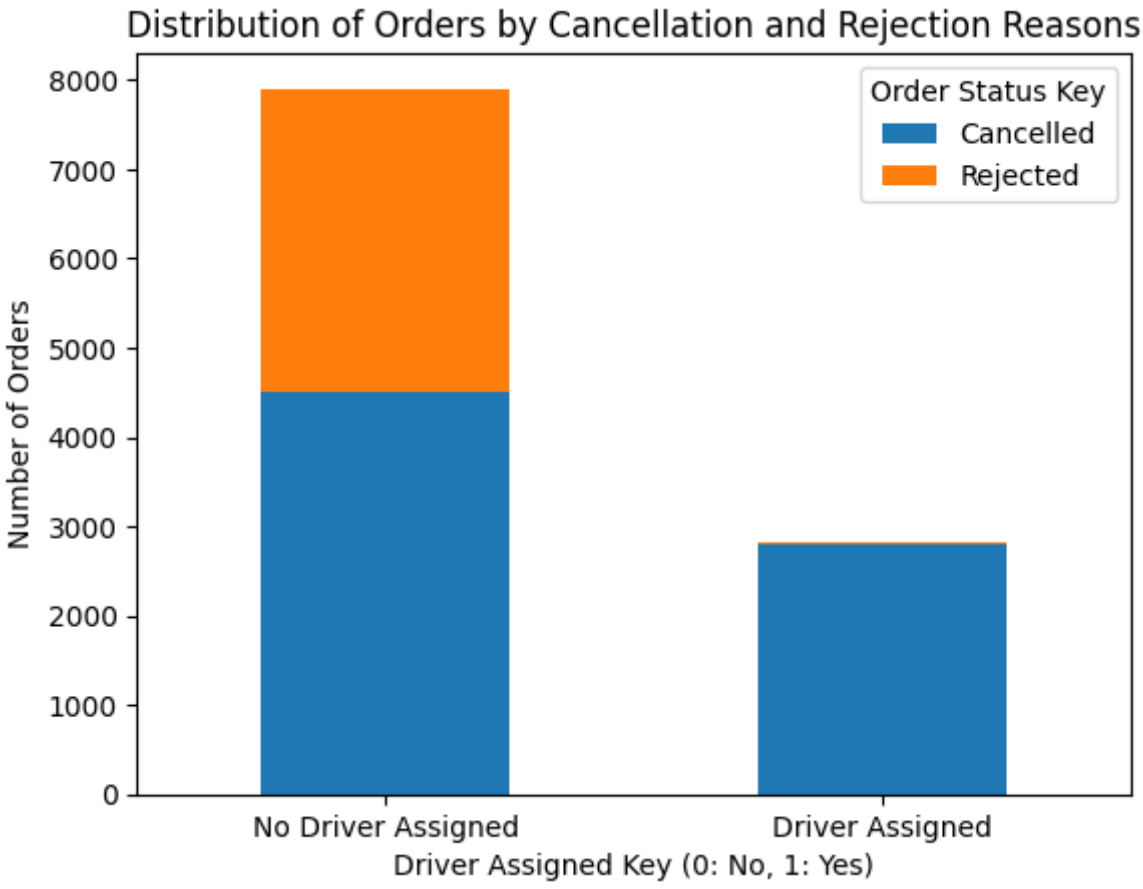
Assignment 2

12112124 尹晨

1

Using the plot method, a bar graph is drawn showing the distribution of different order states (cancellation or rejection) between driver assignment or not. At the same time, the specific data is output to facilitate the analysis of the results.



order_status_key	4	9
is_driver_assigned_key		
0	4496	3406
1	2811	3

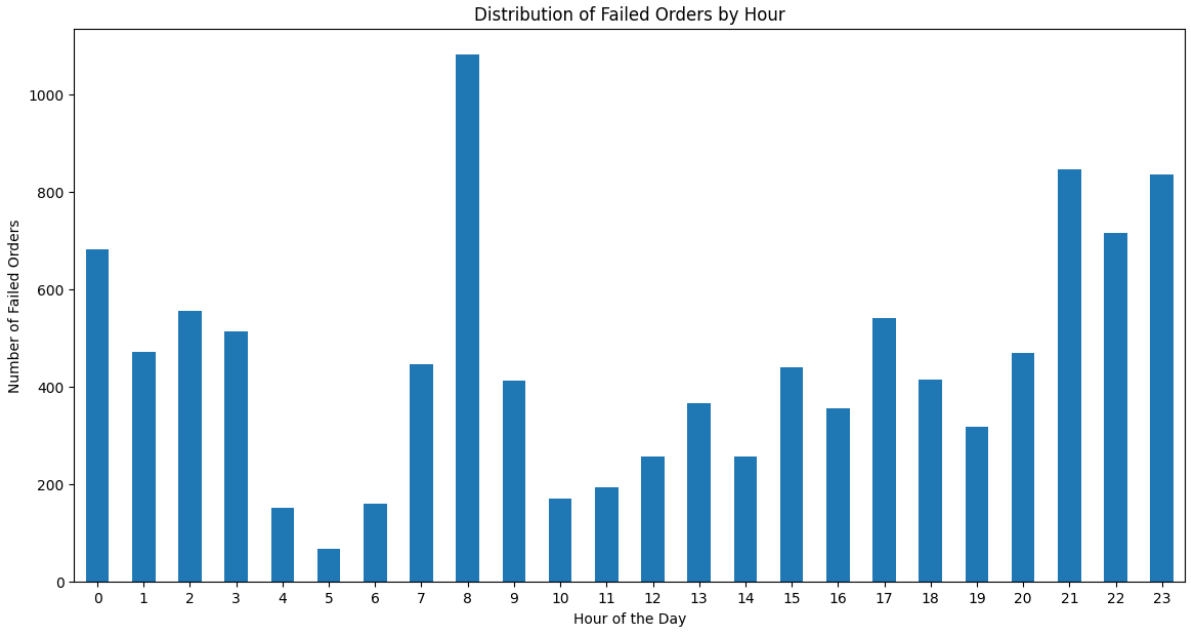
According to the distribution diagram of driver assignment status and order status code, we can see:

When no driver was assigned (is_driver_assigned_key was 0), 4,496 orders were canceled and 3,406 orders were rejected.

When the driver was assigned (is_driver_assigned_key was 1), 2,811 orders were canceled, while only 3 orders were rejected.

This indicates that slightly more orders were cancelled than rejected before drivers were assigned, whereas once drivers were assigned, order cancellations were more common and almost no order rejections occurred.

2



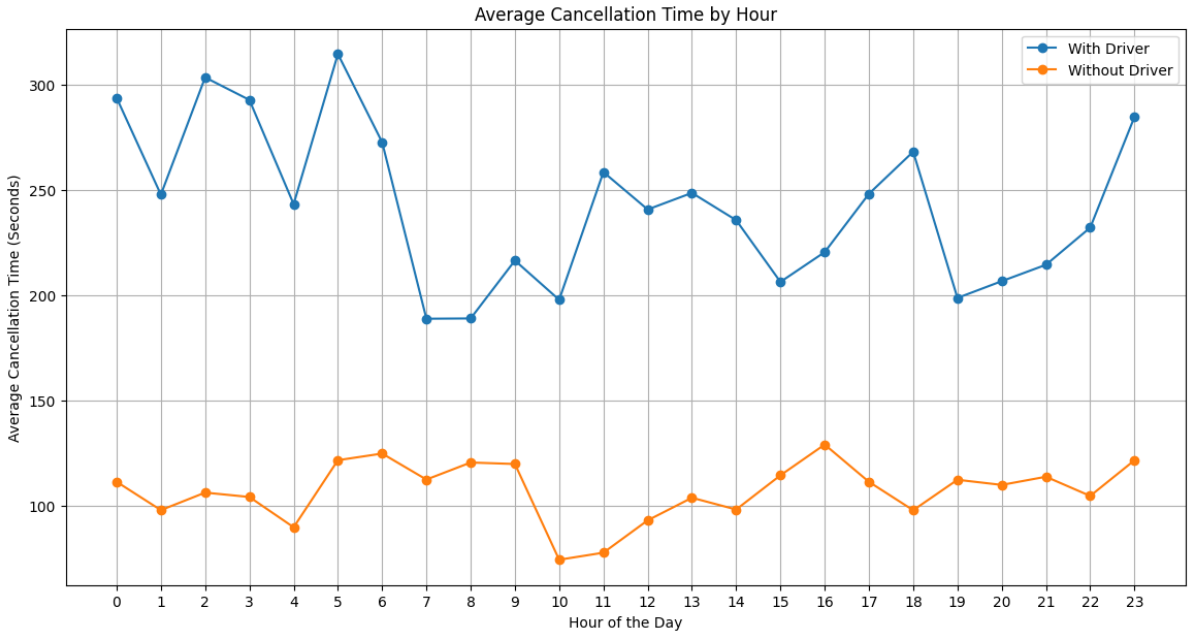

```
hour
0       683
1       471
2       555
3       513
4       152
5        67
6       159
7       447
8      1082
9       412
10      170
11      193
12      256
13      366
14      256
15      439
16      356
17      541
18      414
19      317
20      469
21      846
22      716
23      836
Name: count, dtype: int64
```

As you can see from the chart, there are some peaks and troughs in the distribution of failed orders throughout the day. In particular during the following time periods:

Between 1am (471 failed orders) and 4am (513 failed orders), the number of failed orders was relatively small. There was a clear peak at 8am, with 1,082 failed orders. There were also peaks in the number of failed orders at 21 PM (846 failed orders) and 23 PM (836 failed orders).

This pattern may be related to user ordering habits, such as the morning and evening peak hours, which may lead to an increase in failed orders due to high demand. The lower order volume at night may be due to reduced user activity.

3



At the same time, we output corresponding values for easy viewing and comparative analysis.

```
(hour
 0     293.616667
 1     247.715909
 2     303.307692
 3     292.640625
 4     243.219512
 5     314.400000
 6     272.553191
 7     188.891026
 8     189.025478
 9     216.493590
 10    197.860759
 11    258.423423
 12    240.686869
 13    248.541667
 14    235.618557
 15    206.349650
 16    220.465649
 17    248.125749
 18    268.082090
 19    198.741667
 20    206.692982
 21    214.460784
 22    232.080537
 23    284.557692
```

and:

hour	
0	111.557047
1	98.132420
2	106.438819
3	104.361607
4	90.000000
5	121.800000
6	124.955224
7	112.628049
8	120.702179
9	120.000000
10	74.607843
11	77.945455
12	93.283019
13	103.993243
14	98.415094
15	114.639535
16	129.216783
17	111.533040
18	98.088608
19	112.522124
20	110.086957
21	113.959821
22	104.858896
23	121.756614

The chart shows the average cancellation time per hour, distinguishing between those assigned with and without a driver. We can see that:

In most hours, the average cancellation time for orders with a driver assigned was longer than for orders without a driver assigned.

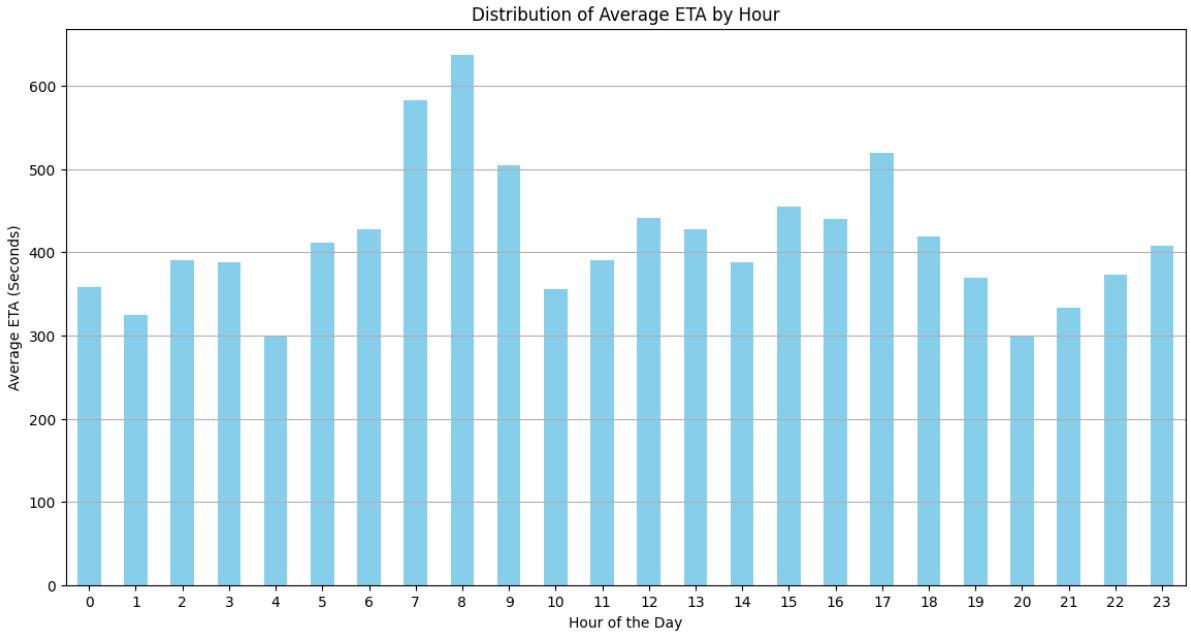
Between 4 a.m. and 6 a.m., there is a small spike in the average cancellation time when there is no driver assigned.

Between 7 a.m. and 9 a.m., the average cancellation time with a driver assigned dropped significantly, possibly due to drivers responding more quickly to cancellations in the morning peak hours or customers deciding to cancel orders more quickly.

Between 21 and 23 p.m., the average cancellation time when there is no driver assigned is relatively stable.

These variations may be related to different activity patterns and service demands throughout the day, for example a quick response in the morning may be due to high driver availability, and in the evening it may be due to a lower number of orders leading to more rapid cancellation operations.

4




```
hour
0     357.959016
1     324.750000
2     391.012821
3     388.093750
4     299.658537
5     411.120000
6     427.148936
7     583.358974
8     636.910828
9     504.891026
10    355.556962
11    390.954955
12    440.787879
13    428.025000
14    387.835052
15    454.790210
16    440.568182
17    519.742515
18    419.186567
19    369.816667
20    300.096491
21    333.852941
22    372.744966
23    408.429487
Name: m_order_eta, dtype: float64
```

From the chart, we can observe that:

The average ETA peaks between 7 and 8 a.m., which may be related to traffic congestion during the morning rush hour, leading to increased delivery times.

The average ETA is lower during late night and early morning hours, such as 4 a.m., probably because there is less traffic, which reduces delivery times. There was an increase in ETA in the afternoon, probably due to increased traffic in the afternoon to early evening.

The average ETA begins to decline after 20pm, which may reflect a decrease in traffic in the evening.

This distribution may reflect changes in traffic flow throughout the day in the city, which has a direct impact on order delivery times. Low traffic at night and in the morning leads to shorter delivery times, while congestion during rush hour leads to longer delivery times.

5

The visualization of order geographic data is realized by using H3 and Folium libraries. The identification of hexagonal areas comprising 80% of total orders helps Gett understand where its main service areas are and where there is likely to be high demand.

By counting the number of orders per hexagon and plotting those that contain the most orders, the company can see which areas have the highest demand for service, which is critical for the optimal allocation of resources.

Marking these hexagons with different colors on the map provides an intuitive visual representation that helps to quickly identify high-density areas. The use of cumulative counts and cut-off points ensures that the highlighted areas on the map contain 80% of the order data, meaning that the most important areas are visually highlighted.

However, this code does not take into account the actual size or value of the order, it is simply based on volume. In addition, all orders are assumed to be of equal importance and are not weighted. It is still at the basic level.

The saved 'hex_map.html' file can be opened and viewed directly in a web browser. The results are as follows: