

Coursera Capstone Project

IBM Data Science Professional Certificate

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1. Introduction Section

Scenario and background

Observing the statistics of car accidents in Seattle, I came to the conclusion that it is possible to prepare services such as the police, fire brigade or ambulance in advance for serious cases of road accidents involving a large number of people and which may result from weather conditions in specific places of Seattle.

1. Introduction Section

Problem to be solved

The challenge to be solved is to properly prepare and inform the police, fire brigade and ambulance in advance about the possibility of very serious road accidents depending on the prevailing road conditions in specific places. Therefore, I want to find accidents with the following assumptions:

- Severity is a minimum of 2
- More than 4 are injured, including pedestrians and cyclists
- Depending on the weather condition and road condition
- Depending on the time of day
- Cases resulting from the use of alcohol and other intoxicants are rejected as not resulting directly from weather factors.

1. Introduction Section

Recipients of the report

I believe that this is a suitable project for a major city security center in Europe, the United States or Asia, as the approach and methodology used here will help prepare services such as the police, fire brigade or hospitals in advance for emergencies (e.g. severe road accidents) from weather conditions.

2. Data Section

Data required to resolve the problem and how the data will be used to solve the problem

The data will be used as follows: First, I sort out the data for which the UNDERINFL parameter (meaning under the influence of intoxicants) is empty or equal to 1 or Y. Thanks to this, I will separate the cases not directly related to the weather conditions, which is based on my assumptions. Then I will sort the data by the SEVERITYCODE attribute for which the minimum value is 2 which will give me only the cases with injuries.

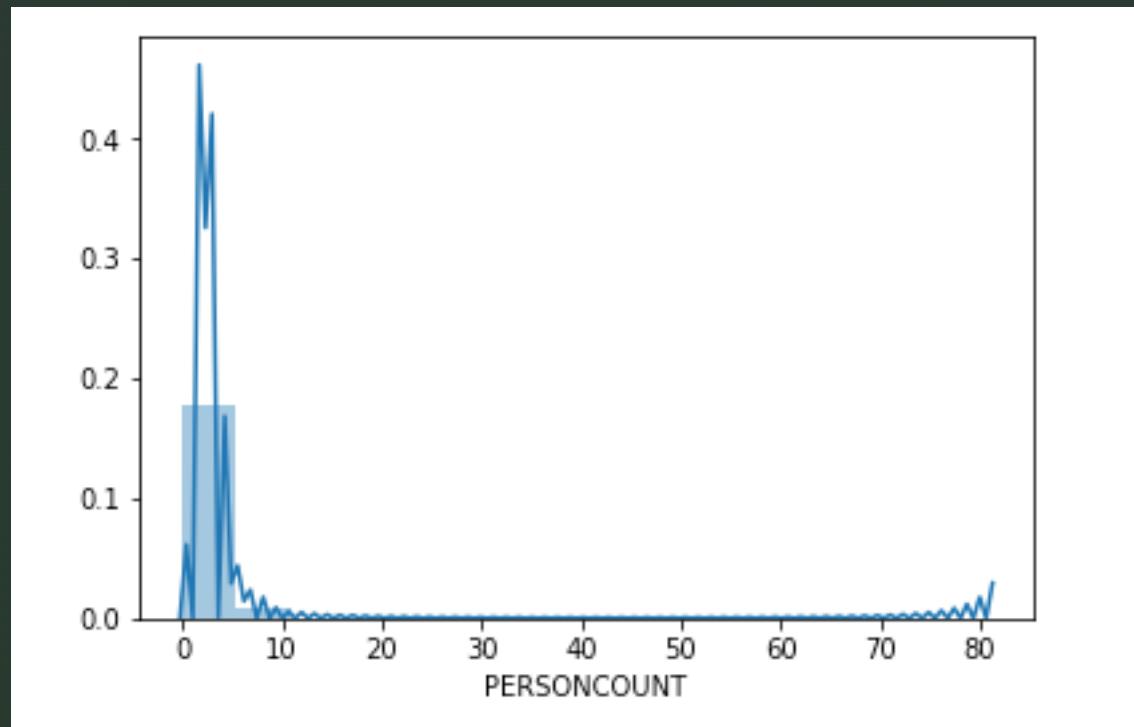
In the next step, I will sort by the number of people participating in the event (PERSONCOUNT) for a minimum value of 4 people and then group them depending on weather conditions (WEATHER), road condition (ROADCOND) and time of day (LIGHTCOND). Finally, I will use the location data (X and Y) to plot the most frequent crash sites on the Seattle map so the services will know exactly the accidents can happen on particular weather and day conditions.

3. Methodology and Result section

- I assume that I want to analyse the accidents which happens only due to the bad weather conditions and during the night
- Due to the different states of parameter light condition I „normalize” them to only two states: Day and Night
- Same assumption was made for Road Condition and Weather Condition. There are two states Good Road Condition or Bad Road Condition. Similarly with Weather Condition: Bad or Good

3. Methodology and Result section

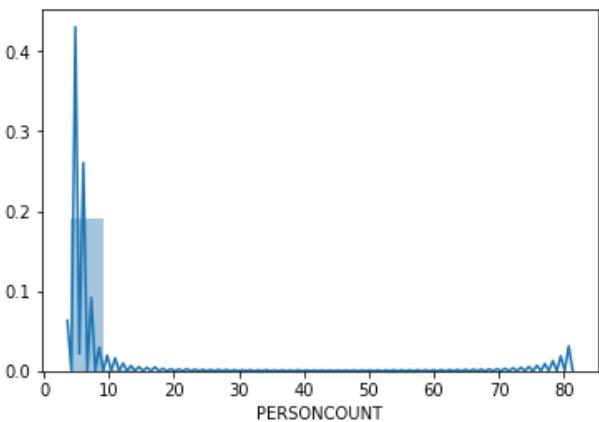
Distribution of the whole number of people involved in the accident



3. Methodology and Result section

Distribution of the whole number of people involved in the accident during night

```
In [23]: # Dropping the accidents with casualties less than 4  
df_acc = df_acc.drop(df_acc[df_acc.PERSONCOUNT < 4].index)  
  
In [24]: # Filtering for the night accidents  
df_night = df_acc.drop(df_acc[df_acc.DAYLIGHT < 1].index)  
  
In [25]: #Check the statistics of the persons which attend the accidents but in night  
sns.distplot(df_night['PERSONCOUNT'], bins=15)  
  
Out[25]: <matplotlib.axes._subplots.AxesSubplot at 0x7f33b1170898>
```



3. Methodology and Result section

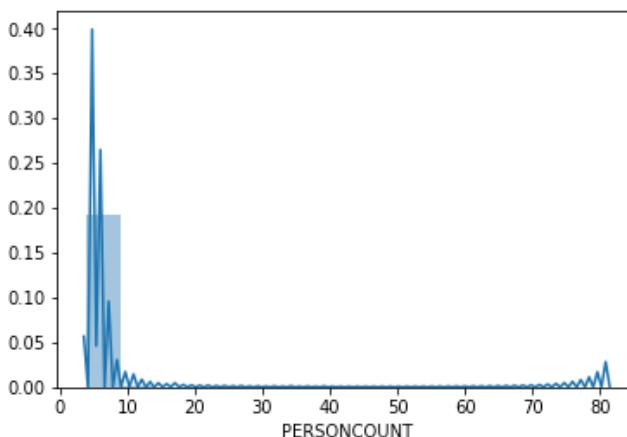
Distribution of the whole number of people involved in the accident during night and bad weather

```
In [27]: # Filtering for the bad weather accidents  
df_bad_weather = df_night.drop(df_night[df_night.GOOD_WEATHER < 1].index)  
len(df_bad_weather)
```

```
Out[27]: 5313
```

```
In [28]: #Check the statistics of the persons which attend the accidents in night and  
sns.distplot(df_bad_weather['PERSONCOUNT'], bins=15)
```

```
Out[28]: <matplotlib.axes._subplots.AxesSubplot at 0x7f33aa1b1898>
```



3. Methodology and Result section

List of nearby Emergency stations

```
In [59]: len(nearby_emn)

#nearby_em_gruoped = nearby_emn.groupby(['Emergency Name']).mean().reset_index()
nearby_em_gruoped=nearby_emn.drop_duplicates(subset=['Emergency Name'], keep="last").reset_index(drop=True)

nearby_em_gruoped

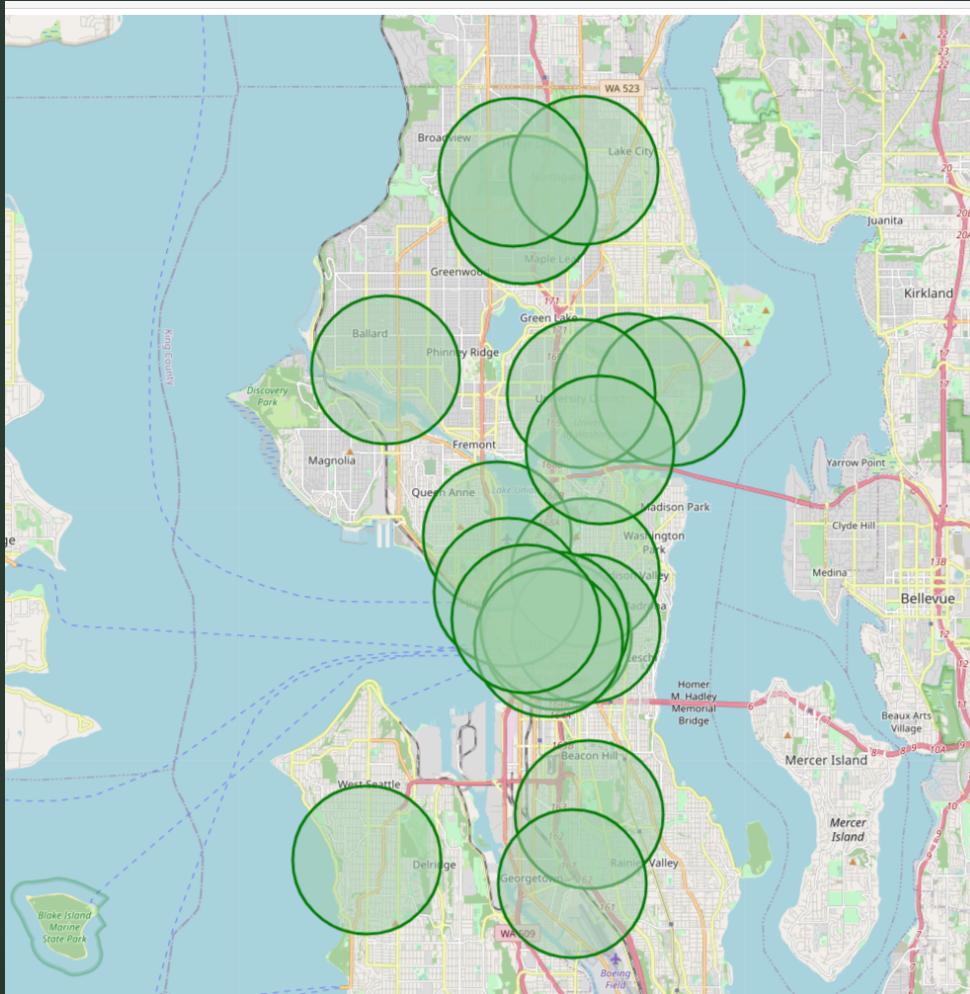
#List of an nearby Emergency Stations which needs to be prepared for casualties during the night and bad weather conditions
```

Out[59]:

	Accident Latitude	Accident Longitude	Emergency Name	Emergency Latitude	Emergency Longitude
0	47.704996	-122.328550	خلايا متحركة	47.705383	-122.333102
1	47.602188	-122.316782	Mental Health and Addiction Services at Harbor...	47.605644	-122.321014
2	47.666651	-122.301607	Care Clinic at Bartell Drugs	47.663863	-122.296602
3	47.624544	-122.339741	Bayside Family Physicians	47.629135	-122.341904
4	47.621491	-122.299118	AMR Central Quarters	47.620498	-122.311640
5	47.705797	-122.344706	سرابا المجانين	47.705386	-122.333176
6	47.599270	-122.303944	Swedish Medical Center - Cherry Hill Emergency...	47.607349	-122.311054
7	47.719432	-122.315406	Twans Emergency Room	47.714547	-122.311730
8	47.615057	-122.337454	Dentist Downtown Seattle	47.615900	-122.338321
9	47.721847	-122.344962	Northwest Hospital Emergency Room	47.714143	-122.336513
10	47.614076	-122.320780	Swedish Emergency Department	47.607937	-122.322051
11	47.561973	-122.385457	Jahyun Koo, DDS	47.553189	-122.387503
12	47.668508	-122.283479	Seattle Children's ER	47.662866	-122.281857
13	47.572508	-122.308430	VA Medical Center Emergency Department	47.563790	-122.310071
14	47.546981	-122.307937	Neighborcare Health Georgetown Dental Clinic	47.547542	-122.315861
15	47.665000	-122.327732	ZOOM+Care	47.662485	-122.312791
16	47.668651	-122.393684	Swedish Ballard ER	47.668006	-122.380696
17	47.602201	-122.319478	Harborview Medical Center	47.604167	-122.324138
18	47.606104	-122.335228	Cindy Tseng DDS	47.609725	-122.332143
19	47.641355	-122.320059	UWMC Emergency Room	47.649261	-122.306232

3. Methodology and Result section

List of nearby Emergency stations



3. Methodology and Result section

List of nearby Police stations

```
In [50]: len(nearby_plc_night_bw)
nearby_plc_night_bw=pd.read_csv('nearby_plc_night_bw.csv')

nearby_plc_night_bw_grouped = nearby_plc_night_bw.groupby(['PoliceS Name']).mean().reset_index()

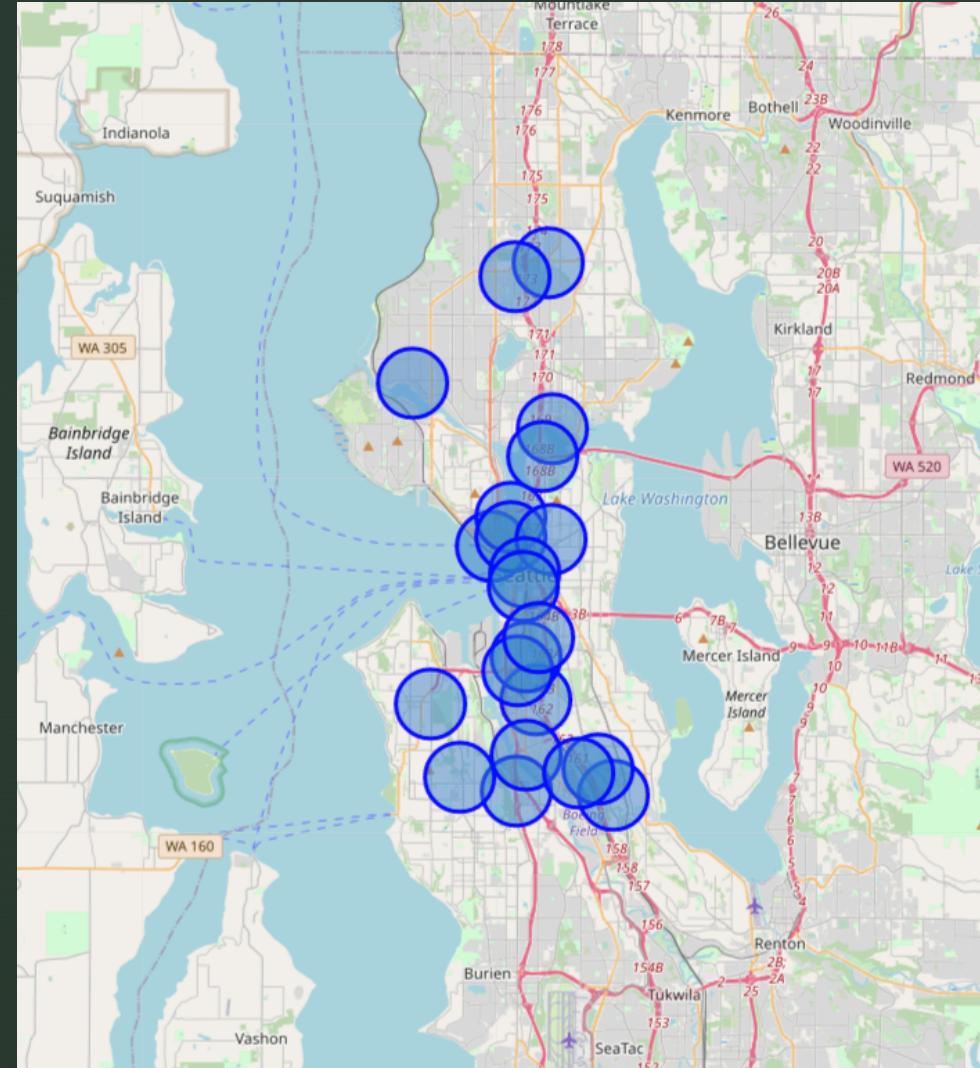
#List of nearby Police Stations which needs to be prepared for casualties during the night and bad weather conditions
```

Out[50]:

	PoliceS Name	Accident Latitude	Accident Longitude	PoliceS Latitude	PoliceS Longitude
0	312 Seattle Outpost	47.614195	-122.351867	47.613186	-122.346592
1	King County Sheriff's - PMU	47.561498	-122.322691	47.561680	-122.324762
2	King County Sheriff's Office	47.531573	-122.281048	47.529816	-122.286371
3	Magnum Storage	47.669664	-122.381108	47.667524	-122.385738
4	NOS Storage	47.529358	-122.334256	47.530923	-122.334151
5	Northgate Self Storage	47.712075	-122.314176	47.707788	-122.318463
6	Police Station	47.623762	-122.343220	47.622950	-122.336647
7	Seattle Cold Storage	47.541576	-122.335407	47.543071	-122.329627
8	Seattle Police Department - Southwest Precinct	47.533454	-122.379301	47.535877	-122.362096
9	Seattle Police Department -West Precinct	47.614529	-122.339648	47.616223	-122.336699
10	Seattle Police Department East Precinct	47.617784	-122.309949	47.615196	-122.316797
11	Seattle Police Department South Precinct	47.540242	-122.291680	47.538366	-122.293349
12	Seattle Police Dept North Pct.	47.701780	-122.339275	47.703178	-122.334709
13	Seattle Police Headquarters	47.604061	-122.330002	47.604396	-122.329953
14	Seattle Police Museum	47.598774	-122.327013	47.599641	-122.330644
15	Seattle Police Officers Guild	47.579809	-122.329056	47.576191	-122.329567
16	Seattle Police Southwest Precinct	47.563347	-122.386114	47.560390	-122.376460
17	U.S. Customs and Border Protection	47.546981	-122.307937	47.537197	-122.303024
18	USCBP	47.571421	-122.328674	47.571302	-122.333439
19	UW Police Station	47.656219	-122.316651	47.652274	-122.316557
20	Washington State Patrol	47.641355	-122.320059	47.643001	-122.321325
21	Washington State Patrol Seattle Crime Lab	47.583176	-122.316646	47.582320	-122.322991

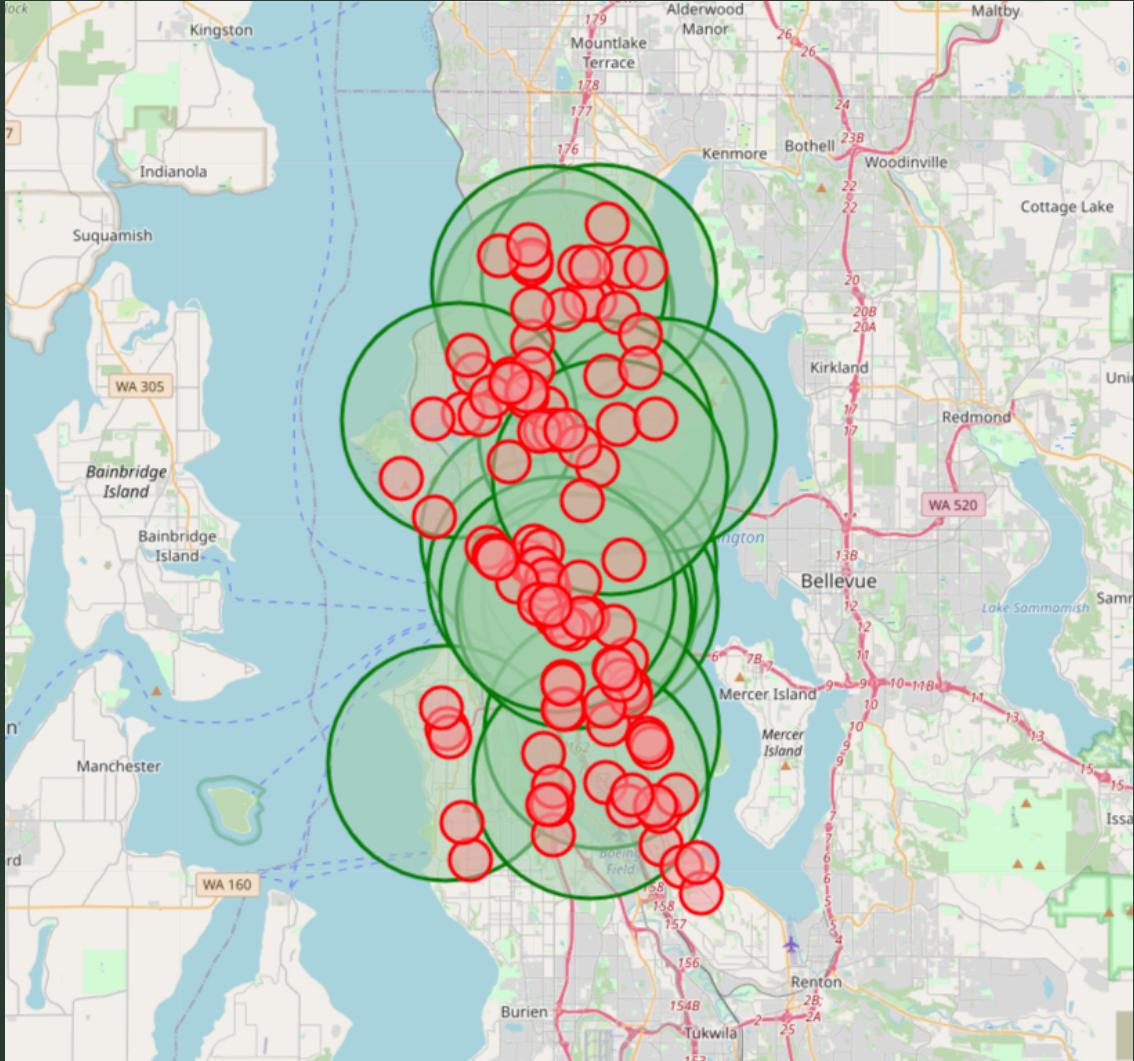
3. Methodology and Result section

List of nearby Police stations



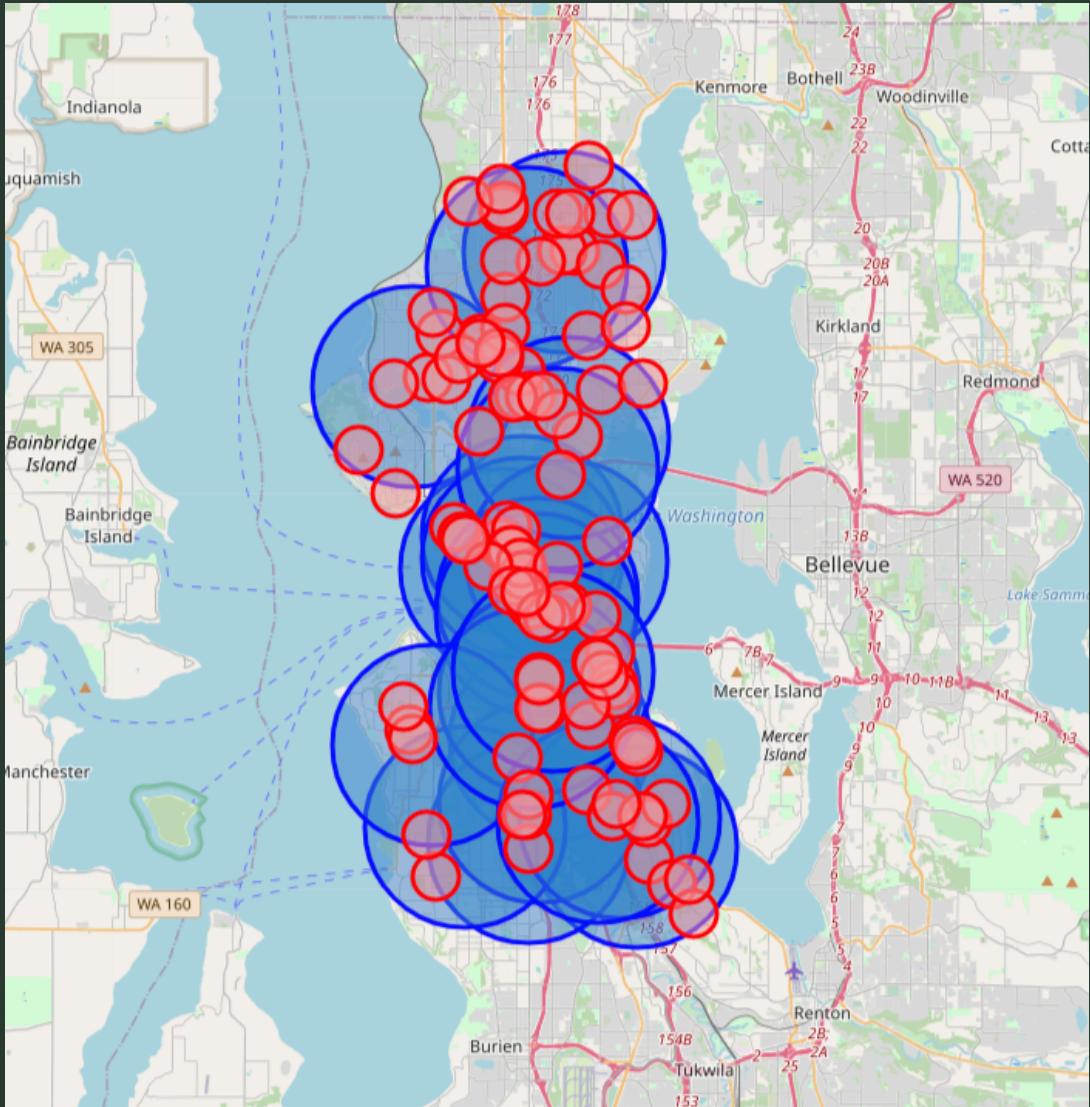
4. Conclusion section

- Accidents coverage by Emergency stations



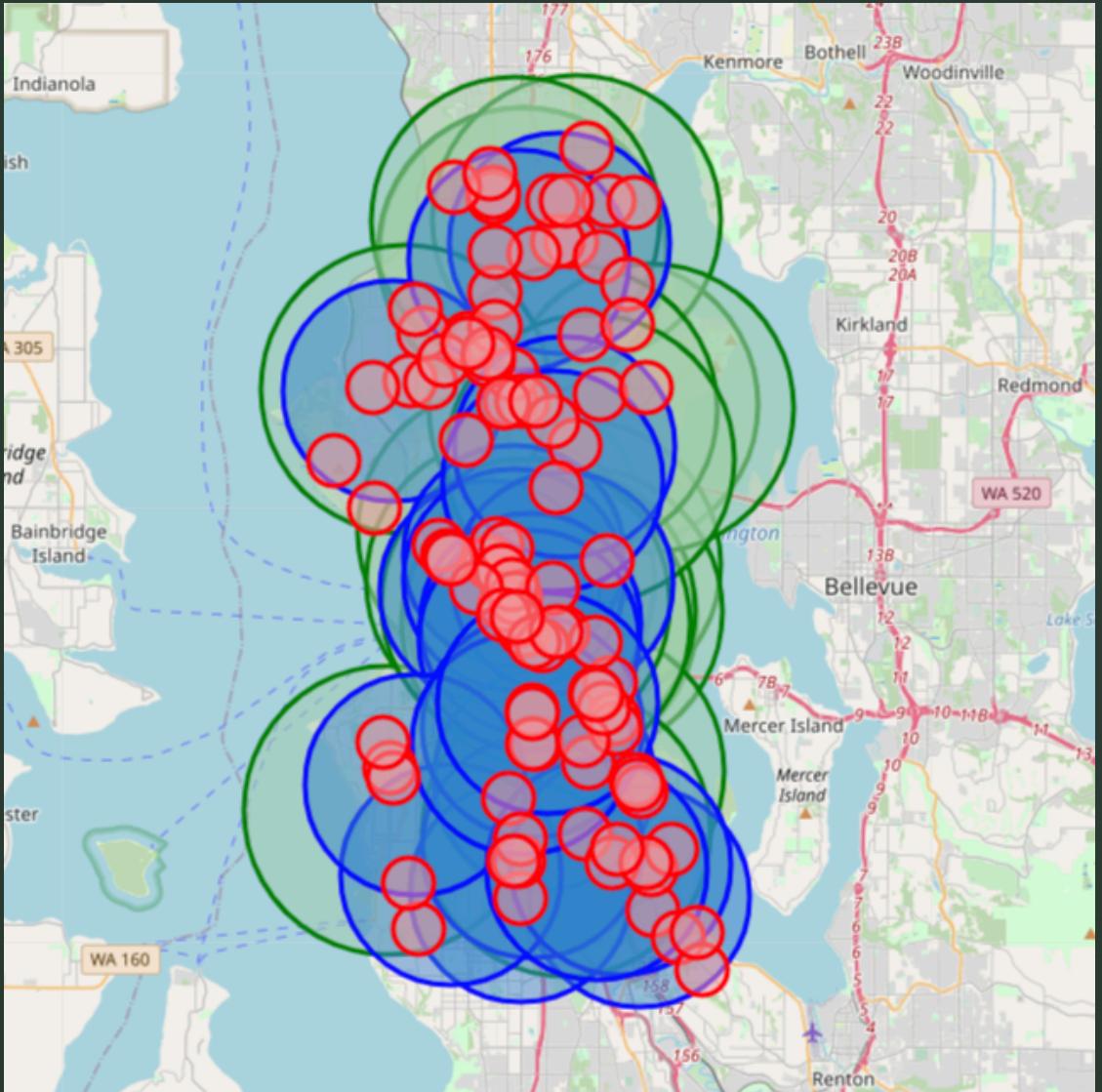
4. Conclusion section

- Accidents coverage by Police stations



4. Conclusion section

- Accidents coverage by Police stations and Emergency Rooms



4. Conclusion section

Using the above maps, we are able to determine the "worst" places in Seattle where statistically the most severe accidents occur, eg at night and difficult weather conditions. Thanks to this, it is possible to indicate the nearest Emergency Rooms and Police Stations that can handle these events. Of course, you can also assume that "for security" you should search for more than one Emergency Room or Police Station nearby due to the lack of information about the current "occupancy" of a given point.