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Scope: Create and share a Colab (Jupyter) notebook to analyze transportation data for the LA-freeways dataset using the tools of your choice About the dataset: The LA-freeways dataset contains average traffic speed on freeway segments in LA for 7-9am and 4-7pm (rush hours) on both directions for M-F week days - 2016: week of May 30 - June 3 and week of June 13-17 - 2017: week of May 29 - June 2 and week of June 12-16 - 2018: week of May 28 - June 1 and week of June 11-15

Road Visualization

Library

```
In [1]: import pandas as pd
        import matplotlib.pyplot as plt
```

Data path

```
In [2]: directory = './la-freeways-dataset'
        files = ['/I-210A', '/I-210B', '/I-5A', '/I-5B', '/I-405A', '/I-405B']
        extension = '.csv'
```

Read data

```
In [3]: data = []
        for i in range(3):
            # Road for A
            path = directory + files[i*2] + extension
            data.append(pd.read_csv(path))

            # Road For B
            path = directory + files[i*2 + 1] + extension
            data.append(pd.read_csv(path))
```

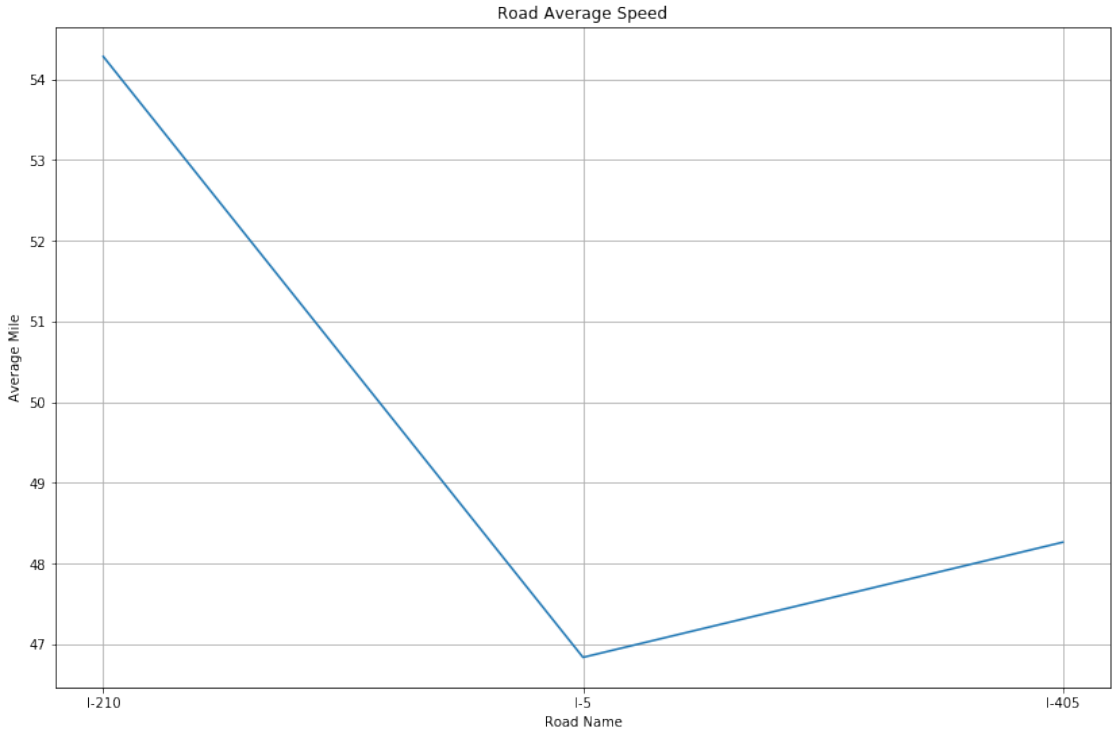
The professor told that speed 0 means that there is no input data. I dropped the examples (objects).

```
In [4]: clean_data = data.copy()
        avg_speed_list = []
        for i in range(len(clean_data)):
            num, avg_speed = 0, 0
            row = clean_data[i]['speed']
            for j in range(len(row)):
                if row[j] == 0:
                    clean_data[i] = clean_data[i].drop(j, 0)
                else:
                    num += 1
                    avg_speed += row[j]
            avg_speed /= num
            avg_speed_list.append(avg_speed)
```

```
I-210A          55.58288029214336
I-210B          52.984962301893844
I-5A          54.512311593868304
I-5B          39.15364044560975
I-405A          50.56768897408627
I-405B          45.953568813096396
```

```
In [5]: road_speed = [(avg_speed_list[0] + avg_speed_list[1])/2,
                     (avg_speed_list[2] + avg_speed_list[3])/2,
                     (avg_speed_list[4]+ avg_speed_list[5])/2]
```

```
In [6]: plt.figure(figsize=(14, 9))
        plt.plot(['I-210', 'I-5', 'I-405'], road_speed)
        plt.xlabel("Road Name")
        plt.ylabel("Average Mile")
        plt.title("Road Average Speed")
        plt.grid()
        plt.show()
```



In I-5, a vehicle could not move fast which means it has the lowest speed. So, I decided to check more detail. Actually, I-5 road is a consisted with I-5A and I-5B.

```
In [20]: info, selected_data = [], [clean_data[2].copy().reset_index(drop=True), clean_data[3]
         for i in range(2):
             pm, am, num_pm, num_am = 0, 0, 0, 0
             row = selected_data[i]['time']
             speed = selected_data[i]['speed']

             for j in range(len(row)):
                 if row[j] == "7-9AM":
                     num_am += 1
                     am += speed[j]
                 else:
                     num_pm += 1
                     pm += speed[j]
             pm /= num_pm
             am /= num_am
             info.append([max(selected_data[i]['speed']), min(selected_data[i]['speed']), avg_s
```

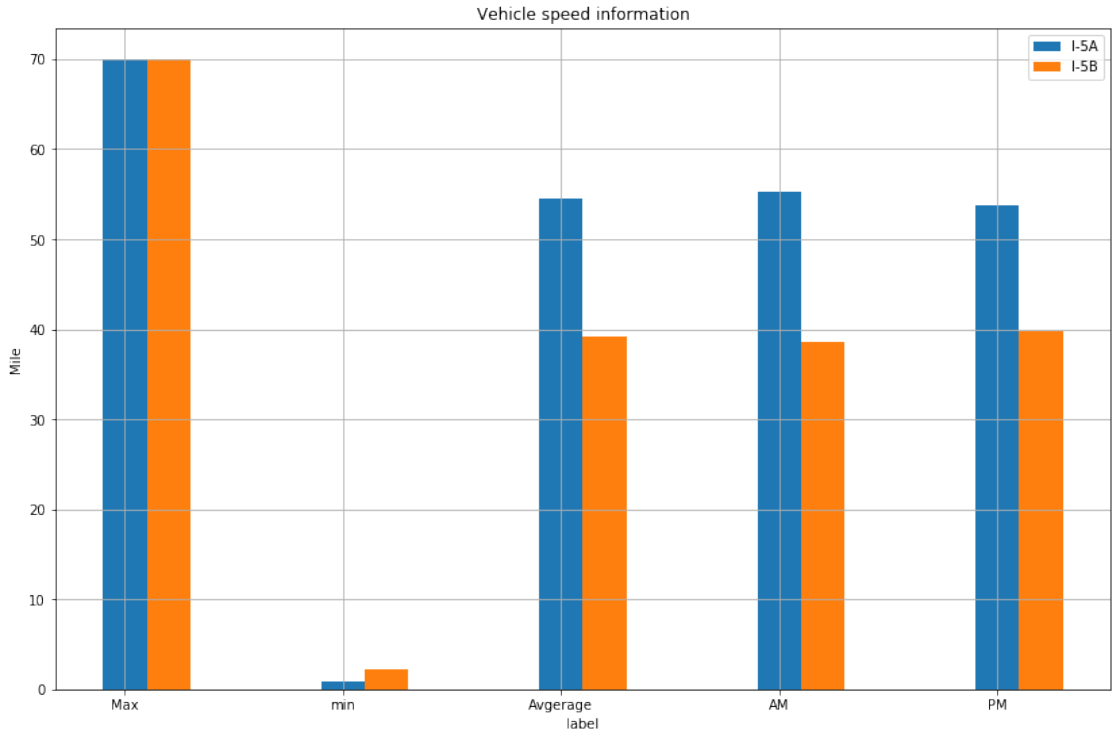
```
In [43]: information = pd.DataFrame(info, columns=['Max', 'min', 'Average', 'AM', 'PM'], index=
         information
```

Out[43]:

	Max	min	Average	AM	PM
A	70.0	0.928315	54.512312	55.228121	53.797035
B	70.0	2.176000	39.153640	38.578542	39.731499

```
In [73]: plt.figure(figsize=(14, 9))
         plt.bar([i * 2 - 0.2for i in range(len(information.columns))], info[0], label='I-5A',
         plt.bar([i * 2 + 0.2 for i in range(len(information.columns))], info[1], label='I-5B'
         plt.grid()
         plt.xticks([i * 2 - 0.2for i in range(len(information.columns))], ['Max', "min", "Avg
         plt.legend()
         plt.xlabel("Iabel")
         plt.ylabel("Mile")
         plt.title("Vehicle speed information")
```

```
Out[73]: Text(0.5, 1.0, 'Vehicle speed information')
```



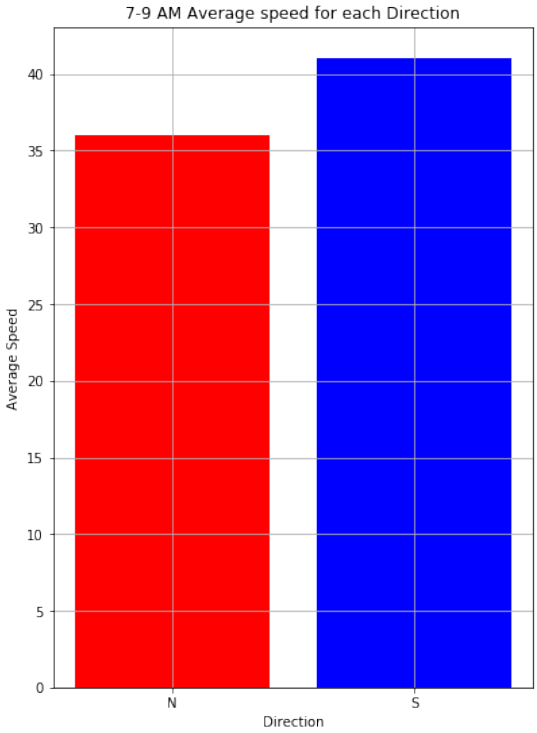
You can check the I-5B has more serious traffic problems. Each road has two directions, I will check vehicle speed on the each of direction, N, and S, in I-5B road.

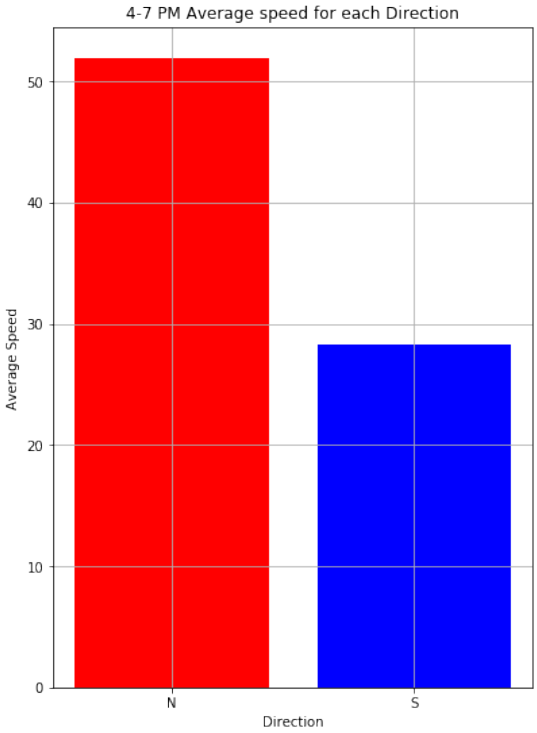
```
In [105]: I_50b = selected_data[1].copy()
          am, pm, am_n, am_s, pm_n, pm_s, num_n_pm, num_s_pm, num_n_am, num_s_am = [], [], 0, 0
          time = I_50b['time']
          direction = I_50b['direction']
          speed = I_50b['speed']
          for i in range(len(time)):
              if time[i] == '4-7PM':
                  if direction[i] =='N':
                      num_n_pm += 1
                      pm_n += speed[i]
```

```
                else:
                    num_s_pm += 1
                    pm_s += speed[i]
            else:
                if direction[i] =="N":
                    num_n_am += 1
                    am_n += speed[i]
                else:
                    num_s_am += 1
                    am_s += speed[i]
        am_n /= num_n_am
        am_s /= num_s_am
        pm_n /= num_n_pm
        pm_s /= num_s_pm

        am.append(am_n)
        am.append(am_s)
        pm.append(pm_n)
        pm.append(pm_s)
```

In [111]:
```
plt.figure(figsize=(14, 9))
sub1 = plt.subplot(1,2,1)
sub1.set_xlabel("Direction")
sub1.set_ylabel("Average Speed")
sub1.set_title("7-9 AM Average speed for each Direction")
sub1.bar(['N', 'S'], [am[0], 0], color='r')
sub1.bar(['N', 'S'], [0,am[1]], color='b')
sub1.grid()
sub2 = plt.subplot(1,2,2)
sub2.set_xlabel("Direction")
sub2.set_ylabel("Average Speed")
sub2.set_title("4-7 PM Average speed for each Direction")
sub2.bar(['N', 'S'], [pm[0],0], color='r')
sub2.bar(['N', 'S'], [0,pm[1]], color='b')
sub2.grid()
plt.show()
```





In the morning, N and S direction show a similar speed. I think it is because of commutting time. However, in the night, it shows huge difference. I supposed that this is because of the residential district. So, I tried to check data based on the date.

I utilized "tableau" for visualizing the results. This data set has only 2 years of contents, so I only visualized that part.

Final result I thought there are unbalance of the dwelling area, as result, many people are commuting for their works or rest. It caused the huge traffic. In my opinion, to solve this problem, the city should offer good public transportation system.