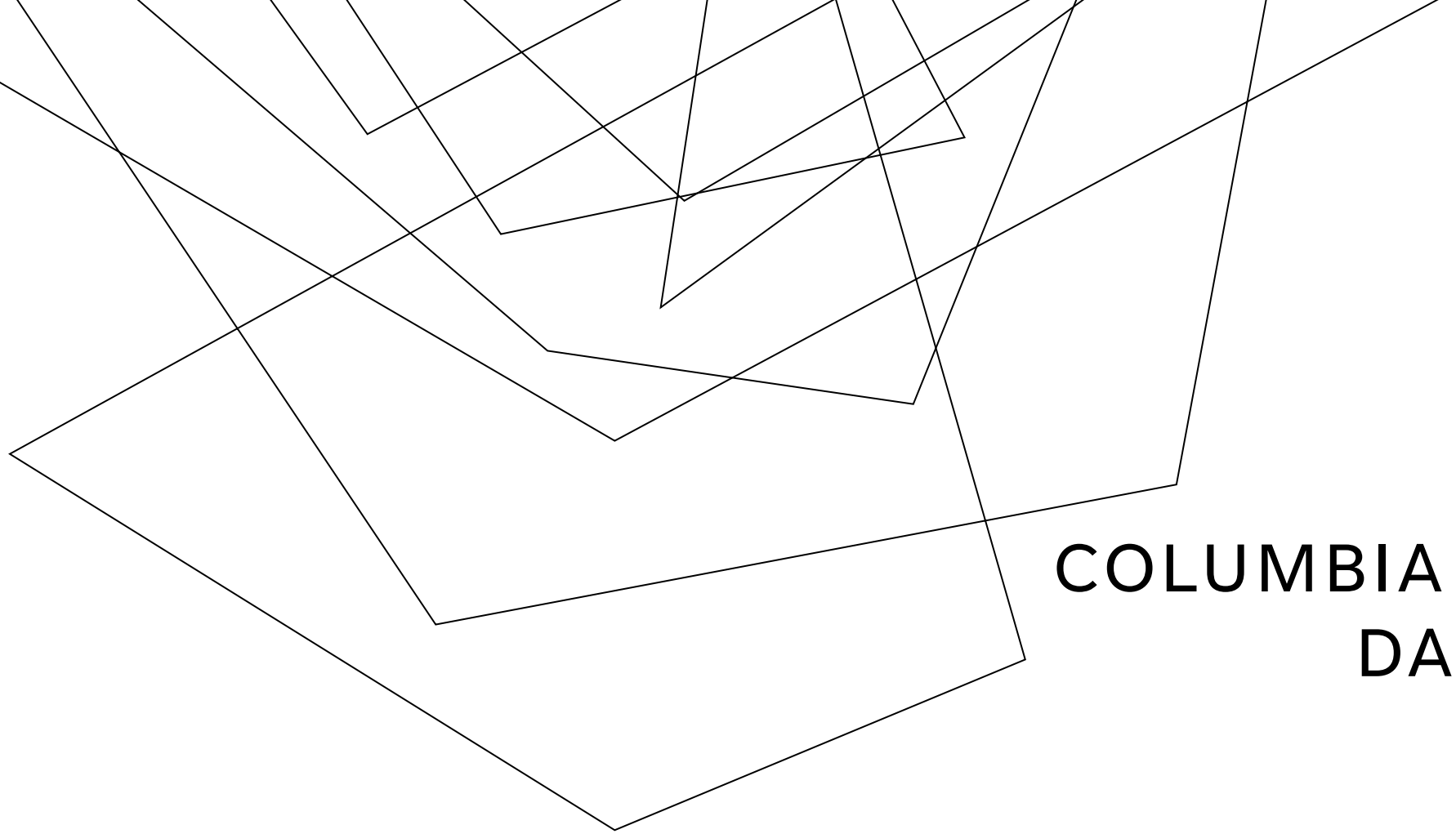


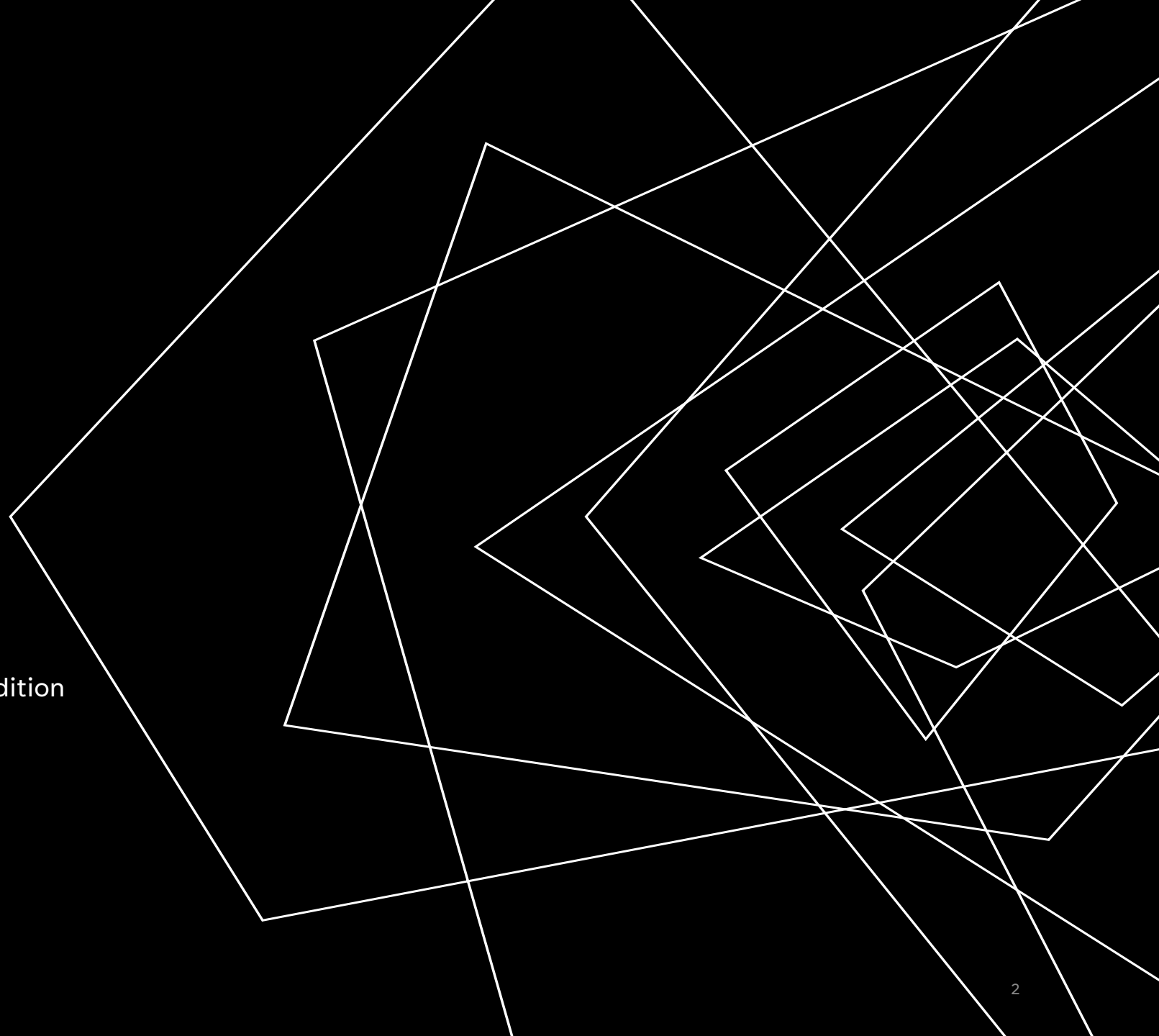
# COLUMBIA ENGINEERING DATA ANALYTICS BOOT CAMP PROJECT I

Date: 6/17/2024

Karen Lin, Kevin Zhang, Sunjae Youm

# AGENDA

- Introduction
- Data Processing
- Analysis
    - Data exploring
    - ROCKVILLE dataset
        - Speed Limit
        - Traffic control
        - Weather & surface condition
        - Hourly intervals
        - Timeseries
- Conclusion



# INTRODUCTION

## Background

Our data team assumed that we received a data request from the Montgomery County local government in Maryland. The purpose of the request was to determine how to use the county budget to reduce car accidents. Additionally, Montgomery County wanted to choose a specific municipality and asked us, as data analysts, to identify which roads need immediate improvements. To achieve this, we investigated traffic accident records from January 2015 to March 2024, analyzing the main car crash accident factors and variables from the dataset.

Data Source:
https://catalog.data.gov/dataset/crash-reporting-drivers-data/resource/9851a37f-4f32-464e-8ba6-c23023653a7f

# QUESTIONS

**Q1. How can we identify the area with the highest frequency of car crashes?**

**Q2. Which factors in the dataset should we prioritize to effectively reduce car accidents?**

**Q3. What insightful patterns can we uncover from the dataset?**

# DATA PROCESSING

# DATA EXPLORING – RAW DATA

```
car_crash_df.columns
```

```
Out[3]: Index(['Report Number', 'Local Case Number', 'Agency Name', 'ACRS Report Type',
       'Crash Date/Time', 'Route Type', 'Road Name', 'Cross-Street Type',
       'Cross-Street Name', 'Off-Road Description', 'Municipality',
       'Related Non-Motorist', 'Collision Type', 'Weather',
       'Surface Condition', 'Light', 'Traffic Control',
       'Driver Substance Abuse', 'Non-Motorist Substance Abuse', 'Person ID',
       'Driver At Fault', 'Injury Severity', 'Circumstance',
       'Driver Distracted By', 'Drivers License State', 'Vehicle ID',
       'Vehicle Damage Extent', 'Vehicle First Impact Location',
       'Vehicle Second Impact Location', 'Vehicle Body Type',
       'Vehicle Movement', 'Vehicle Continuing Dir', 'Vehicle Going Dir',
       'Speed Limit', 'Driverless Vehicle', 'Parked Vehicle', 'Vehicle Year',
       'Vehicle Make', 'Vehicle Model', 'Equipment Problems', 'Latitude',
       'Longitude', 'Location'],
      dtype='object')
```

```
In [21]: car_crash_df.dtypes
```

```
Out[21]: Report Number                    object
         Local Case Number                object
         Agency Name                      object
         ACRS Report Type                 object
         Crash Date/Time                  object
         Route Type                       object
         Road Name                        object
         Cross-Street Type                object
         Cross-Street Name                object
         Off-Road Description             object
         Municipality                     object
         Related Non-Motorist             object
         Collision Type                   object
         Weather                          object
         Surface Condition                object
         Light                            object
         Traffic Control                  object
         Driver Substance Abuse           object
         Non-Motorist Substance Abuse     object
         Person ID                        object
         Driver At Fault                  object
         Injury Severity                  object
         Circumstance                     object
         Driver Distracted By             object
         Drivers License State            object
         Vehicle ID                       object
         Vehicle Damage Extent            object
         Vehicle First Impact Location    object
         Vehicle Second Impact Location   object
         Vehicle Body Type                object
         Vehicle Movement                 object
         Vehicle Continuing Dir           object
         Vehicle Going Dir                object
         Speed Limit                       int64
         Driverless Vehicle               object
         Parked Vehicle                   object
         Vehicle Year                      int64
         Vehicle Make                     object
         Vehicle Model                    object
         Equipment Problems               object
         Latitude                        float64
         Longitude                       float64
         Location                         object
         dtype: object
```

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 1 | Report Number | Local Case Number | Agency Name | ACRS Report Type | Crash Date/Time | Route Type | Road Name |
| 2 | MCP3040003N | 190026050 | Montgomery County Police | Property Damage Crash | 5/31/2019 15:00 | | |
| 3 | EJ78850038 | 230034791 | Gaithersburg Police Depar | Property Damage Crash | 7/21/2023 17:59 | Maryland (State) | FREDERICK RD |
| 4 | MCP2009002G | 230034583 | Montgomery County Police | Property Damage Crash | 7/20/2023 15:10 | Maryland (State) | GEORGIA AVE |
| 5 | MCP3201004C | 230035036 | Montgomery County Police | Property Damage Crash | 7/23/2023 12:10 | County | CRYSTAL ROCK DR |
| 6 | MCP23290028 | 230035152 | Montgomery County Police | Property Damage Crash | 7/24/2023 6:10 | County | MONTGOMERY VILLAGE AVE |
| 7 | MCP295200DV | 230032956 | Montgomery County Police | Property Damage Crash | 7/11/2023 7:40 | County | WAYNE AVE |
| 8 | MCP33510013 | 230033282 | Montgomery County Police | Property Damage Crash | 7/12/2023 20:28 | Maryland (State) | COLESVILLE RD |
| 9 | EJ7869003F | 230032124 | Gaithersburg Police Depar | Injury Crash | 7/5/2023 23:25 | Maryland (State) | CLOPPER RD |
| 10 | MCP3244002K | 230034697 | Montgomery County Police | Property Damage Crash | 7/21/2023 7:14 | US (State) | GEORGIA AVE |
| 11 | MCP2863002V | 230034445 | Montgomery County Police | Property Damage Crash | 7/19/2023 19:00 | Maryland (State) | WOODFIELD RD |
| 12 | MCP2456007L | 230034690 | Montgomery County Police | Property Damage Crash | 7/20/2023 17:00 | County | OLD COLUMBIA PIKE |
| 13 | MCP2009002G | 230034583 | Montgomery County Police | Property Damage Crash | 7/20/2023 15:10 | Maryland (State) | GEORGIA AVE |
| 14 | MCP9365001V | 230030221 | Montgomery County Police | Injury Crash | 6/24/2023 12:39 | Maryland (State) | SANDY SPRING RD |
| 15 | EJ78860034 | 230034298 | Gaithersburg Police Depar | Property Damage Crash | 6/19/2023 22:19 | | |

## Raw Data Summary

- No quantitative data
- 43 columns
- Car crash date/time is in the same cell

# DATA EXPLORING – A MULTIPLE PIVOT TABLES

| Row Labels | Count of Report Number |
|---|---|
| 2015 | 20286 |
| 2016 | 21778 |
| 2017 | 21541 |
| 2018 | 21042 |
| 2019 | 20941 |
| 2020 | 13809 |
| 2021 | 16208 |
| 2022 | 17582 |
| 2023 | 18916 |
| 2024 | 2 |
| Grand Total | 172105 |

| Collision Type | Count of Report Number |
|---|---|
| SAME DIR REAR END | 55755 |
| STRAIGHT MOVEMENT ANGLE | 30340 |
| OTHER | 19030 |
| SAME DIRECTION SIDESWIPE | 16226 |
| SINGLE VEHICLE | 15869 |
| HEAD ON LEFT TURN | 12926 |
| SAME DIRECTION RIGHT TUR | 3832 |
| HEAD ON | 3786 |
| SAME DIRECTION LEFT TURN | 3715 |
| OPPOSITE DIRECTION SIDES\ | 2883 |
| ANGLE MEETS LEFT TURN | 2033 |
| ANGLE MEETS RIGHT TURN | 1204 |
| SAME DIR REND LEFT TURN | 743 |
| SAME DIR REND RIGHT TURN | 720 |
| SAME DIR BOTH LEFT TURN | 719 |
| UNKNOWN | 717 |
| ANGLE MEETS LEFT HEAD ON | 700 |
| N/A | 585 |
| OPPOSITE DIR BOTH LEFT TUF | 322 |
| Grand Total | 172105 |

| Municipality | Count of Report Number |
|---|---|
| N/A | 137042 |
| (blank) | 15937 |
| ROCKVILLE | 9320 |
| GAITHERSBURG | 6437 |
| TAKOMA PARK | 1685 |
| KENSINGTON | 413 |
| CHEVY CHASE #4 | 325 |
| CHEVY CHASE #3 | 156 |
| FRIENDSHIP HEIGHTS | 133 |
| POOLESVILLE | 108 |
| CHEVY CHASE VIEW | 93 |
| CHEVY CHASE VILLAGE | 87 |
| CHEVY CHASE #5 | 74 |
| SOMERSET | 53 |
| GARRETT PARK | 53 |
| WASHINGTON GROVE | 41 |
| NORTH CHEVY CHASE | 34 |
| GLEN ECHO | 33 |
| MATINS ADDITION | 28 |
| LAYTONSVILLE | 25 |
| BROOKEVILLE | 16 |
| DRUMMOND | 12 |
| Grand Total | 172105 |

| Light | Count of Report Number |
|---|---|
| DAYLIGHT | 116140 |
| DARK LIGHTS ON | 39549 |
| DARK NO LIGHTS | 4967 |
| DUSK | 3935 |
| DAWN | 3472 |
| DARK -- UNKNOWN LIGHTI | 1579 |
| N/A | 1445 |
| UNKNOWN | 676 |
| OTHER | 342 |
| Grand Total | 172105 |

| Weather | Count of Report Number |
|---|---|
| CLEAR | 116774 |
| RAINING | 20608 |
| CLOUDY | 17294 |
| N/A | 13354 |
| SNOW | 1444 |
| UNKNOWN | 692 |
| FOGGY | 676 |
| WINTRY MIX | 391 |
| OTHER | 370 |
| SLEET | 218 |
| SEVERE WINDS | 154 |
| BLOWING SNOW | 115 |
| BLOWING SAND, SOIL, DIRT | 15 |
| Grand Total | 172105 |

| Row Labels | Count of Report Number |
|---|---|
| Oct | 16596 |
| Dec | 15745 |
| Nov | 15561 |
| Sep | 15304 |
| May | 14905 |
| Jan | 13971 |
| Jun | 13916 |
| Jul | 13731 |
| Aug | 13693 |
| Mar | 13320 |
| Apr | 12846 |
| Feb | 12517 |
| Grand Total | 172105 |

| Surface Condition | Count of Report Number |
|---|---|
| DRY | 120569 |
| WET | 28426 |
| (blank) | 15935 |
| N/A | 4183 |
| ICE | 1058 |
| SNOW | 938 |
| UNKNOWN | 509 |
| SLUSH | 204 |
| OTHER | 164 |
| MUD, DIRT, GRAVEL | 46 |
| WATER(STANDING/M | 41 |
| OIL | 28 |
| SAND | 4 |
| Grand Total | 172105 |

| Traffic Control | Count of Report Number |
|---|---|
| NO CONTROLS | 68626 |
| TRAFFIC SIGNAL | 58892 |
| N/A | 25469 |
| STOP SIGN | 12488 |
| FLASHING TRAFFIC SIGNAL | 2132 |
| OTHER | 1991 |
| YIELD SIGN | 1727 |
| UNKNOWN | 284 |
| PERSON | 282 |
| WARNING SIGN | 154 |
| RAILWAY CROSSING DEVICE | 44 |
| SCHOOL ZONE SIGN DEVICE | 16 |
| Grand Total | 172105 |

| Driver Substance Abuse | Count of Report Number |
|---|---|
| NONE DETECTED | 122532 |
| N/A | 31324 |
| UNKNOWN | 11993 |
| ALCOHOL PRESENT | 4084 |
| ALCOHOL CONTRIBUTED | 1435 |
| ILLEGAL DRUG PRESENT | 258 |
| MEDICATION PRESENT | 117 |
| ILLEGAL DRUG CONTRIBUTED | 102 |
| COMBINED SUBSTANCE PRESI | 92 |
| MEDICATION CONTRIBUTED | 64 |
| OTHER | 58 |
| COMBINATION CONTRIBUTED | 46 |
| Grand Total | 172105 |

| Route Type | Count of Report Number |
|---|---|
| Maryland (State) | 77074 |
| County | 55568 |
| (blank) | 16973 |
| Municipality | 9379 |
| US (State) | 7567 |
| Interstate (State) | 3149 |
| Other Public Roadway | 1129 |
| Government | 627 |
| Ramp | 579 |
| Service Road | 40 |
| Unknown | 20 |
| Grand Total | 172105 |

| Related Non-Motorist | Count of Report Number |
|---|---|
| (blank) | 166642 |
| PEDESTRIAN | 3880 |
| BICYCLIST | 1169 |
| OTHER | 246 |
| OTHER CONVEYANCE | 84 |
| MACHINE OPERATOR/RIDEI | 39 |
| OTHER PEDALCYCLIST | 26 |
| OTHER, PEDESTRIAN | 9 |
| BICYCLIST, OTHER | 4 |
| BICYCLIST, PEDESTRIAN | 3 |
| IN ANIMAL-DRAWN VEH | 1 |
| OTHER CONVEYANCE, PEDI | 1 |
| OTHER, OTHER CONVEYANC | 1 |
| Grand Total | 172105 |

| Surface Condition | Count of Report Number |
|---|---|
| PASSENGER CAR | 119102 |
| (SPORT) UTILITY VEHI | 15991 |
| PICKUP TRUCK | 6786 |
| VAN | 4957 |
| TRANSIT BUS | 3642 |
| SCHOOL BUS | 2975 |
| (blank) | 2470 |
| POLICE VEHICLE/NOI | 2116 |
| OTHER LIGHT TRUCK | 1909 |
| CARGO VAN/LIGHT TF | 1858 |
| OTHER | 1539 |
| POLICE VEHICLE/EME | 1498 |
| MEDIUM/HEAVY TRUC | 1469 |

| Traffic Control | Count of Report Number |
|---|---|
| TOYOTA | 23171 |
| HONDA | 18870 |
| FORD | 17138 |
| TOYT | 8840 |
| NISSAN | 8525 |
| HOND | 5765 |
| DODGE | 4488 |
| HYUNDAI | 3935 |
| CHEVROLET | 3796 |
| JEEP | 3769 |
| UNKNOWN | 3705 |
| CHEV | 3670 |
| BMW | 3310 |

| Driver Substance Abuse | Count of Report Number |
|---|---|
| 35 | 50479 |
| 40 | 33589 |
| 25 | 24045 |
| 30 | 23377 |
| 45 | 12454 |
| 15 | 6125 |
| 0 | 4749 |
| 50 | 4669 |
| 5 | 4213 |
| 55 | 3978 |
| 10 | 3094 |
| 20 | 1192 |
| 60 | 76 |

| Route Type | Count of Report Number |
|---|---|
| NO MISUSE | 123464 |
| N/A | 34141 |
| UNKNOWN | 14148 |
| AIR BAG FAILED | 174 |
| OTHER | 112 |
| BELT(S) MISUSED | 34 |
| BELTS/ANCHORS BROKE | 12 |
| STRAP/TETHER LOOSE | 8 |
| FACING WRONG WAY | 6 |
| NOT STREPPED RIGHT | 4 |
| SIZE/TYPE IMPROPER | 2 |
| Grand Total | 172105 |

| Related Non-Motorist | Count of Report Number |
|---|---|
| 2015 | 11861 |
| 2014 | 11632 |
| 2016 | 11207 |
| 2013 | 10937 |
| 2012 | 9337 |
| 2017 | 9093 |
| 2011 | 8368 |
| 2007 | 7926 |
| 2008 | 7906 |
| 2010 | 7430 |
| 2006 | 7413 |
| 2009 | 6783 |
| 2018 | 6738 |

# Data Cleaning – Removed Not available rows

In [3]:
```
# show what columns the dataframe has
car_crash_df.columns
```

Out[3]:
```
Index(['Report Number', 'Local Case Number', 'Agency Name', 'ACRS Report Type',
       'Crash Date/Time', 'Route Type', 'Road Name', 'Cross-Street Type',
       'Cross-Street Name', 'Off-Road Description', 'Municipality',
       'Related Non-Motorist', 'Collision Type', 'Weather',
       'Surface Condition', 'Light', 'Traffic Control',
       'Driver Substance Abuse', 'Non-Motorist Substance Abuse', 'Person ID',
       'Driver At Fault', 'Injury Severity', 'Circumstance',
       'Driver Distracted By', 'Drivers License State', 'Vehicle ID',
       'Vehicle Damage Extent', 'Vehicle First Impact Location',
       'Vehicle Second Impact Location', 'Vehicle Body Type',
       'Vehicle Movement', 'Vehicle Continuing Dir', 'Vehicle Going Dir',
       'Speed Limit', 'Driverless Vehicle', 'Parked Vehicle', 'Vehicle Year',
       'Vehicle Make', 'Vehicle Model', 'Equipment Problems', 'Latitude',
       'Longitude', 'Location'],
      dtype='object')
```

In [5]:
```
# Check the total number of Municipality records
car_crash_df["Report Number"].count()
```

Out[5]:
```
172105
```

In [6]:
```
# Remove rows where Municipality is "N/A"
car_crash_df = car_crash_df[car_crash_df["Municipality"] != "N/A"]

# Remove rows where Municipality is NaN
car_crash_df = car_crash_df.dropna(subset=["Municipality"])

# Check data cleaning process has been properly applied
car_crash_df["Report Number"].count()
```

Out[6]:
```
19126
```

# DATA TRANSFORMATION

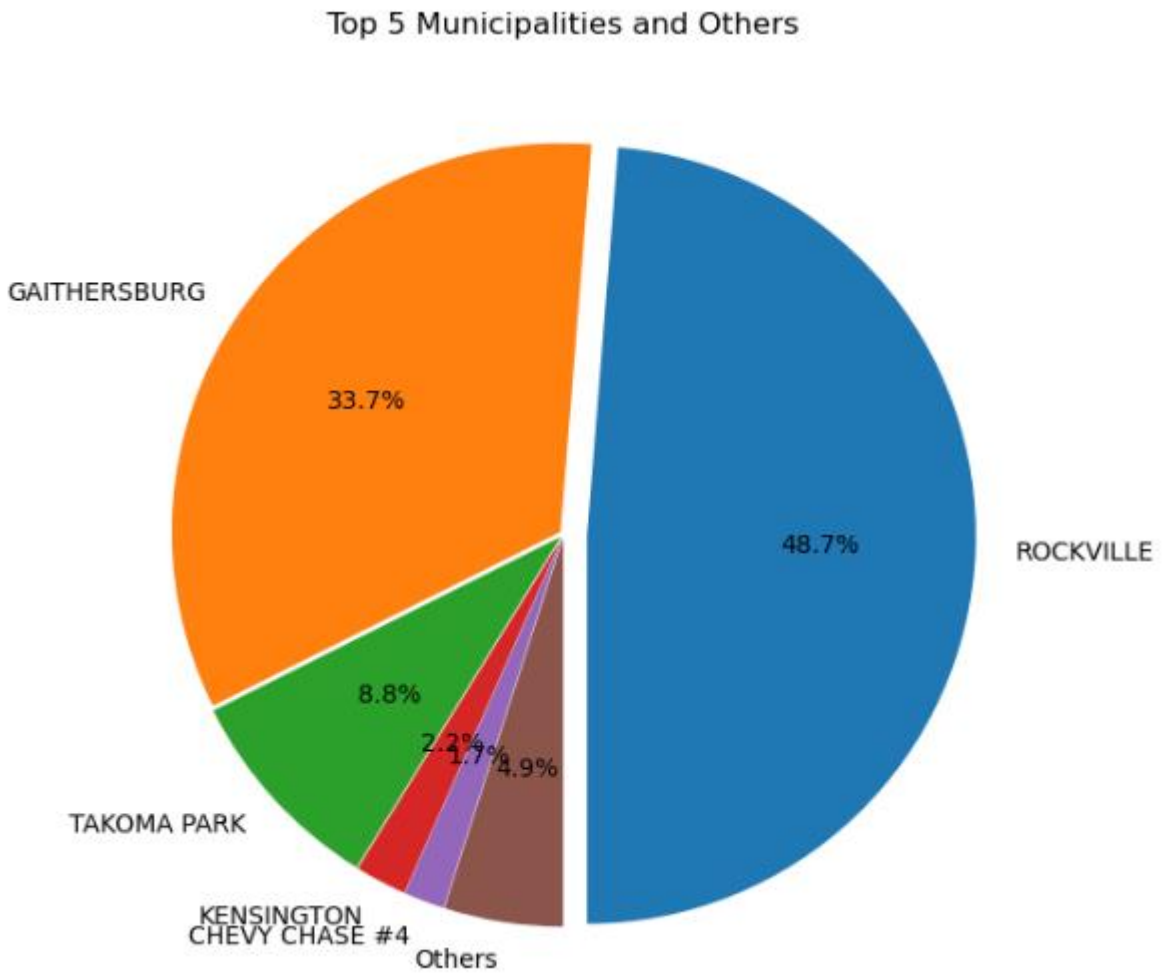
| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 1 | Report Number | Local Case Number | Agency Name | ACRS Report Type | Crash Date/Time | Route Type | Road Name |
| 2 | MCP3040003N | 190026050 | Montgomery County Police | Property Damage Crash | 5/31/2019 15:00 | | |
| 3 | EJ78850038 | 230034791 | Gaithersburg Police Depar | Property Damage Crash | 7/21/2023 17:59 | Maryland (State) | FREDERICK RD |
| 4 | MCP2009002G | 230034583 | Montgomery County Police | Property Damage Crash | 7/20/2023 15:10 | Maryland (State) | GEORGIA AVE |
| 5 | MCP3201004C | 230035036 | Montgomery County Police | Property Damage Crash | 7/23/2023 12:10 | County | CRYSTAL ROCK DR |
| 6 | MCP23290028 | 230035152 | Montgomery County Police | Property Damage Crash | 7/24/2023 6:10 | County | MONTGOMERY VILLAGE AVE |
| 7 | MCP295200DV | 230032956 | Montgomery County Police | Property Damage Crash | 7/11/2023 7:40 | County | WAYNE AVE |
| 8 | MCP33510013 | 230033282 | Montgomery County Police | Property Damage Crash | 7/12/2023 20:28 | Maryland (State) | COLESVILLE RD |
| 9 | EJ7869003F | 230032124 | Gaithersburg Police Depar | Injury Crash | 7/5/2023 23:25 | Maryland (State) | CLOPPER RD |
| 10 | MCP3244002K | 230034697 | Montgomery County Police | Property Damage Crash | 7/21/2023 7:14 | US (State) | GEORGIA AVE |
| 11 | MCP2863002V | 230034445 | Montgomery County Police | Property Damage Crash | 7/19/2023 19:00 | Maryland (State) | WOODFIELD RD |
| 12 | MCP2456007L | 230034690 | Montgomery County Police | Property Damage Crash | 7/20/2023 17:00 | County | OLD COLUMBIA PIKE |
| 13 | MCP2009002G | 230034583 | Montgomery County Police | Property Damage Crash | 7/20/2023 15:10 | Maryland (State) | GEORGIA AVE |
| 14 | MCP9365001V | 230030221 | Montgomery County Police | Injury Crash | 6/24/2023 12:39 | Maryland (State) | SANDY SPRING RD |
| 15 | EJ78860034 | 230034298 | Gaithersburg Police Depar | Property Damage Crash | 6/19/2023 22:19 | | |

```
rame
 = car_crash_df[selected_columns]
[['Date', 'Time']] = reduced_car_crash_df['Crash Date/Time'].str.split(' ', expand=True, n=1)

o military format
['Time'] = pd.to_datetime(reduced_car_crash_df['Time'], format='%I:%M:%S %p').dt.strftime('%H:%M:%S')

"Crash Date/Time" and "Time" columns if needed
.drop(columns=['Crash Date/Time'], inplace=True)

['Date'] = pd.to_datetime(reduced_car_crash_df['Date'], format='%m/%d/%Y')
['Year'] = reduced_car_crash_df['Date'].dt.year
['Month'] = reduced_car_crash_df['Date'].dt.month
['Day'] = reduced_car_crash_df['Date'].dt.day
.head()
```

| treet ame | Collision Type | Municipality | Weather | Surface Condition | Traffic Control | Speed Limit | Latitude | Longitude | Date | Time | Year | Month | Day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| INCE ARD BLVD | STRAIGHT MOVEMENT ANGLE | GAITHERSBURG | CLEAR | DRY | STOP SIGN | 30 | 39.141990 | -77.224371 | 2023-07-20 | 14:48:00 | 2023 | 7 | 20 |
| T AVE | SAME DIR REAR END | CHEVY CHASE #4 | CLEAR | DRY | NO CONTROLS | 25 | 38.977186 | -77.088324 | 2023-07-27 | 16:14:00 | 2023 | 7 | 27 |
| N LA | SAME DIRECTION RIGHT TURN | TAKOMA PARK | CLEAR | DRY | NaN | 35 | 38.985947 | -76.988159 | 2023-07-22 | 17:10:00 | 2023 | 7 | 22 |
| R AVE | SAME DIR REAR END | GAITHERSBURG | CLEAR | DRY | NO CONTROLS | 25 | 39.133463 | -77.203386 | 2023-07-15 | 10:47:00 | 2023 | 7 | 15 |
| W STON DR | STRAIGHT MOVEMENT ANGLE | ROCKVILLE | NaN | DRY | TRAFFIC SIGNAL | 40 | 39.074431 | -77.135645 | 2023-07-22 | 04:07:00 | 2023 | 7 | 22 |

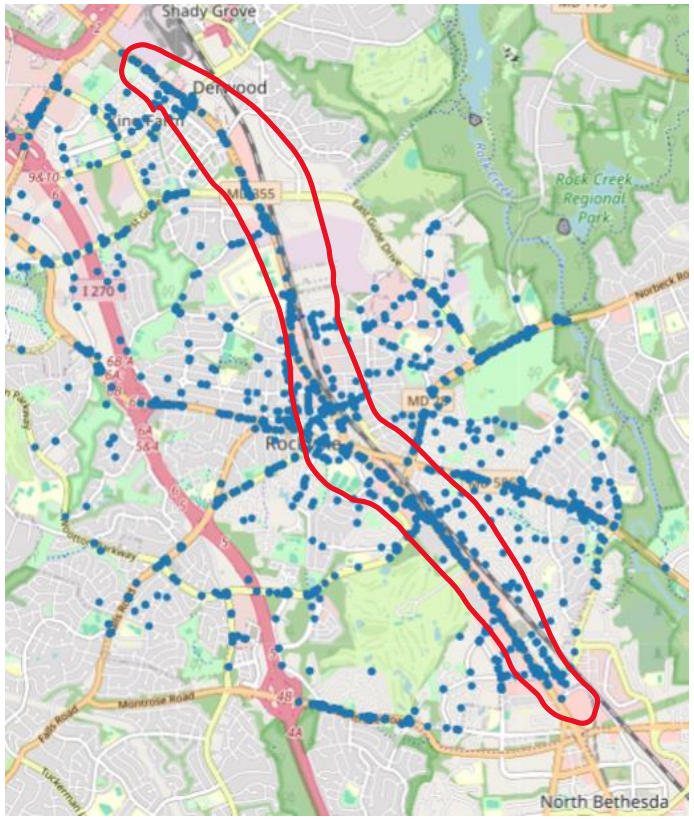
# ANALYSIS

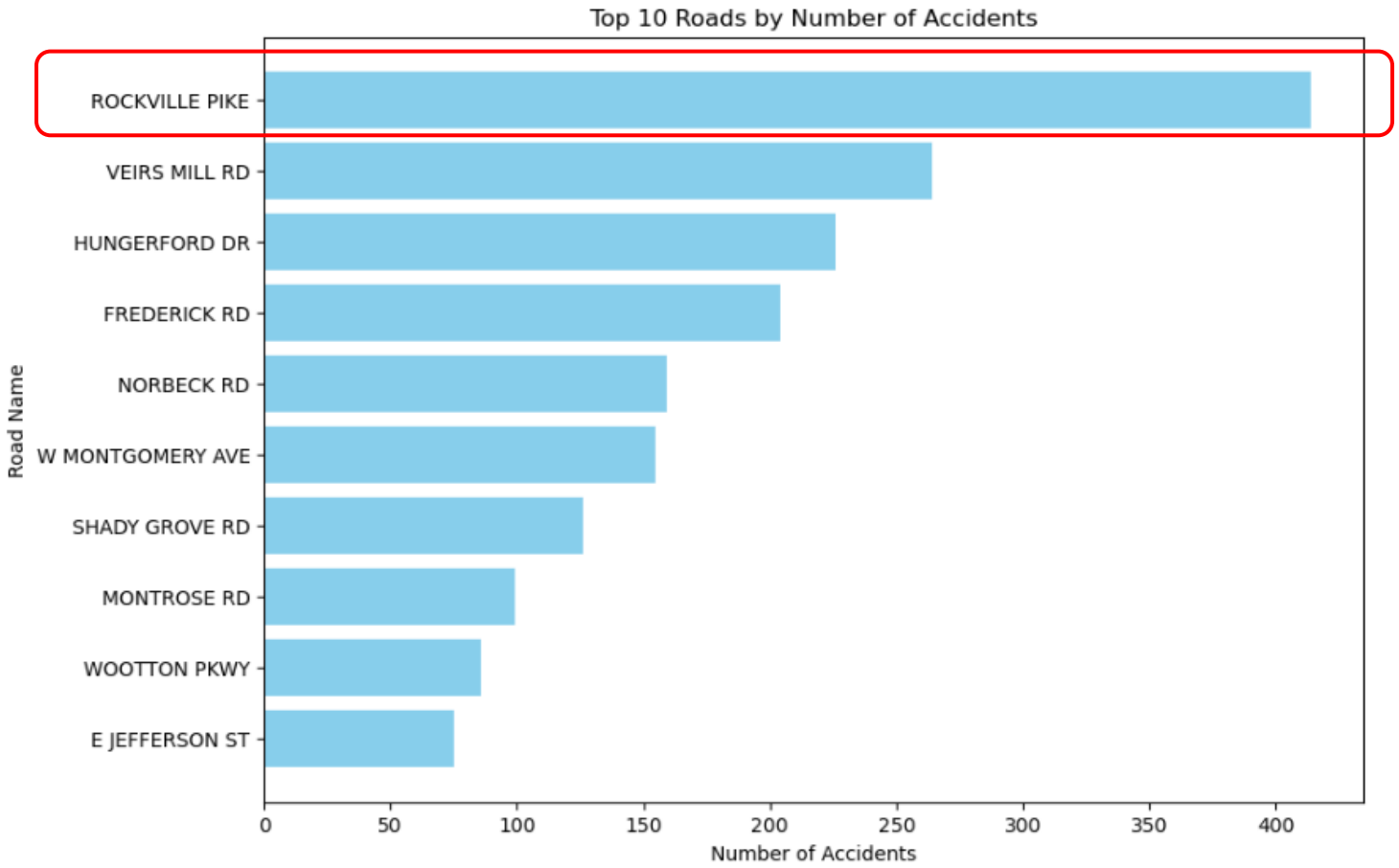
# EXPLORING DATA




- ROCKVILLE Municipality has the highest number of car accidents in Montgomery county

# EXPLORING DATA

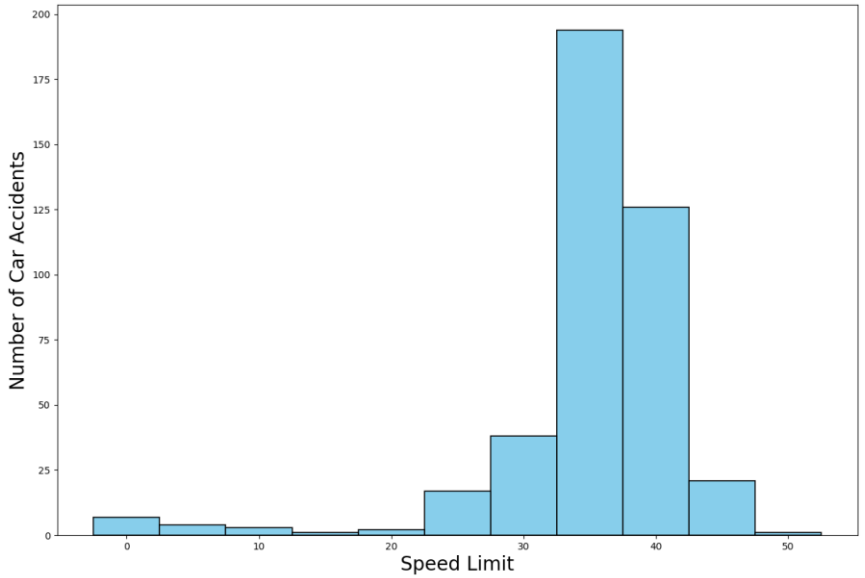



- Used Latitude and Longitude in the dataset to draw the map plot to see where the car accidents most happen
- Aggregated the number of car crash accidents by road name in Rockville Municipality

# ROCKVILLE DATA SET – BY SPEED LIMIT

| | Speed Limit | num_of_accident |
|---|---|---|
| 0 | 35 | 194 |
| 1 | 40 | 126 |
| 2 | 30 | 38 |
| 3 | 45 | 21 |
| 4 | 25 | 17 |
| 5 | 0 | 7 |
| 6 | 5 | 4 |
| 7 | 10 | 3 |
| 8 | 20 | 2 |
| 9 | 15 | 1 |
| 10 | 50 | 1 |




Observations:

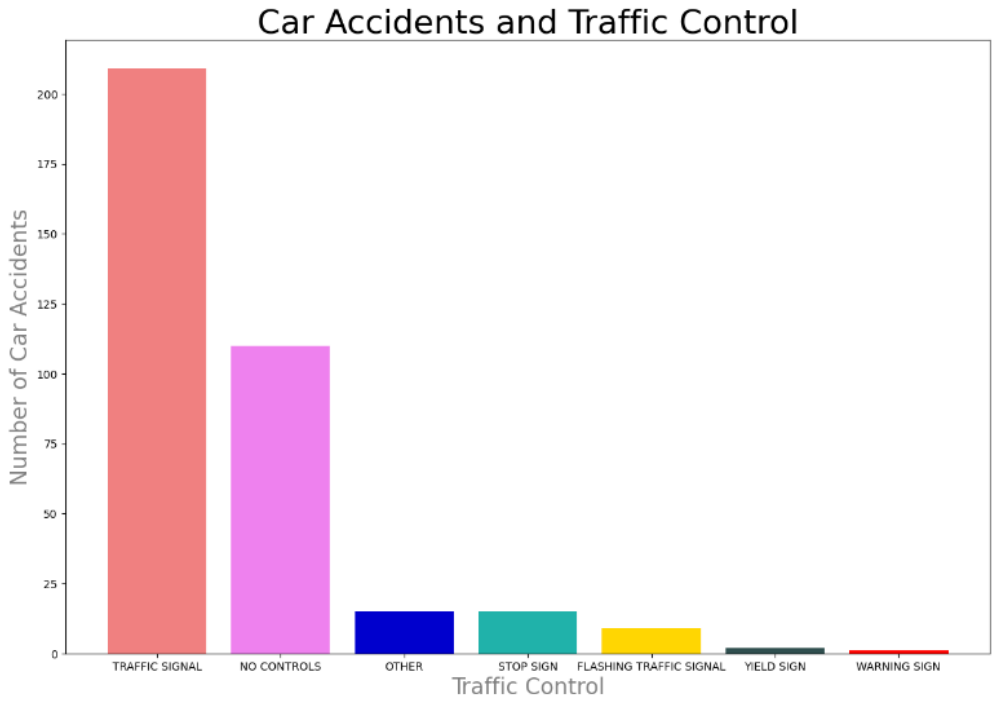
- 80% of the number of accidents were occurred between 35 and 40 limit.

Recommendations:

- For car accidents that occur on roads with speed limit 35 and 40 mph, One suggestion is to reduce the speed limit, but further study needs to be done to see which roads the accidents occurred, to tailor the response and take into account congestion times.

# ROCKVILLE DATA SET – BY TRAFFIC CONTROL

| | Traffic Control | num_of_accident |
|---|---|---|
| 0 | TRAFFIC SIGNAL | 209 |
| 1 | NO CONTROLS | 110 |
| 2 | OTHER | 15 |
| 3 | STOP SIGN | 15 |
| 4 | FLASHING TRAFFIC SIGNAL | 9 |
| 5 | YIELD SIGN | 2 |
| 6 | WARNING SIGN | 1 |



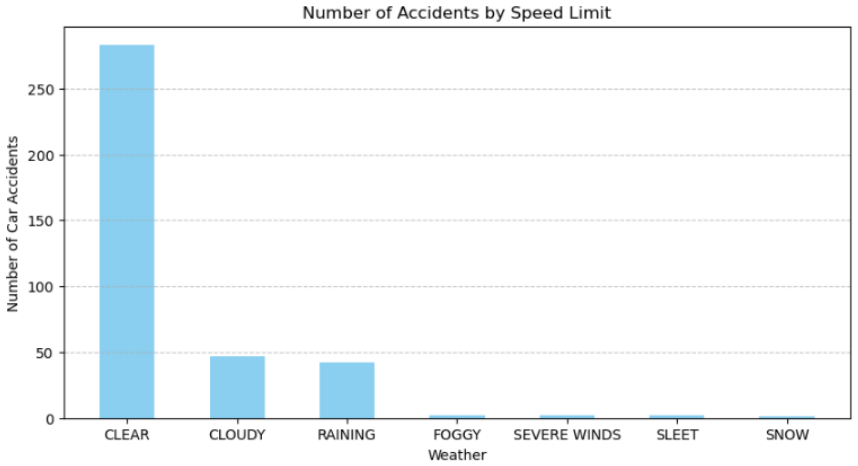

Observations:

- Car accident near Traffic Signal was the number one reason among other traffic controls

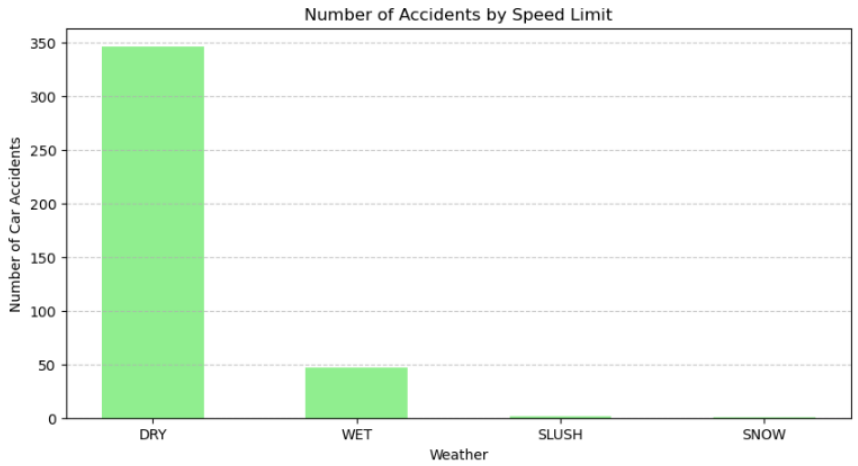
Recommendations:

- The road has higher speed limit and normally drivers get into the car accident when they try to pass the yellow light. With that said, shorting the yellow light time would help improve the number of car accident

# ROCKVILLE DATA SET – BY WEATHER & SURFACE CONDITION




| | Weather | num_of_accident |
|---|---|---|
| 0 | CLEAR | 283 |
| 1 | CLOUDY | 47 |
| 2 | RAINING | 42 |
| 3 | FOGGY | 2 |
| 4 | SEVERE WINDS | 2 |
| 5 | SLEET | 2 |
| 6 | SNOW | 1 |



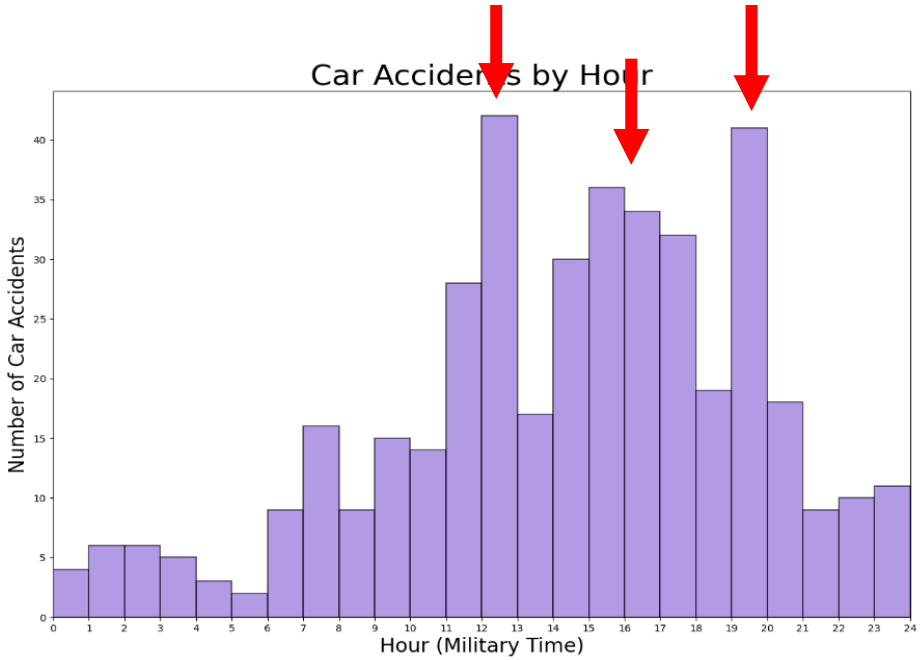

| | Surface Condition | num_of_accident |
|---|---|---|
| 0 | DRY | 346 |
| 1 | WET | 47 |
| 2 | SLUSH | 2 |
| 3 | SNOW | 1 |

Observations:

- **Can't** find any correlation with the number of car accidents

# ROCKVILLE DATA SET – BY HOURLY INTERVALS

| Hour Interval | num_of_accident |
|---|---|
| 00:00:00 - 00:59:59 | 2 |
| 01:00:00 - 01:59:59 | 6 |
| 02:00:00 - 02:59:59 | 6 |
| 03:00:00 - 03:59:59 | 5 |
| 04:00:00 - 04:59:59 | 3 |
| 05:00:00 - 05:59:59 | 2 |
| 06:00:00 - 06:59:59 | 9 |
| 07:00:00 - 07:59:59 | 16 |
| 08:00:00 - 08:59:59 | 9 |
| 09:00:00 - 09:59:59 | 15 |
| 10:00:00 - 10:59:59 | 14 |
| 11:00:00 - 11:59:59 | 28 |
| 12:00:00 - 12:59:59 | 42 |
| 13:00:00 - 13:59:59 | 17 |
| 14:00:00 - 14:59:59 | 30 |
| 15:00:00 - 15:59:59 | 36 |
| 16:00:00 - 16:59:59 | 34 |
| 17:00:00 - 17:59:59 | 32 |
| 18:00:00 - 18:59:59 | 19 |
| 19:00:00 - 19:59:59 | 41 |
| 20:00:00 - 20:59:59 | 18 |
| 21:00:00 - 21:59:59 | 9 |
| 22:00:00 - 22:59:59 | 10 |
| 23:00:00 - 23:59:59 | 11 |



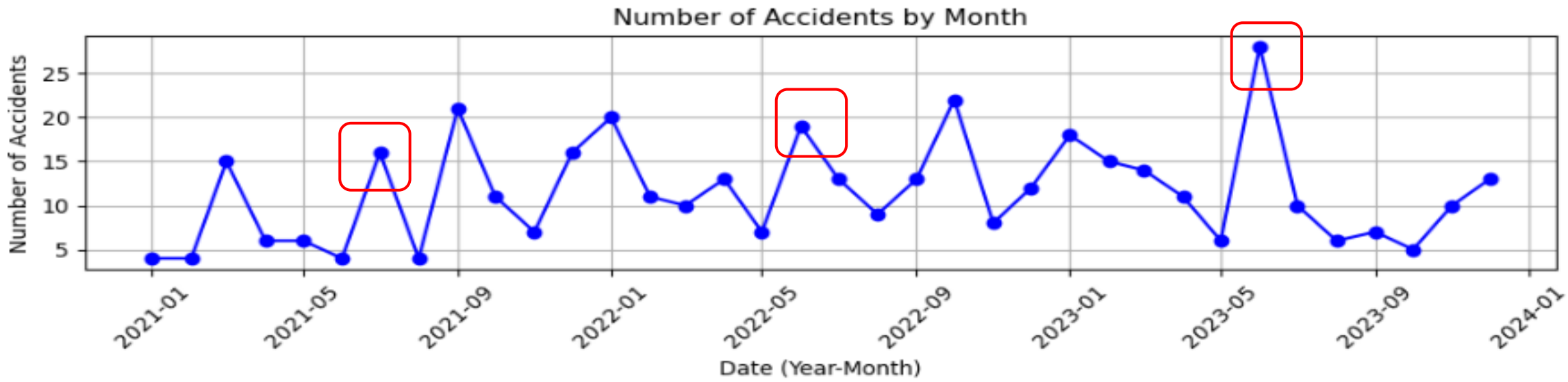

Observations:

- The number of car accidents were higher than another hour interval at between "12:00 PM and 1:00PM", "02:00PM and "06:00PM" and "07:00 PM and 08:00PM".

Recommendations:

- Place more traffic polices on the ROCKVILLE PIKE on that time intervals

# ROCKVILLE DATA SET – TIME SERIES




| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YearMonth | 2021-01-01 | 2021-02-01 | 2021-03-01 | 2021-04-01 | 2021-05-01 | 2021-06-01 | 2021-07-01 | 2021-08-01 | 2021-09-01 | 2021-10-01 | 2021-11-01 | 2021-12-01 | 2022-01-01 | 2022-02-01 | 2022-03-01 | 2022-04-01 | 2022-05-01 | 2022-06-01 | 2022-07-01 | 2022-08-01 | 2022-09-01 | 2022-10-01 | 2022-11-01 | 2022-12-01 | 2023-01-01 | 2023-02-01 | 2023-03-01 | 2023-04-01 | 2023-05-01 | 2023-06-01 | 2023-07-01 | 2023-08-01 | 2023-09-01 | 2023-10-01 | 2023-11-01 | 2023-12-01 |
| num_of_accident | 4 | 4 | 15 | 6 | 6 | 4 | 16 | 4 | 21 | 11 | 7 | 16 | 20 | 11 | 10 | 13 | 7 | 19 | 13 | 9 | 13 | 22 | 8 | 12 | 18 | 15 | 14 | 11 | 6 | 28 | 10 | 6 | 7 | 5 | 10 | 13 |

Observations:

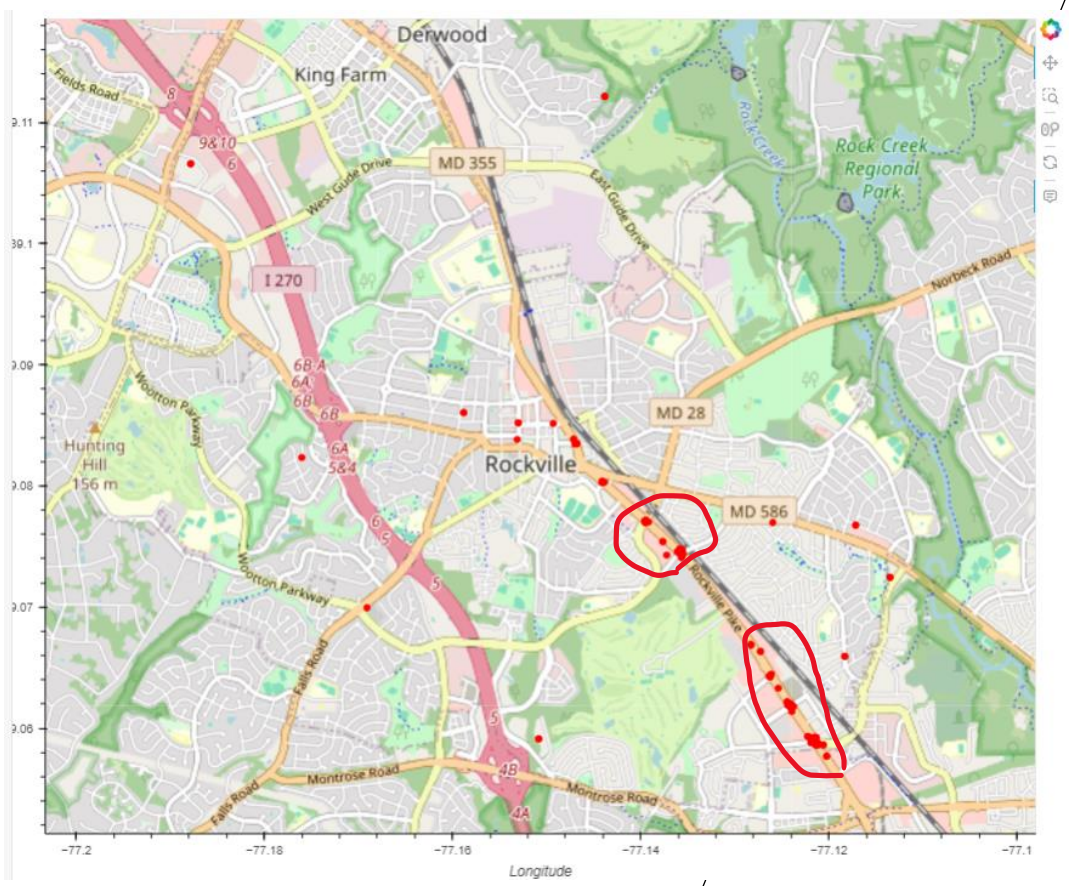
- Every year June had high increase of car accidents
- Research shows that the traffic congestion is getting higher due to the increase of population (https://empowermontgomery.com/transit-power/)

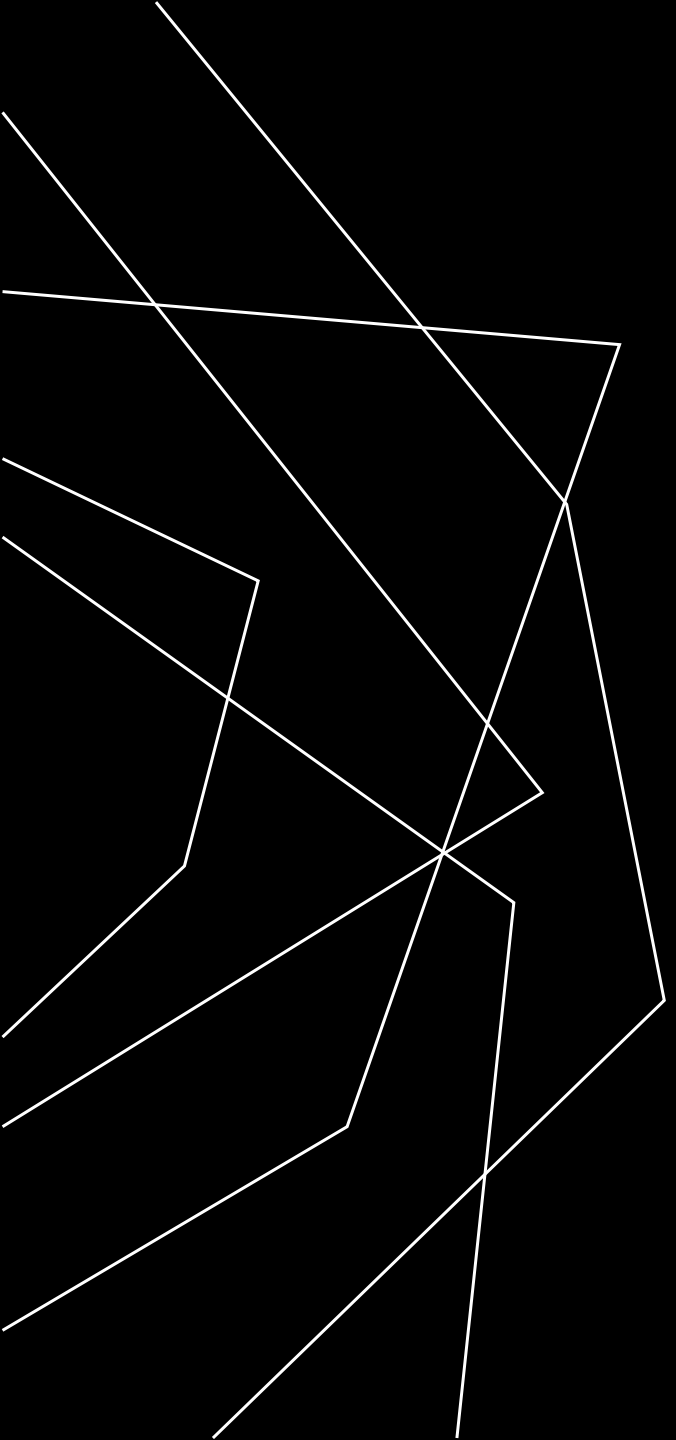
Recommendations:

- Expand the highway right next to Rockville Pike or put more traffic police in June to control the traffic

# CONCLUSION

- **With the two data perspectives Speed Limit and Traffic Signal, we could narrow down to the final recommendation**
- **Based upon the filters (speed limit & traffic signal), 155 records could be collected**
- **Final Recommendation for this analysis is lower the speed limit on the spotted area in the map or control traffic signal light**





# THANK YOU