CS 5630 Group Project Process Book

Coronavirus Disease 19 viewed as Chronology

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Github Repository

https://github.com/pemassi/dataviscourse-pr-covid-19

Overview and Motivation

This year (2020) has been greatly impacted by Coronavirus Diseases 19 (COVID-19) and even our life pattern is changed. This issue is a current hot potato for all generations and we could handle this much better if we prepare or acknowledge the disease before it spreads. Therefore, we thought it would be a great opportunity to understand the virus and check and follow its chronology by time.

We would like to back-track the virus each time that countries have most spread the virus and have been controlling well. Therefore we can learn which countries are handling the virus, a user is able to learn their system to control the virus effectively, and a user is able to scope the virus by time and a user can compare it with other social events.

Related Work

- By The New York Times

  https://www.nytimes.com/interactive/2020/us/coronavirus-us-cases.html

- By Google Covid-19 Statistics Dashboard

  https://www.google.com/search?q=coronavirus+map&oq=coronavirus+map&aqs=chrome

- By CoronaBoard from South Korea

  https://coronaboard.kr

- By WHO

  https://covid19.who.int/

Questions

- What is the best, efficient, and interactive way to display the data by timeline?
    - Solution:
        - Our initial thought was using a Bar chart to display live moving data by timeline. But we ended up deciding to use a map.
        - One thing we hesitate to use a map for is that many other sites are already displaying covid-19 data via map and we wanted to try something new.
        - However, we found out that there were no sites that used a map and displayed live moving and interactive data by a timeline within the map.
        - We concluded to use a map to display initial data to a user.

- What libraries do we need to use to display a map?
    - Solution:
        - We considered using 3rd party libraries to show a map.
        - We had a few options but decided to use a Google map.

- What data format do we need to use?
    - Solution:
        - There are several formats we considered such as CSV, JSON, etc.
        - We concluded that the JSON format will fit well with our project.

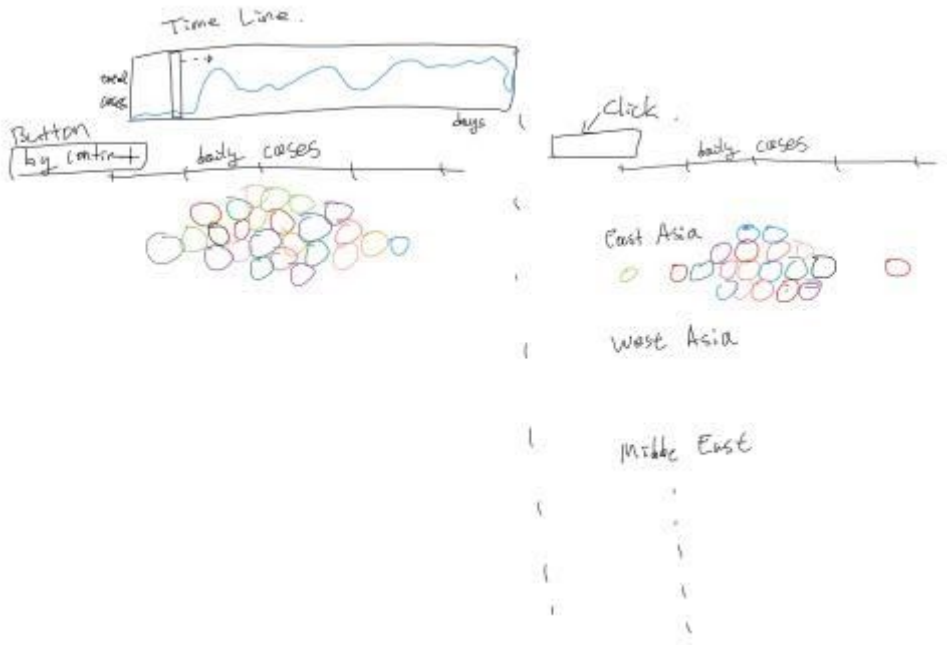
- Should we use live data?
    - Solution:
        - The data that we are using is too big (about 45MB) to get all the time. We thought it would take a lot of time to download depending on the Network speed. Therefore, we had decided to use static data.
        - Even if we decided to use the static data, we could give an option to the user to download the live data to visualize it.
- Showing only a new case is effective?
    - Solution:
        - In this case, a user may have a hard time to find which country is in the most critical situation. So we decided to make new categories which are New Case With Population and New Case with Population Density since high-density areas are more dangerous if the number of new cases is the same

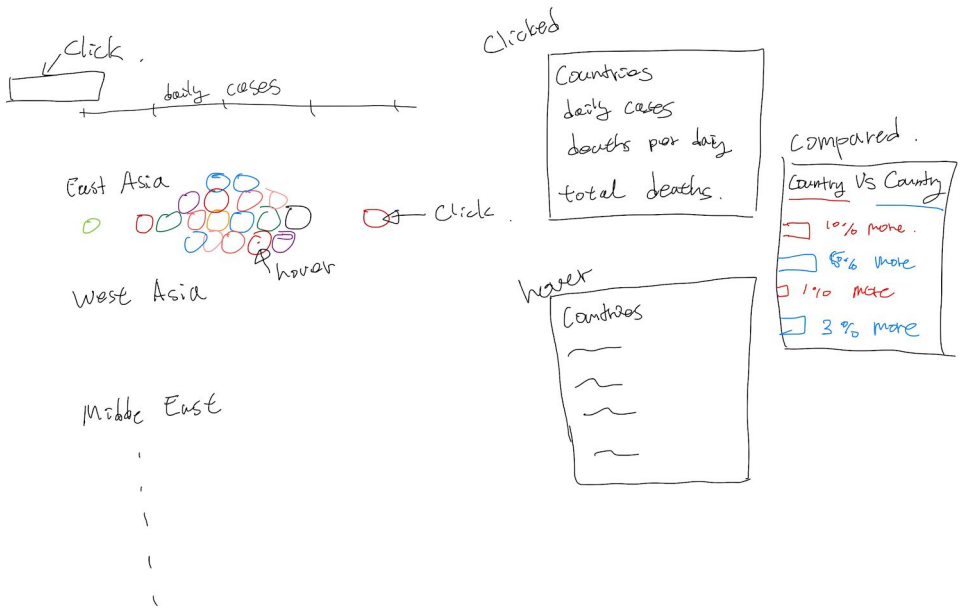
Exploratory Data Analysis

There are many visualizations that display Covid-19 data on the web, but We could not find well-designed or organized visualizations that show the history of Covid-19 from beginning to Today. Our design was inspired by a Youtube video that displays data within the timeline and thought it would be fun to show Covid-19 on the google map within the timeline and let users interact with data.

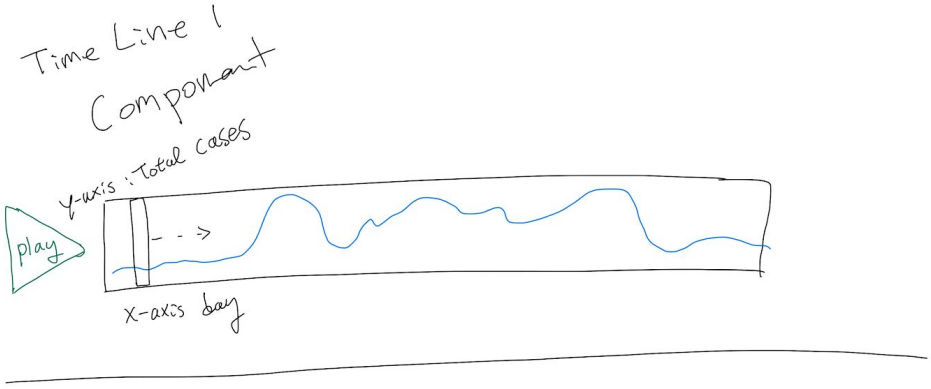
Design Evolution

- First Plan

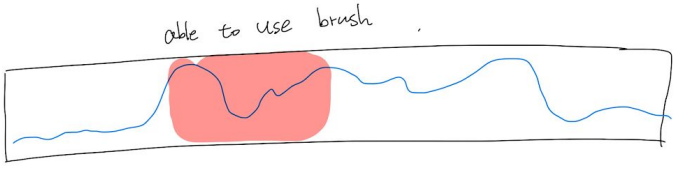



Click.
daily cases
East Asia
West Asia
hover
Click.
Middle East
Clicked
Countries
daily cases
deaths per day
total deaths.
Compared.
Country Vs Country
10% more.
5% more
1% more
3% more
Hover
Countries

-

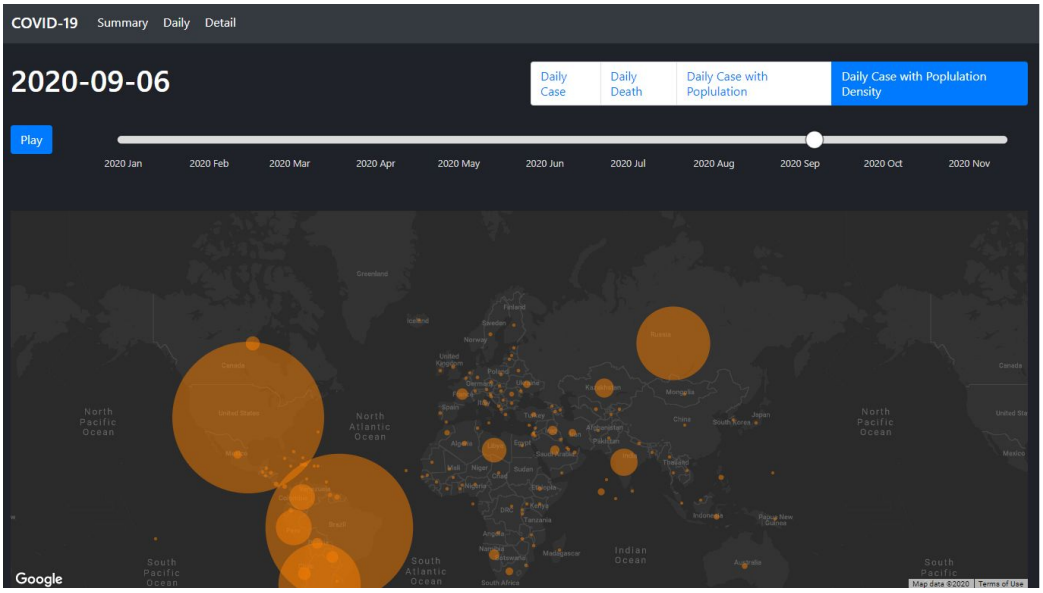

Time Line 1
Component
y-axis : Total cases
play
x-axis day

Timeline 2

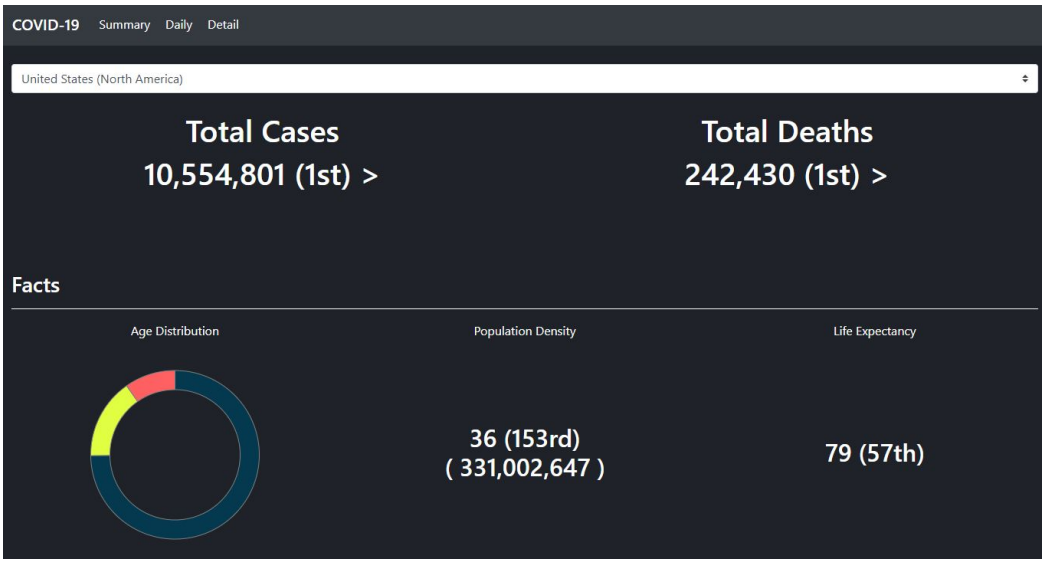

able to use brush.

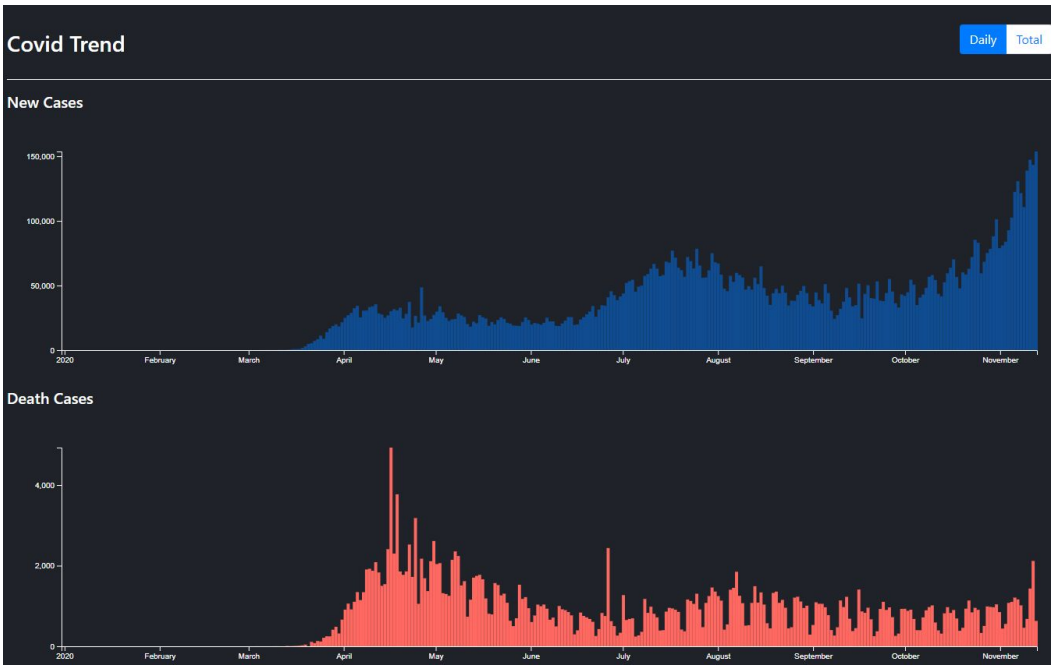
At first, shows the data cluster by daily cases and timeline. The X-axis of the timeline represents days of Covid-19 and the Y-axis for total cases per day. A user is able to click a play button that automatically moves the timeline indicator by days, and by clicking the graph the data will be displayed according to the selected date. A user can drag the timeline that allows selecting a certain time period that the user wants to scope more, and the data will be displayed according to the selected time period. When a user clicks the expansion button, the data displays by continents and it's also able to hover and get details. When a user clicks the data(country), the data pins at the top, and by hovering the day it shows its details and compares each component with clicked(pined) data.

- After
    - Daily Page



- Detail Page


COVID-19
Summary
Daily
Detail
United States (North America)
Total Cases
10,554,801 (1st) >
Total Deaths
242,430 (1st) >
Facts
Age Distribution
Population Density
36 (153rd)
(331,002,647)
Life Expectancy
79 (57th)


Covid Trend
Daily
Total
New Cases
150,000
100,000
50,000
0
2020
February
March
April
May
June
July
August
September
October
November
Death Cases
4,000
2,000
0
2020
February
March
April
May
June
July
August
September
October
November

Implementation

- Basic Setup, Google Map API

November 13th, 2020

Setup a development environment with Webpack. We were going to use Vue.js to control HTML DOM and Bootstrap for design. Also, we set up Google Map API.
We got the covid data which is in Geo Alpha 3, so we needed a resource to convert and track the data. We found a CSV file called “latlng.csv” on the internet which was open-source and it provides various information that we need such as country, numeric code, latitude, longitude, etc. Finally, we converted the CSV file to JSON format which allows us to access needed info.

- Data transform and Putting a mark on the map

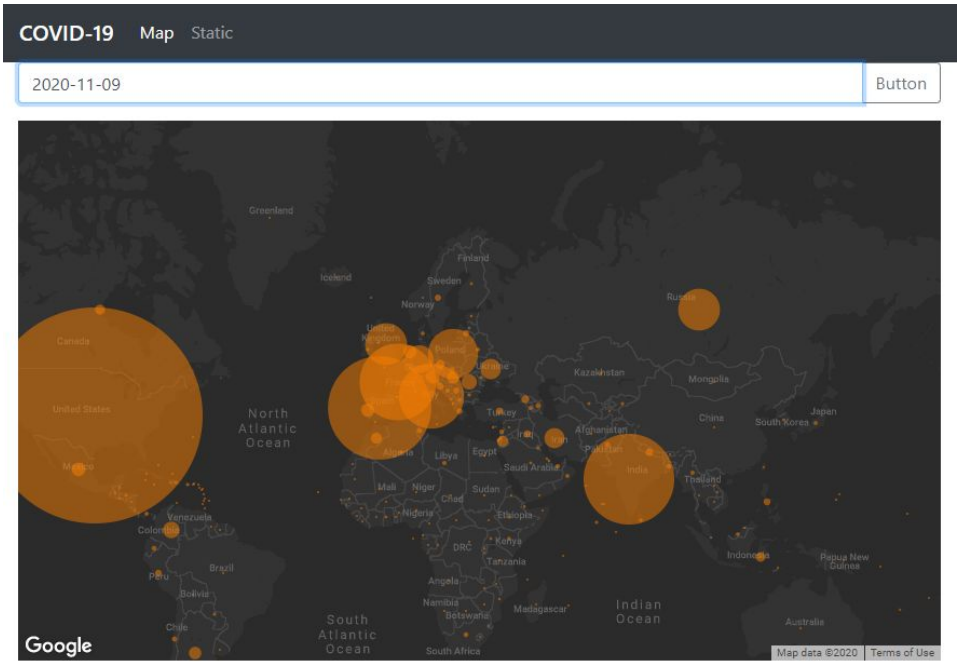
November 14th, 2020

We realized the COVID data that we got is not in an array format, so we converted it into the array format. Also, the data had date data but it was in an array format which is hard to find data with a date, so we converted it into a hash map. Finally, the original data did not have a position (latitude and longitude), so we combined it with the data we had found. Now, our data is ready to use for any visualization.

We had tried to visualize the new cases on November 13th.

- Add animation when the date is changed

November 14th, 2020



Add animation when the date is changed. It was more difficult than we expected because we need to deal with Google Maps API too. We decided when the animation is in action, disable the interaction with the map. This means in the future when we add a play button for a date, we need to disable interaction for the map.

- Setting a basic structure of the timeline.

November 14th, 2020

As we planned, after the map and mark covid-19 data according to the date, we set up a timeline bar that a user can navigate to a specific date according to total new cases in the date. We considered a line and bar chart and decided to use a bar chart instead of a line because it shows the data more dynamically than a line chart and a user can be easily navigated as well. We put a tooltip to increase the readability of the data. Now we can develop and improve this basic bar chart as a timeline and our next step will be to implement a brush and play button feature to play the dynamic visualizations chronologically.

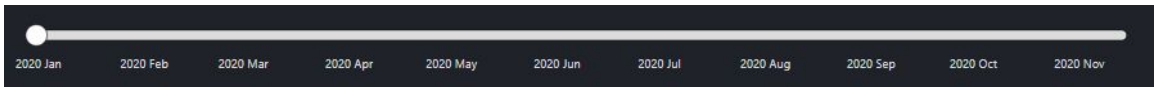
- TA meeting

November 21st, 2020

After the meeting, we thought, instead of showing the total case on the map with the mark, showing the total new case related to the county's population would be a better way to display the data. Also, we realized we need to think about storytelling.

- Working on Date Slider

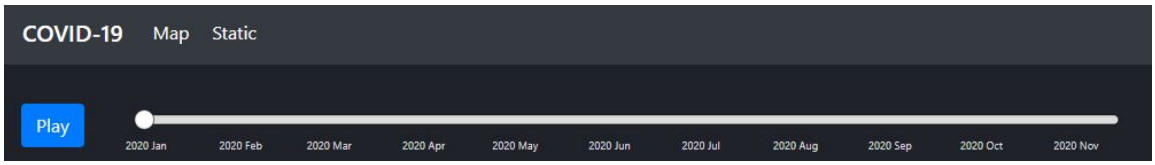
November 23rd, 2020

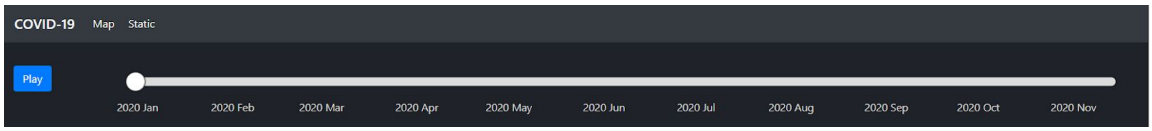


We have made a prototype date slider. This slider will give an event when a user changes the value to other components such as a map and charts.

- Responsive date slider and play button

November 24th, 2020

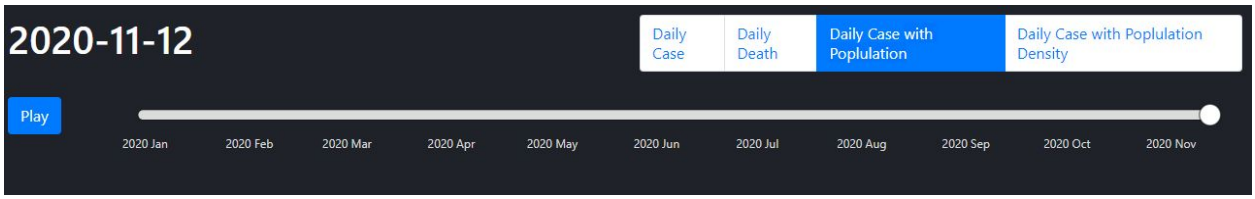




Now the slider responsively changes the size depending on the screen size. Also, we added the play button. When a user clicks the play button, the date slider moves every 0.25 secs. We are still looking for good cycle value.

- Add category

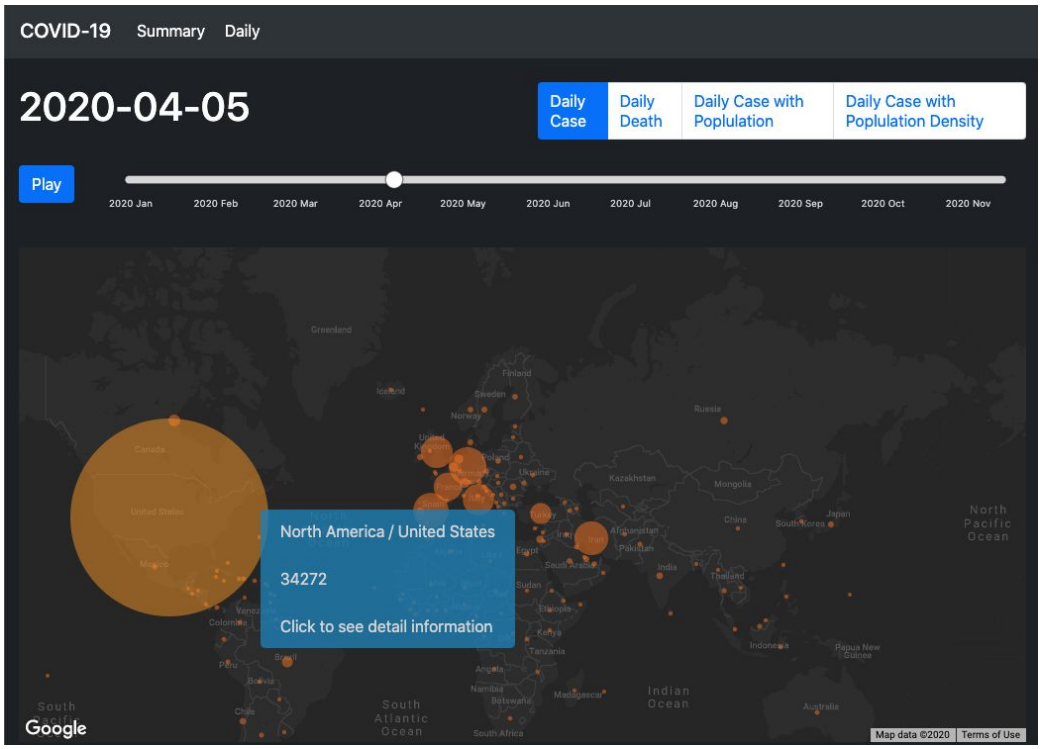
November 25th, 2020



We added multiple categories which are Daily Case, Daily Death, Daily Case With Population, and Daily Case with Population Density. With the only daily case, we were not able to catch which county is critical. This is because many new cases are more dangerous in proportion to the number of people. In addition, high-density areas are more dangerous if the number of new cases is the same. This was why we added categories.

- Add multiple menu and hovering on the map

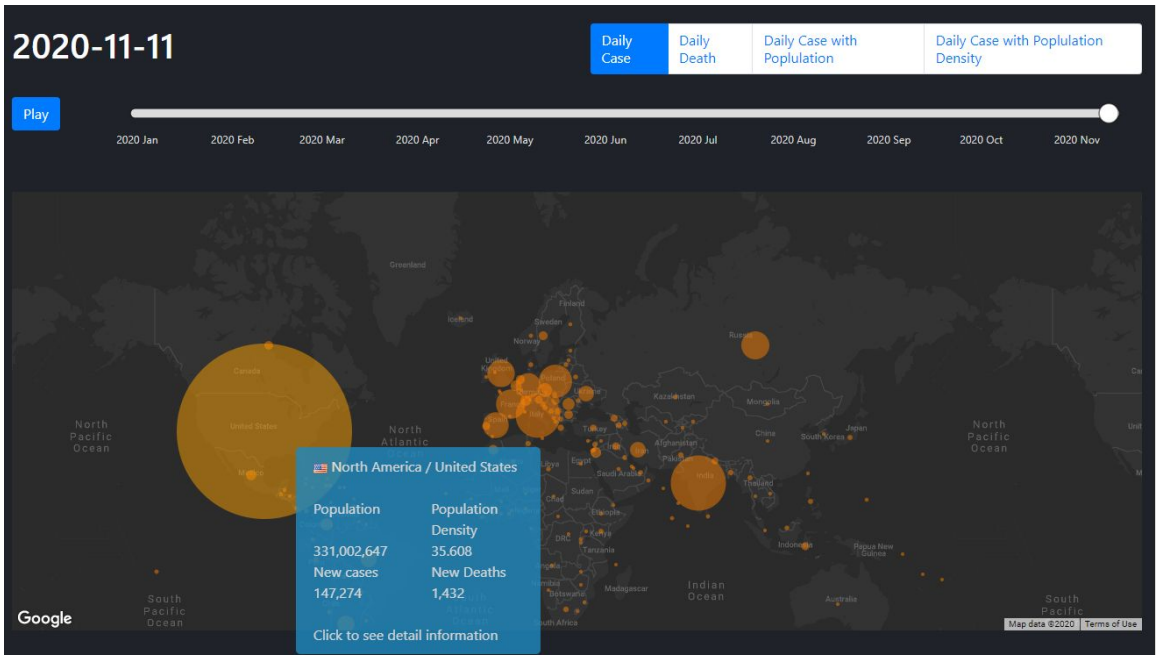
November 27th, 2020

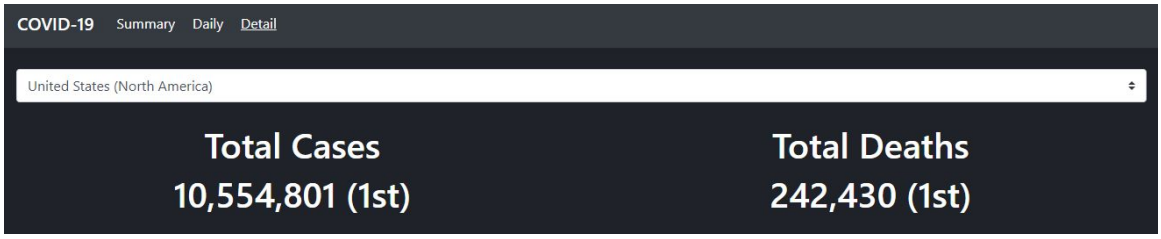


We decided to visualize the total and daily summary for the user, and we added a hovering feature on the map. It was quite difficult to add because there were multiple layers on the map, so these layers blocked getting hovering events from the circles. Also, we need to consider that the circle keeps changing when the user changes the category or changes the date. At the end, we thought it was because of z-index but we solved it with only one CSS code line which is about `pointer-events`.

- Start working on detail page

November 29th, 2020

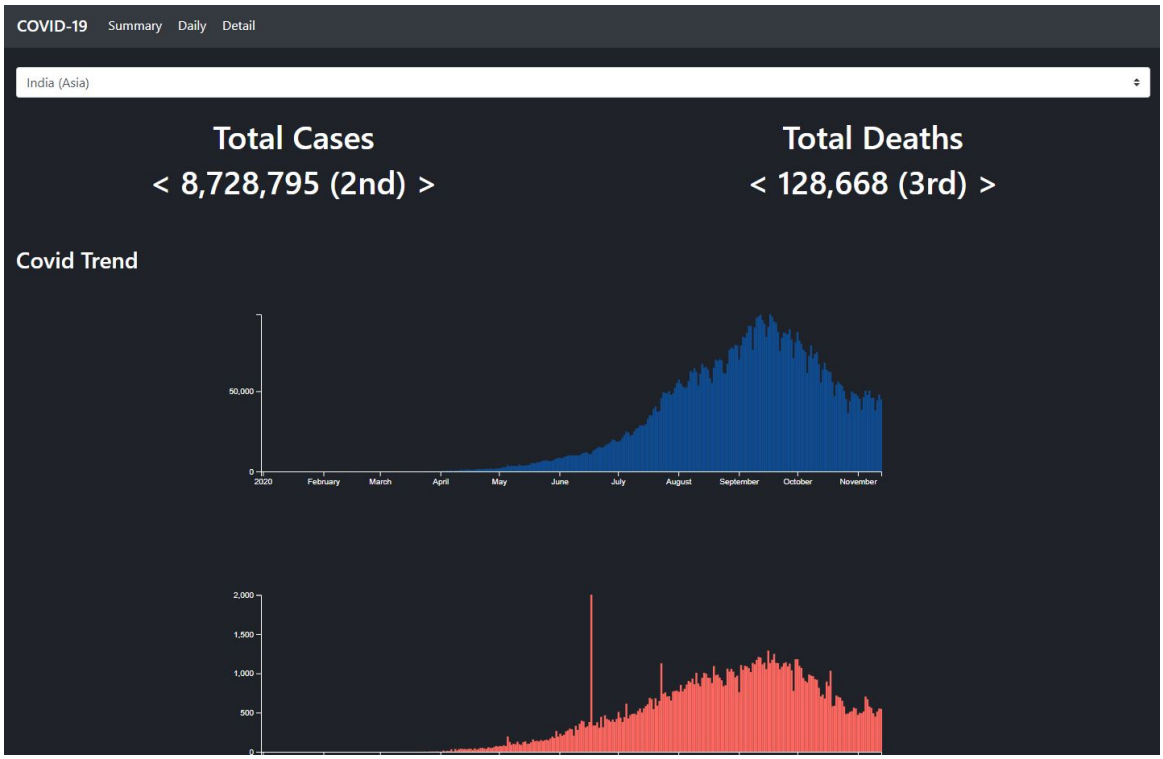




We thought showing total cases and deaths rank to the user would be great in the detail page, so we added it. We needed to rearrange our data to show ranks. Also, we edited detailed data on the map.

- Add Covid Trend graph and Browsing with ranking

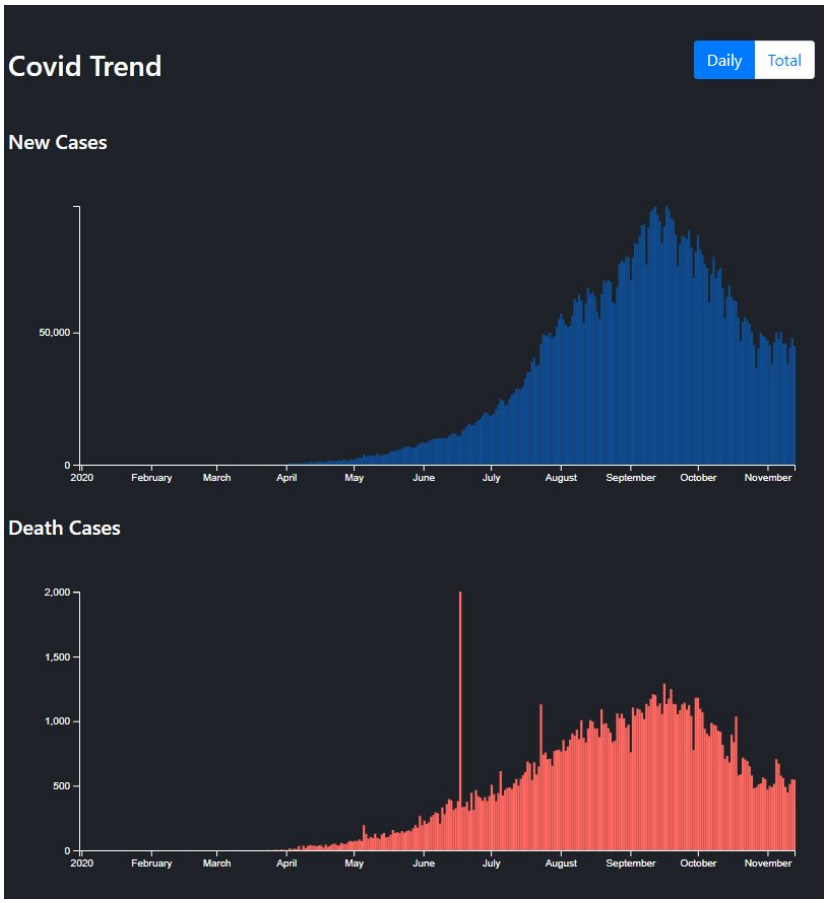
November 30th, 2020



Now a user is able to browse all countries with total cases and deaths ranking by clicking arrows. Also we visualized new cases and deaths by date in the graph.

- More data on Covid Trend and transition between daily and detail menu

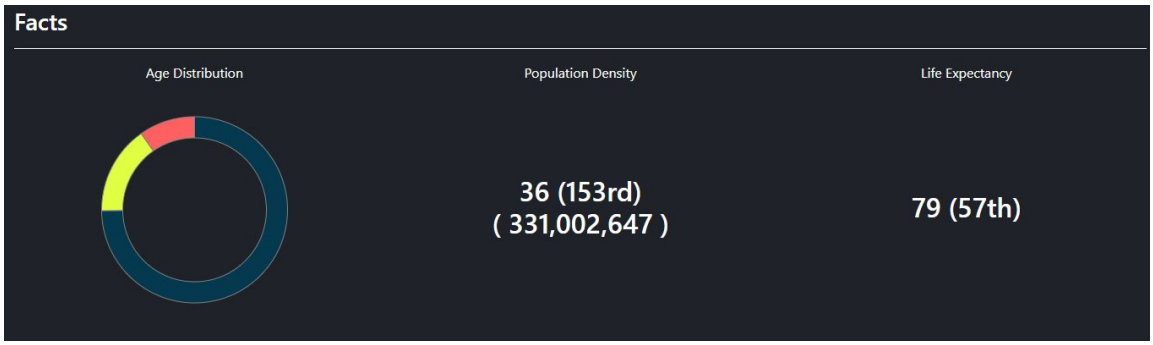
November 31th, 2020



Now a user can choose a category between Daily and Total on Covid Trend graph. Also now users can move smoothly between the daily and detail menu with clicking the graph bar or circle in the map when a user wants to see detailed information about that day or country. Furthermore, all visualizations are responsive on screen width.

- More information on Detail page

November 31th, 2020



We decided to show more information such as age distribution, population density and life expectancy because we thought this information affects to COVID new cases and deaths. We visualized age distribution with a pie chart.

Implemented front page that displays the accumulated total cases per each country. The color shows its continent and the size of the circle indicates total cases.

We used a d3-force feature that let users interact and play with the data. Users can get more info via tooltips and by clicking the component, it redirects to the detail page.

Evaluation

So far, during the class, for the homework, the data was always provided, so we did not need to find and process any data to visualize it. However, for the project, we needed to find reasonable data and process it into proper format to visualize it. This step took a lot of time than we expected which means it was hard to do. Even after formatting the data, it was difficult to decide what data we needed and had to display it and prioritized the data that would be the most important.

Our initial plan was showing a bar chart with a map and displaying the data on it. However, we realize that it would be great to put some interactions that users can play and scope the data. In the first main page we put a circle packaging visualization with d3-force that the user can interact with, and added a slider bar instead of a regular bar chart to navigate users to desired date. Furthermore, we decided to use a map instead of a bubble chart because we thought that users can easily understand which country is having difficulty with COVID-19. In addition, we put the time bar that can be played, so users can see the timeline by a day.

Finally we structured the web page to three parts such as summary, daily and detail, and tried to put the three components on the single page. But it didn't go well that we expected because all the three components are important and we wanted to emphasize each component and it would be better to split them instead combine all of them on a single page.

Reference

- COVID 19 Data

  https://ourworldindata.org/coronavirus-source-data

- Geo Alpha 3 code to latlng

  https://github.com/JulienGdnr/covid19/blob/master/latlng.csv