Visualization Project

Project 3: Coronavirus Disease

Supervisor: Dr. Wei Zeng

Group member:

Aaron, 1730026104, m730026104@mail.uic.edu.hk

Dendi, 1730026061, m730026061@mail.uic.edu.hk

Tommy, 1730026030, m730026030@ mail.uic.edu.hk

Phillip, 1730026014, m730026014@ mail.uic.edu.hk

Analytic Tools Used:

Echart in JavaScript

Time we used:

Our entire group spends more than 50 hours

Abstract

The COVID-19 was first discovered in Wuhan, China. As a newly discovered coronavirus, COVID-19 has affected the lives of people all around the world significantly. In the report, we will mainly discuss and analyze the two problems through data visualization. In this report, we will use our data visualization to show the status of this virus around the world and the impact on the economy and life.

Content

1. Introduction

Novel coronavirus 2019, named 2019-nCov by the world health organization on January 12, 2020. Coronaviruses are a large family of viruses known to cause colds and more serious illnesses and COVID-19 is a novel coronavirus strain that has never been found in humans before. Therefore, there is no specific treatment for COVID-19 disease currently. For the time being, it has infected more than six million people and caused more than three hundred and sixty thousand deaths.
Due to the attack of the new coronavirus on the world, we will use some data visualizations to show the current situation in various countries so that people of all countries have a certain understanding of their environment and take preventive measures.

In task 1, we visualize the confirmed rate, death rate, and recovered rate in different regions of the world from January 22 to May 18. We created a bubble chart on the world map to show the global impact of COVID-19. And a histogram shows the difference in the number of diagnoses and deaths between China and the United States. We also make a line chart to describe timeline analysis on the spread of COVID-19. These diagrams are designed in a dashboard that users can easily view.

In task 2, we chose topic 3 as our topic to analyze the impacts of COVID-19 on life and economy. For the amount of data is too large, we chose the UK as our key research area. We conducted a statistical analysis of the number of British tourists from December 2, 2019 to March 23, 2020, and plotted a line chart. We also made a bar chart to study the price fluctuation of high-demand products between week 3 (30 March to 5 April), and week 4 (6 April to 12 April).

2. Task One

2.1 The Global Impact of COVID-19

COVID-19 is taking its toll on the world, causing deaths, illnesses, and economic despair. Addressing the unforeseen challenges of the COVID-19 pandemic. The situation has taken a heavy toll on people around the world. Until May 8th, there are over 4,000,000 confirmed cases of COVID-19 across the globe.

According to **Figure 1**, the countries with the largest numbers of confirmed cases are the United States, Spain, Italy, and France. However, even the countries that the new coronavirus has hit less aggressively are still under considerable strain. As many as 213 countries and territories have registered COVID-19 cases, and

the entire world is buzzing with uncertainty. At the moment, many countries have taken measures to slow down the spread of COVID-19.

Figure 1

China appeared to manage the coronavirus outbreak effectively, putting in place early travel bans within the country itself. As early as January 23, Chinese authorities declared a nationwide travel ban. Some experts suggest it may have averted over 700,000 COVID-19 confirmed cases within the country. Earlier in April, China eased the lockdown measures in Wuhan, the original epicenter of the new coronavirus outbreak.

Figure 2 is the infection situation in China.

Figure 2

Some European countries have been quicker than others to respond to the sharp rise in COVID-19 cases. On March 10, Italy became the first country in Europe to impose a strict nationwide blockade. **Figure 3** shows the confirmed rate is about 0.0167% and the number is 21157, which is the second-largest in the world. The government bans all travel within the country and people can only leave their homes if necessary, such as to buy food. When going out, people must carry declaration forms, wear masks, and

disposable gloves. To slow down in the growth of new COVID-19 cases, the Italian government has recently extended lockdown measures through May 3.

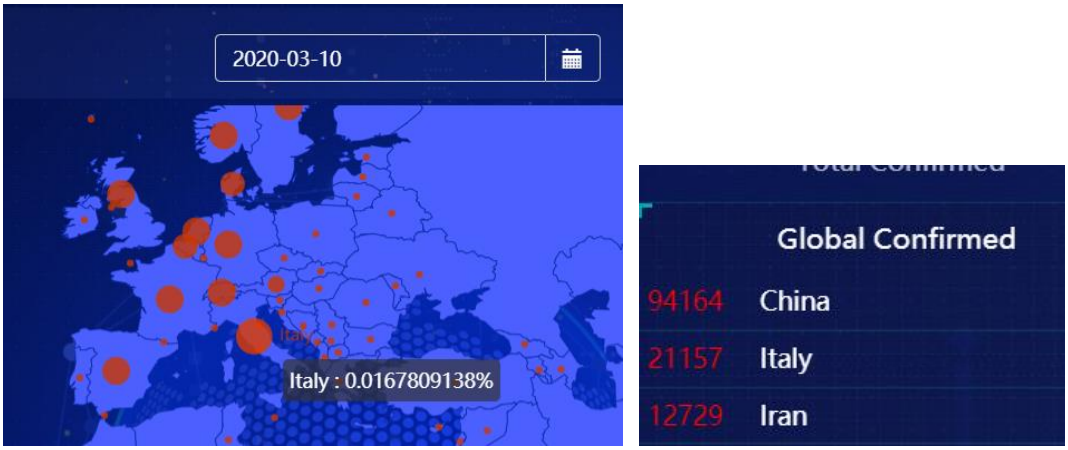

Figure 3

Spain, another European country that was hard hit by the coronavirus, also announced strict lockdown measures beginning March 14. **Figure 4** shows the confirmed rate is about 0.0136% and the number is 6391, which is the fifth-largest in the world. The Spanish government appears to share such worries and is considering easing these measures in May. It is still unclear how the pandemic may progress in the country.

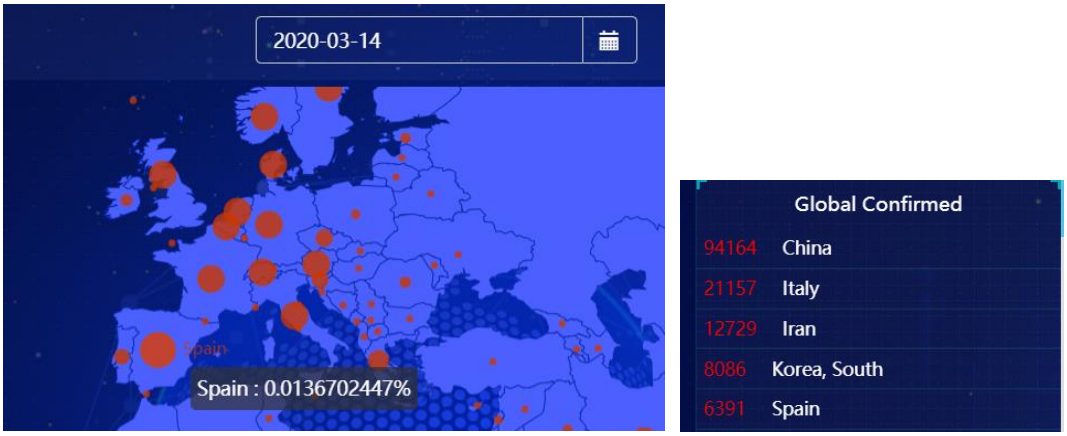

Figure 4

2.2 The infected, mortality and recovery rates in different regions.

From the overview of the bubble chart on our map, we can roughly see the distribution of coronaviruses around the world on a specific date. Among them, the color of the bubble represents the type of data currently visualized. In **Figure 5**, yellow bubbles represent the mortality rate, green bubbles represent the cure rate, and red bubbles

represent the infection rate. Besides, the size of the bubbles represents the numeric size. The larger the bubbles are, the higher the values become.

Spatial dimension

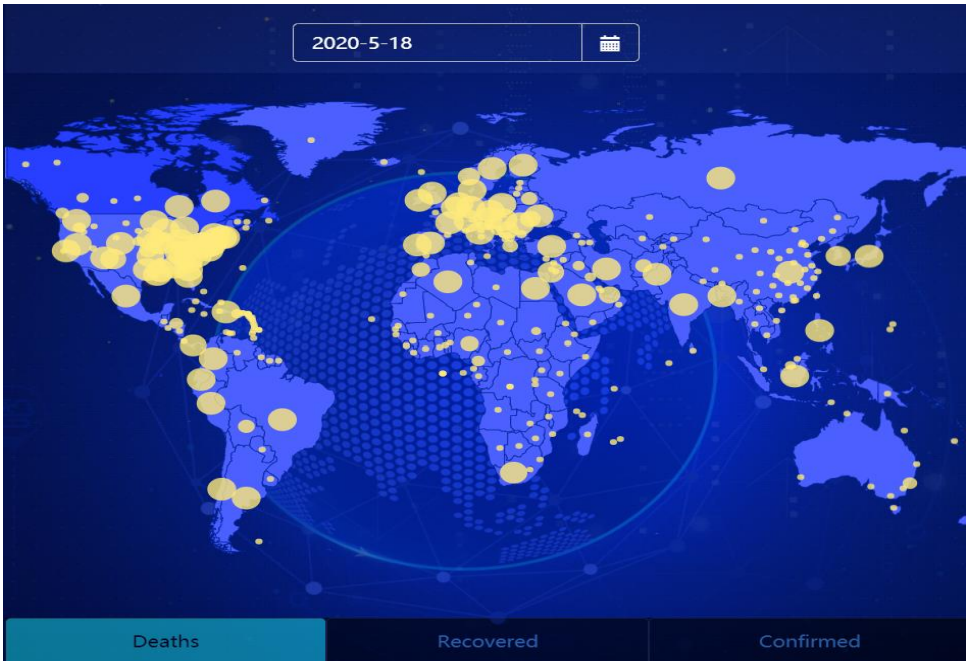

Figure 5

We take May 8 as an example here; the death rate is selected. We can find that regions with high mortality are concentrated in Western countries. There are also some others in Central Asia, Europe, and East Asian. Although their mortality rates are not low, the cases here are more sparse than western countries. Besides, the mortality rates in Africa, South America, Oceania, and other regions are all at a relatively low level.

Time dimension

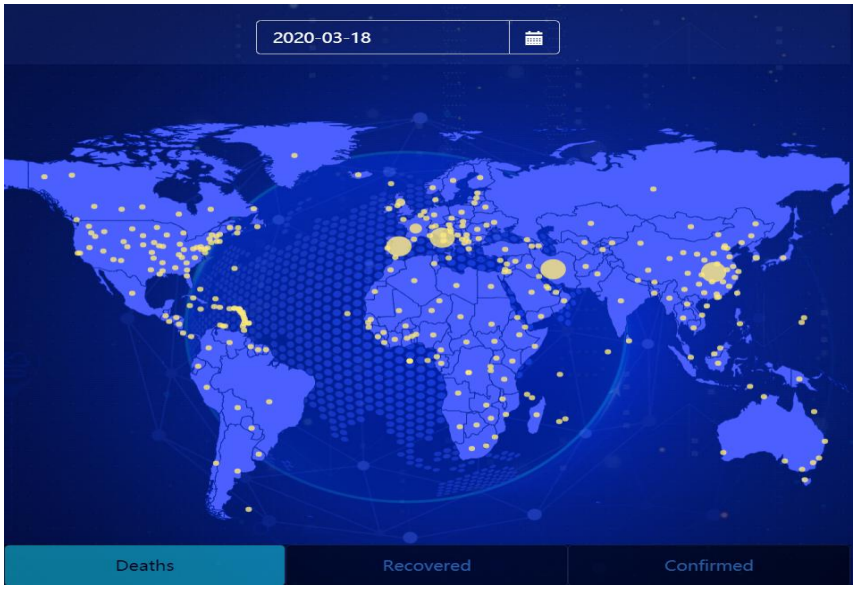

Figure 6

In terms of time, we switched the date to March 18. The distribution of mortality is very

different from the previous one. Obviously, only China, Iran, Italy, and Spain have high mortality rates on the map. Recalling the development of the coronavirus epidemic, in mid-March, the virus did not have a global epidemic, but was only partially endemic in the above-mentioned countries.

Interaction taxonomy: Zooming

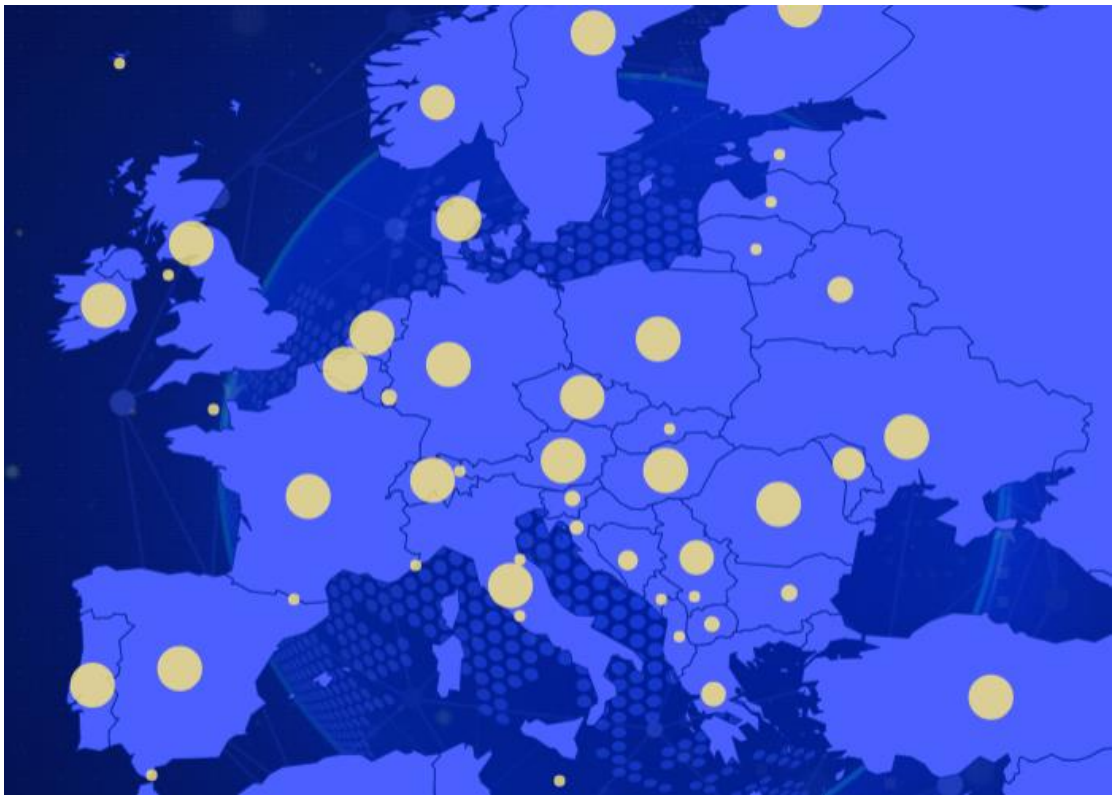

Figure 7

In order to better show the characteristics of mortality, response rate, and diagnosis rate in different regions, some interactions were used in our visualization. Zoom in on a part of the map, we will get more detailed information. In other words, it is easier to compare the differences between regions. Zoom in on a part of the map, we will get more detailed information. In other words, it is easier to compare the differences between regions. From the bubble chart of mortality rates in some European epidemics above, the distribution of various European countries can be observed. This is not possible when looking at the world map. Considering that some countries are small in size, they cannot be fully displayed on the entire World Map channel. Zooming, as an interactive taxonomy of visualization, perfectly handles the problem between overview and context.

Interaction taxonomy: Select and explore

Figure 8

If we want to compare the differences between the two countries, the bubble size alone seems not enough to judge. For example, Russia and India in **Figure 8** have almost the same size as the mortality bubble. If there is no value, it is impossible to judge which country is higher. Therefore, we added select which is another interaction taxonomy. After selecting a country (keep the mouse among this country), we can click and get the specific mortality/cure rate/diagnosis rate. It can be seen from the figure that although the bubble sizes of the two are close, the death rate in India is still 10% higher than that in Russia.

Figure 9

It is not limited to comparing areas with similar bubble sizes. We can compare exactly any area of interest by select and explore. For example, within China, the mortality rate in Hubei Province is more than ten times that in Guangdong Province. This is the data on May 18, when the epidemic stabilized.

Focus on two country:

China and the United States are the two largest countries in the world. Their epidemic prevention measures concern nearly a quarter of the world ’s people. To understand the pros and cons of the deployment of anti-epidemic measures in the two countries, we compared the differences in deaths and confirmed rates between them.

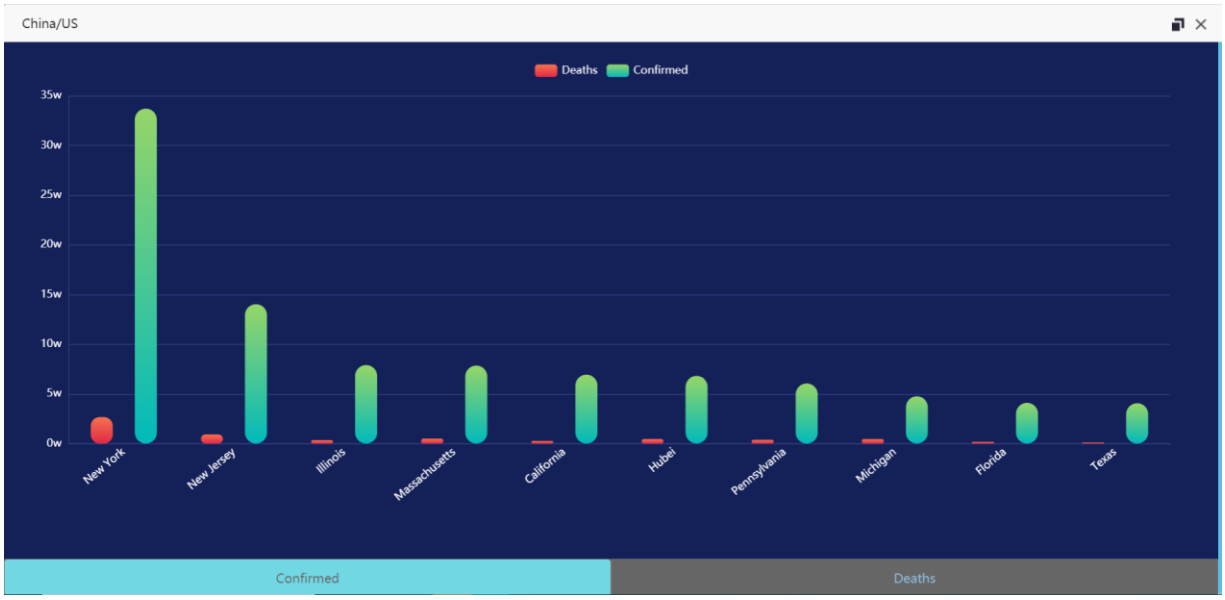

Figure 10

Unlike the previous worldwide visualization, we can use **Figure 10** to visualize the data between the two countries. We used data on April 18 for analysis. This is a histogram ranked by the number of diagnoses. The top ten regions in the United States account for 9 of them. New York State has the highest number of diagnoses, ranking first with 337,055. Hubei Province ranks sixth with 68,128 diagnoses, which is higher than Pennsylvania, Michigan, Florida, and Texas.

Figure 11

Ranked by the number of deaths, the situation varies from region to region. Due to the high number of diagnoses, New York, New Jersey, and Massachusetts are still in the top three. The fourth and fifth are replaced by Michigan and Hubei Province respectively. In addition, Illinois, which ranked third in the number of diagnoses, ranked

seventh with 3,406 deaths in this ranking because of its lower mortality rate. In conclusion, although the number of diagnoses in the United States is much higher than in China, its advanced medical level still maintains a low mortality rate.

2.3 Timeline Analysis on Spread of COVID-19

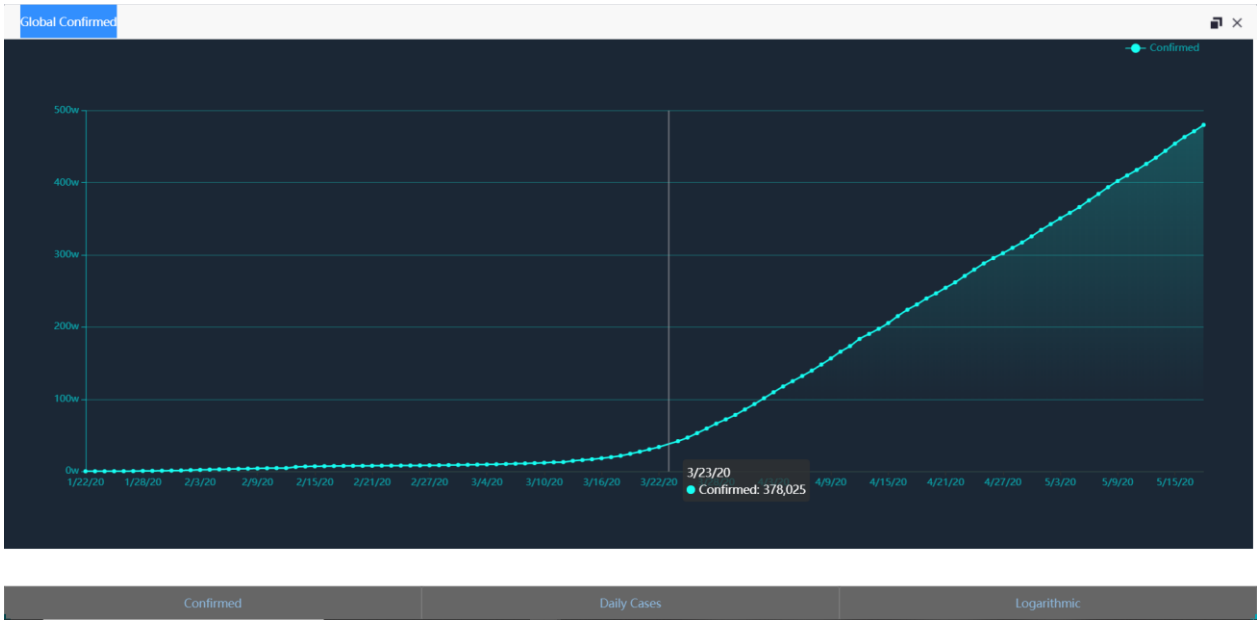

Figure 12

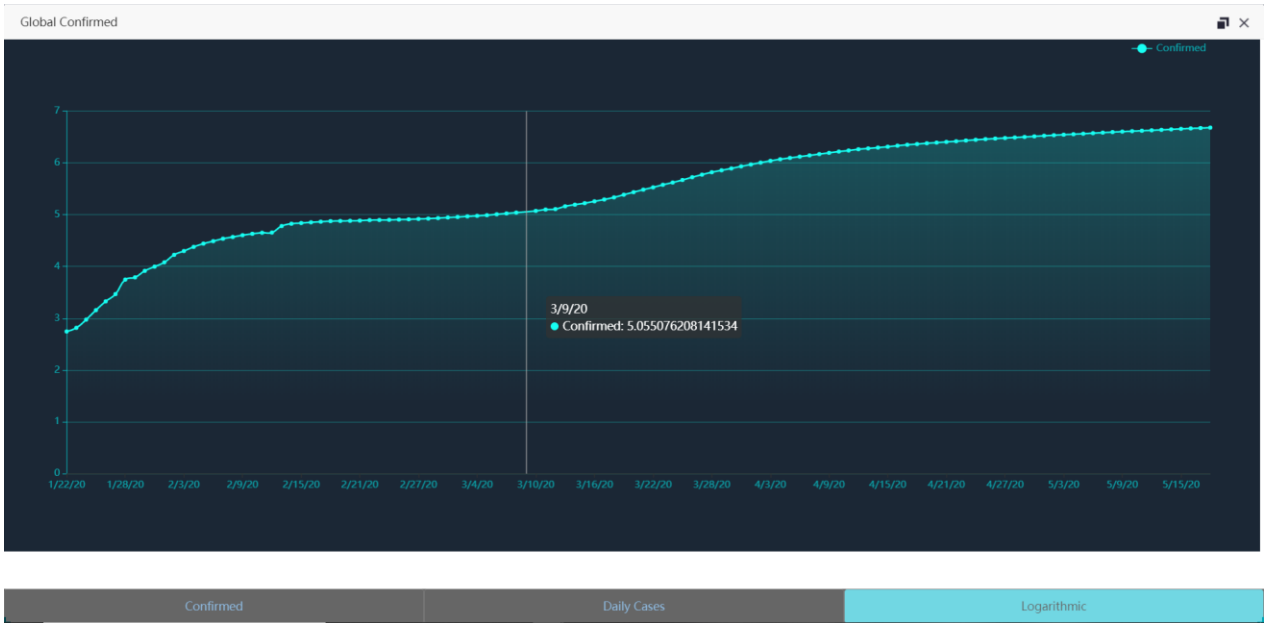

Figure 13

Figure 5 and **Figure 6** represent the number of global confirmed cases. The y-axis is the confirmed number. The x-axis is the date. It's clear that the tendency of the global

confirm number is increasing constantly and around 3.22, the confirm number increased dramatically. There is a dashboard in the bottom with two buttons: daily case and logarithmic. The graph of "daily case" is an exponential function and the graph of logarithmic is a logarithmic function. The aim of the logarithmic function is to let the scale to be smaller. If as the time went by, the number will be bigger and the y coordinate will increase then the previous date's scatter will look the same.

"Daily case" is that the graph is like an index movement. The "logarithmic" is like a log function.

Based on the two line charts, we can propose some **domain problems** such as:

- ✓ What is the tendency of the global confirm number?
- ✓ From which data the number began to increase dramatically.

Scalability and limitations:

Scalability: thousands of items.
If we increased more items, the range of the x range will become larger and the graph can still show the tendency clearly.

Identify visualization

- ✓ Chart type: line chart
- ✓ Mark: Circles
- ✓ Visual channels: Horizontal and vertical positions

Data characteristics:

One quantitative attribute: number of global confirmed cases.
One order attribute: date.

Interaction techniques:

Selection: is the elimination or the de-emphasis of certain objects/attributes.
I can show the point on the screen with the graph. When I select the point, it will show the details. For example, the confirmed number and the date information.

Reconfigure: is provide different perspectives by changing the spatial arrangement of representation. We don't change the visual appearance, so it's not the interaction techniques of encode. We rearrange the view: Keep the same fundamental representation and what data is being shown, but rearrange elements after we change the y-axis.

Explore: Overcome the limitation of display size. When we double click the graph, it will become bigger.

Figure 14

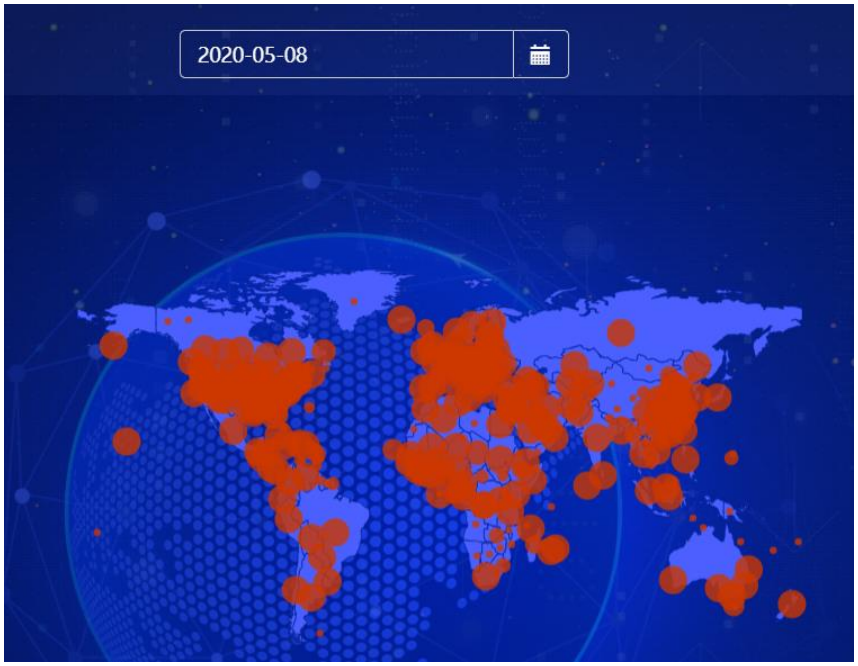

Figure 15

Figure 14 and **Figure 15** are two screenshots of our bubble chart. The size of the circle is the confirmed number. We can choose the date from the date box to know the situation of that date and we can easily find that the size of the bubble becomes bigger from March 14th to May 8th. The same sense in the death rate & recover rate. Therefore, this kind of graph shows the timeline analysis on the spread of COVID-19 by searching interaction. The searching is a very important interaction technique that can help us have a good understanding of each date.

3. Task Two

3.1 Analytical Visualization:

Figure 16

Figure 16 showed the audience a line chart of the number of British tourists visiting UK ports, week commencing 2 December 2019 to week commencing 30 March 2020. It is dedicated to presenting the current situation and future trends of the British tourism industry.

In **Figure 16**, we can propose a domain problem such as:
What are the changes in the number of people visiting the British port?

In **Figure 16**, there are 3 attributes in total:
One quantitative attribute: the number of visitors.
One categorical attribute: the type of the visitor.
One order attribute: date

The chart type of graph is the line chart and marked by points. Lines connect marks between them.

The graph has three channels:
- ✓ Aligned lengths to express quantitative value.
- ✓ Order by quantitative attribute
- ✓ The position of the Horizontal and vertical.

The interaction of the graph that is select categories.
When we change the selected time, the image will show different data. For instance, in **Figure 16**, we chose March 2nd and then the image will show the data of individual tourists and all tourists of that day.

In the week commencing 30 March 2020, the number of unique visits to UK ports fell by 4.9%. Total visits to UK ports decreased by 8.8% in the same period. It can be seen that the number of British tourists using the port is showing a decreasing trend. The UK tourism industry has been hit by the COVID-19 epidemic. I think there is still room for improvement in this picture. As the official website data of the British government stopped updating on March 23, we were unable to obtain more data. I hope we can get more data.

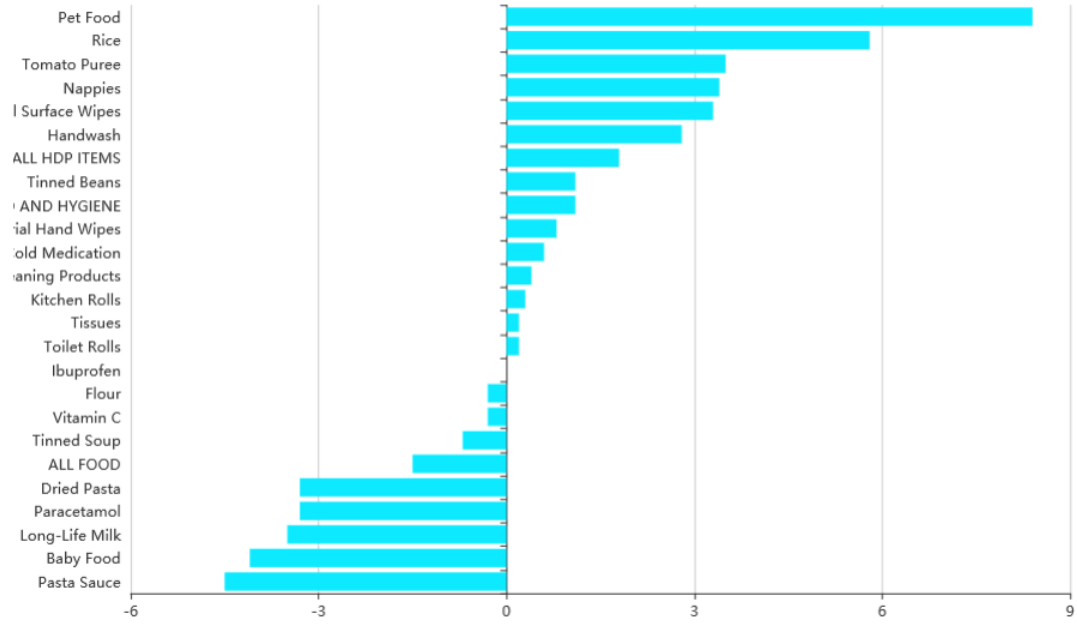

Figure 17

Figure 17 shows the percentage change of some items over the period week 3 to week 4.

We can see that:
Prices for the HDP basket increased by 1.8% from week 3 to week 4 with prices for all long-life food items decreasing by 1.5% and all household and hygiene items increasing by 1.1%. More specifically, on the one hand, prices for pet food and rice rose by 8.4% and 5.8% respectively. On the other hand, the prices of pasta sauce fell by 4.5%. We can get two attributes from **Figure 2** in total, one quantitative attribute and one categorical attribute. The quantitative attribute is the percentage change and the categorical attribute is the category of items.

The chart type of Figure 2 is bar chart and it has 3 channels. It uses lines as marks. Its visual channels are:

- ✓ Horizontal and vertical positions.
- ✓ It's ordered by quantitative attributes.
- ✓ It aligns lengths to express quantitative value.
- ✓ It uses the direction to represent positive or negative.

The interaction of Figure 2 is Select, as long as you put the mouse in the bar, the graph can show you its name and accurate percentage value. For instance, if I put the mouse over Per food, it can show me “Per Food, Percentage: 8.4%.

Therefore, we can see that as the epidemic gets worse, the prices of most essential foods and daily necessities are increasing; on the other hand, the prices of most unnecessary foods and goods are decreasing.

3.2 Questions of topic 3

1. What’s the line chart shows?

   In the week commencing 30 March 2020, the number of unique visits to UK ports fell by 4.9%. Total visits to UK ports decreased by 8.8% in the same period. The UK tourism industry has been hit hard, and unless the epidemic slows, the number of tourists will decrease.

2. What’s the impact of COVID-19 on the UK tourism industry?

   According to the forecast of the Royal Society of Arts and Crafts, in the blocked UK, the total number of jobs at risk is much higher in tourist-dependent areas such as Cornwall, the Lake District and Yorkshire. This is in line with the recent shocking estimates of the British Tourism Board, which estimates that the United Kingdom may lose more than 18 billion dollars by 2020, with fewer tourists flowing into the country ’s common hotspots (such as surfing beaches or forest hiking trails on the southwest coast) 22 million in Lakeland. In such an area, an alarming third of the work is at risk. Like the US, 80% of hotel rooms are currently empty, and the UK hotel industry is currently struggling to maintain a livelihood. The vast majority of British workers in the hotel, food, art, entertainment, and leisure industries have been fired. This year, towns that employ workers in these industries may be completely skipped. Only the COVID-19 crisis officially subsides, the UK tourism industry may have a chance to recover.

3. Describe the impact of COVID-19 on the UK economy

   As governments around the world seek to save lives by slowing down the spread of the coronavirus, the UK government is having to take dramatic measures, with big implications for economic activity. The United Kingdom declared a lockdown on March 23, 2020, to control the COVID-19 pandemic. This seems to have helped rein in the public-health crisis but is taking its toll on the economy.

   In a typical lockdown week in May 2020, the United Kingdom estimates that economic activity (as measured by GDP) is down roughly 30 percent from February 2020 levels. According to the Office of National Statistics, in the weeks from April

6 to 19, 2020, 23 percent of businesses had temporarily closed or paused trading, with around 60 percent of businesses that continued to trade reporting a fall in revenues.

Economic activity will recover as lockdown restrictions are lifted, but the speed and patterns are highly uncertain and will vary by sector. In McKinsey's midpoint scenario, UK GDP in 2020 is expected to shrink by 9 percent, overall.