SENG3011 Final Report

Team API-demic : Covid Scout

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Github: https://github.com/z5208980/SENG3011_API-demic

Table of Content

1. Executive Summary

1.1 Background

A pandemic known as Covid-19 (Coronavirus) has risen as of 2020. There are thousands of information and new reports concerning the effects and numbers covid-19 has made. However, as reliable as those sources are, they are all over different websites and are usually hard to access. The main problem is not the vast information already out there, but the ease and simplification of portraying that information. Hence with Covid-Scout, is a web application that aims on bringing a solution that allows Australians and everyone to attain a vivid and insightful understanding about covid-19 on one website. Along with our API-demic API to provide users with the latest covid-19 new articles.

1.2 Project Vision

Our vision for this web application is to deliver the most reliable updates and real-time information about covid-19 around mainly Australians but for others as well. Our system mainly comprises two systems.

The first is our API. With our API we are able to deliver up to date new articles based on covid-19 around our area. This includes a database where our API will retrieve stored new articles scraped from H5N1.

The second is our Covid-Scout web app. With this users can get more information graphical and analytically. We aim for loose coupling in our back and frontend, ensuring that both systems load fast and are optimised for the frontend to quickly render for users.

1.3 Stakeholder

Our implementation relies on anyone who has access to a browser and internet. This includes anyone who is curious about the numbers of covid-19, analytical researchers who want statistics on Covid-19, news readers who would like to read Covid-19 from official sources to Australian where there is a dedicated page which provides details of covid-19 cases by locations.

2. Requirements

2.1 API

1.1. Periodically scrape from external website and store in Postgres Database
External Site (Datasource): https://crofsblogs.typepad.com/h5n1/

1.2. Get JSON formatted on reports given the optional parameters
   - 1.2.1. start_date
   - 1.2.2. end_date
   - 1.2.3. location
   - 1.2.4. key_terms
   - 1.2.5. limit

1.3. Get JSON formatted response on trending keywords on searches

2.2 Analytical Platform

1.4. Dashboard
   - 1.4.1. Display real time covid-19 cases, death, recover, active (automatically updated hourly)
   - 1.4.2. Display column chart of new covid-19 cases over time.

1.5. News
   - 1.5.1. Ability to generate latest articles from API from
     - 1.5.1.1. API-demics
     - 1.5.1.2. TODO

1.6. Live Geo HeatMap
   - 1.6.1. Display the latest Geo Heatmap of Covid-19 by country.
     - 1.6.1.1. Display by confirmed cases
     - 1.6.1.2. Display by deaths
   - 1.6.2. Display List of Covid-19 cases by country.

1.7. Data Center
   - 1.7.1. Global and selected country cases, death and recovery comparison.
   - 1.7.2. Display column charts of new cases of 10 most affected country
   - 1.7.3. Display Flatten Curve information
   - 1.7.4. Display General Covid-19 Advices

1.8. Australia
   - 1.8.1. Display Geo Heatmap Covid-19 of Australia cases by Local Government Areas.
     - 1.8.1.1. Available to New South Wales
     - 1.8.1.2. Available to Victoria
     - 1.8.1.3. Available to Queensland

        1.8.1.4. Available to Western Australia
    1.8.2. Display pie chart of cases by Australian states
    1.8.3. Display column chart of hospitalised by Australian states
    1.8.4. Display table of cases by LGA
        1.8.4.1. Available to New South Wales
        1.8.4.2. Available to Victoria
        1.8.4.3. Available to Queensland
        1.8.4.4. Available to Western Australia

3. Use Cases

3.1 Information about Covid-19 Australia

Use Case 1	User can view all Covid-19 information/statistic related to Australia
Actor	User
Pre condition	A user is interested in only covid 19 information related to Australia and is in the Australia page.
Post condition	Information on covid-19 related to Australia displayed.
Basic Flow	The user can view covid-19 information related to Australia by clicking and viewing the "Australia" page.
1	The user clicks "Australia" in the navbar
2	The system fetches all related json information for each state. A heatmap of Australia is displayed showing cases of covid-19 in certain areas.
3	The user is presented with a heatmap of Australia by available Local Government Areas (LGA), where they can click on selected (LGA) to obtain more information.

	A heatmap of Australia is displayed showing cases of covid-19 in certain areas.
4	The user can interact with zoom feature to scale the geochart for better view
5	The user can press moving down arrow to access more information
6	The user can interact with graphs and charts relating to the information by states. Includes: total confirmed, test conducted and hospitalised.
7	The user can view scrollable table of deaths that occurred in Australia due to Covid-19 and tablised LGA total positive for each available states

3.2 View New Articles

Use Case 2	Users can view a list of the latest new articles around the world.
Actor	User
Pre condition	A user would like to read and be updated to date with covid-19 news and is in the news page.
Post condition	A list of new articles from the past week is displayed with a link to the source.
Basic Flow	Users can view a list of new articles from the past week, after clicking the news in the navbar.
1	User is at the new page
2	The system fetches from two APIs, a list of new articles from today until last week and displays it on the page
3	The user can click on the header of new articles if they would like to read the rest of the article.

Alternative Flow 1A	The user can search new articles from a time period, either resulting in the request results or no articles from that period.

3.3 Live Dashboard

Use Case 3	Users can view the latest Covid-19 cases and information about the current coronavirus situation
Actor	Users
Pre condition	A user would like to display a live number statistic of Covid-19 and is in the dashboard page.
Post condition	Users are displayed with the latest updates on confirmed, death, recovered and active number of covid-19
Basic Flow	The user desired to display or view latest covid-19 cases globally
1	On load, the backend fetches Covid-19 the latests updated information from an API and process the data
2	The user is displayed a table of numbers including confirmed cases, deaths, recovered and active and a column graph indicating the growth of new confirmed cases daily.

3.4 Global Heatmap

Use Case 4	Users can view an interactive geochart heatmap of covid-19 cases and deaths by country.
Actor	Users

Pre condition	A user is interested in the latest count of covid-19 deaths and cases by country and is in the heatmap page.
Post condition	An information panel about each country's cases and a heat map is displayed
Basic Flow	User can interactive will the heatmap and is provided a list of information about covid-19 for each country
1	The user clicks "Global Heatmap" in the navbar
2	The system fetches a large geojson of the world map and json of covid-19 by country. The two are processed so that their country name matches.
3	The user is able to click cases or death buttons, for the frontend to update the heatmap and an ordered list of covid-19 countries by cases or deaths respectively.
4	The user can interact with zoom feature to scale the geochart for better view
5	The user can hover over a country to view statistics about the country.
6	The user is presented with an ascending order list of confirmed cases by country which can be clicked to expand more information.

3.5 Data Center

Use Case 5	Users can analyse covid-19 data through the use of graphs on a specified country or globally
Actor	User
Pre condition	A user is interested in analysing covid-19 numbers in a more easier format

Post condition	Graphs based on cases confirmed, deaths and recovered provided for a specified country or globally
Basic Flow	The user can analyse covid-19 data by clicking and viewing the “data centre page”
1	The user clicks “Data Centre” in the navbar
2	The user can select which country they want to view in a dropdown box provided
3	The user is presented with graphs and numbers on confirmed cases, recovered and deaths and how much have been gained and recovered daily for their specified country and globally
4	The user can hover over a specific part of the graph to display the exact number at that point.
5	The user can also scroll down to view top 10 countries affected by covid-19plus their own graphs and interact with their graphs to view new cases confirmed on a particular day.
6	Users can scroll down to advice and facts and mythbusters to view advice and mythbusters.

4 Software Architecture

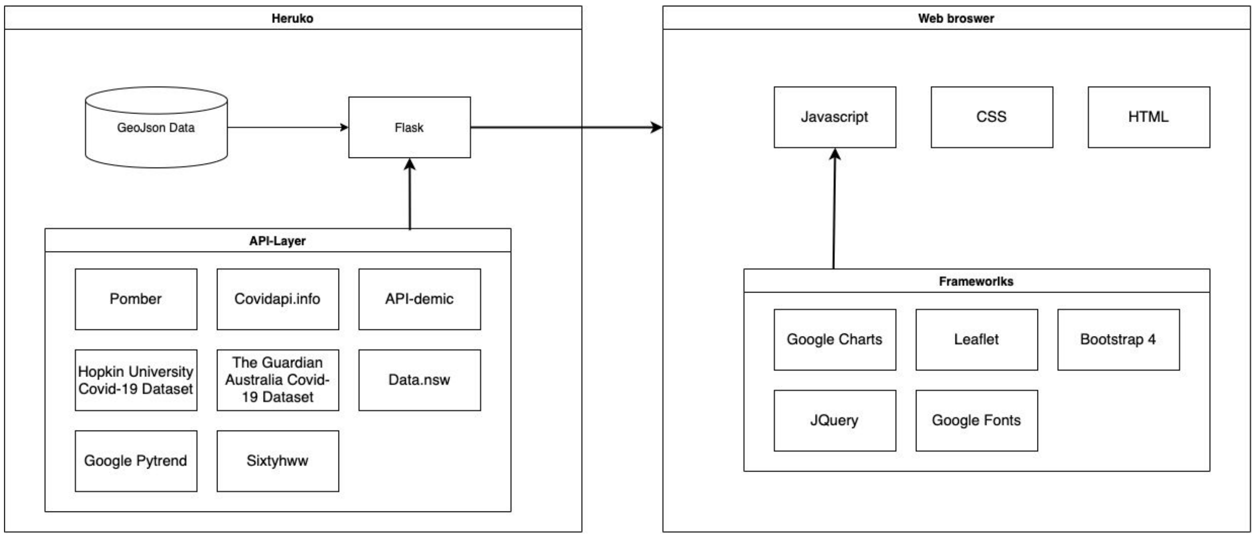


Figure 4.1 Software Architecture

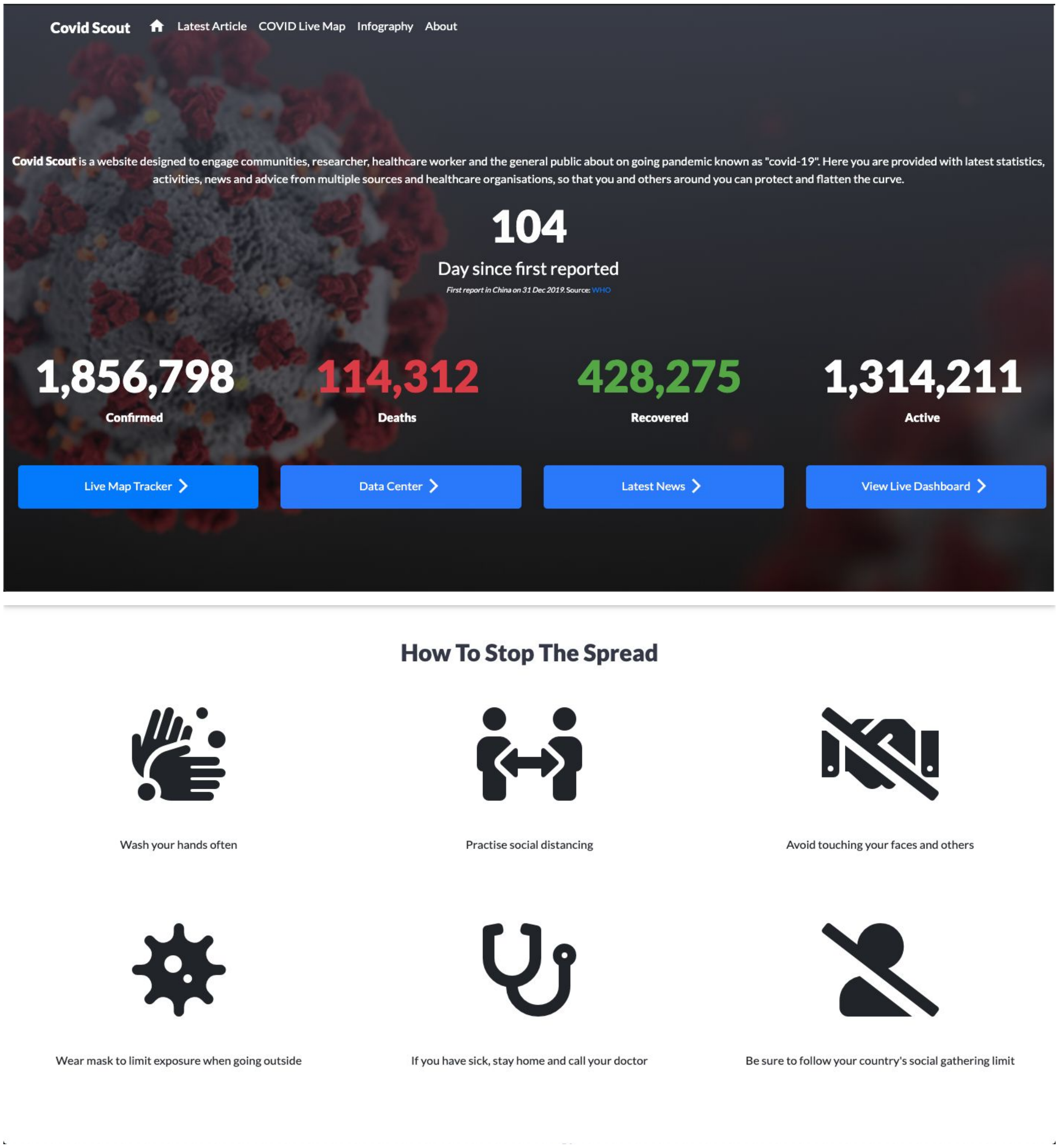
Our software architecture consists of a front and back end. The frontend is used for rendering dynamic information through visualisation charts whilst the backend is processing the API and cleaning the JSON for the frontend output.

4.1 Front End

In the application technical architecture, the frontend is written in HTML5, CSS3, JS. Frameworks like Bootstrap 4, allowed us to speed up our development, whilst maintaining consistency in our code and providing a responsive and clean UI. This meant that we could focus on making sure our JSON was valid in JS. JS was our chosen language as it provided the functionality of extending a webpage and being able to make small client side calculations such as rates and difference of data. Also in order to use Google Charts and Leaflet, the language must be in JS, allowing us to create dynamic and visualise our data. With the addition of jQuery, it allowed for succinctness and convenience.

4.1.1 Homepage

When users use our web application, they will be presented with our homepage. It contained the purpose of Covid-Scout, along with information and cases on covid-19. These information are extracted from a JSON response given from an API call. Downward the page, there are ways to protect yourself and statistics and insight information about Covid-19 in Australia.



Covid Scout is a website designed to engage communities, researcher, healthcare worker and the general public about on going pandemic known as "covid-19". Here you are provided with latest statistics, activities, news and advice from multiple sources and healthcare organisations, so that you and others around you can protect and flatten the curve.

104
Day since first reported
First report in China on 31 Dec 2019. Source: WHO

1,856,798	114,312	428,275	1,314,211
Confirmed	Deaths	Recovered	Active

How To Stop The Spread

Wash your hands often

Practise social distancing

Avoid touching your faces and others

Wear mask to limit exposure when going outside

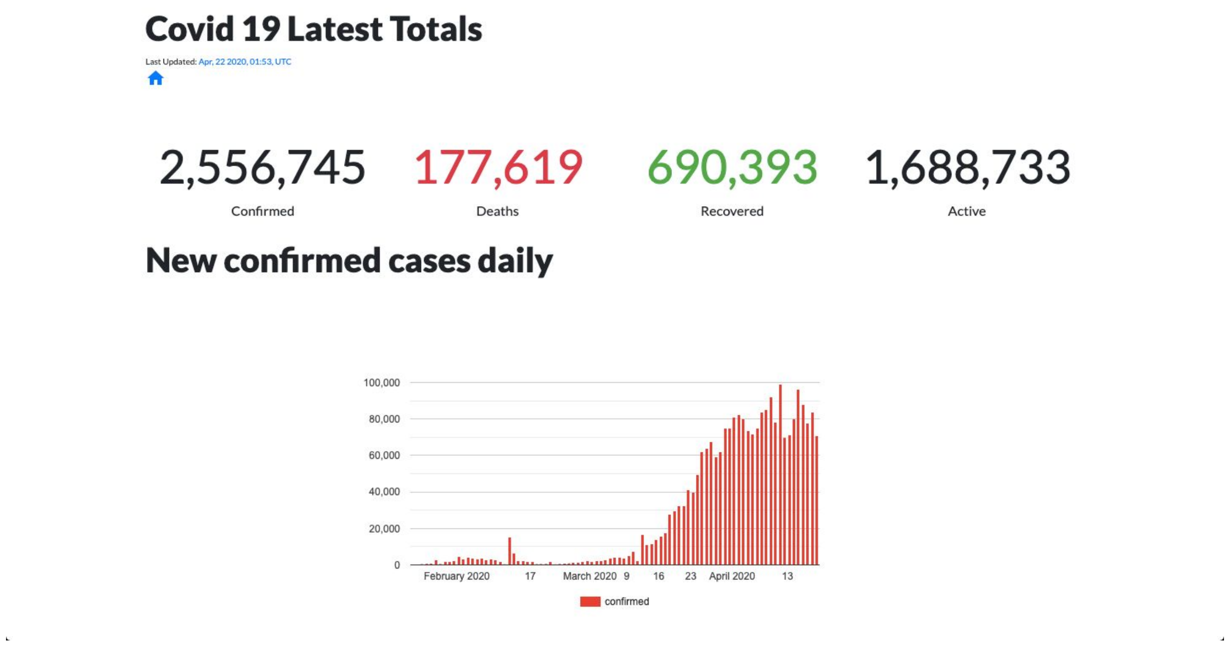
If you have sick, stay home and call your doctor

Be sure to follow your country's social gathering limit

Images 4.1.1 Homepage of covid-scout

4.1.2 Dashboard

The dashboard is a page for allowing users to display the global cases of Covid-19 and share a live update. The information is given from a API response and a time series that is used to calculate the new confirmed cases daily.



Covid 19 Latest Totals

Last Updated: Apr, 22 2020, 01:53, UTC

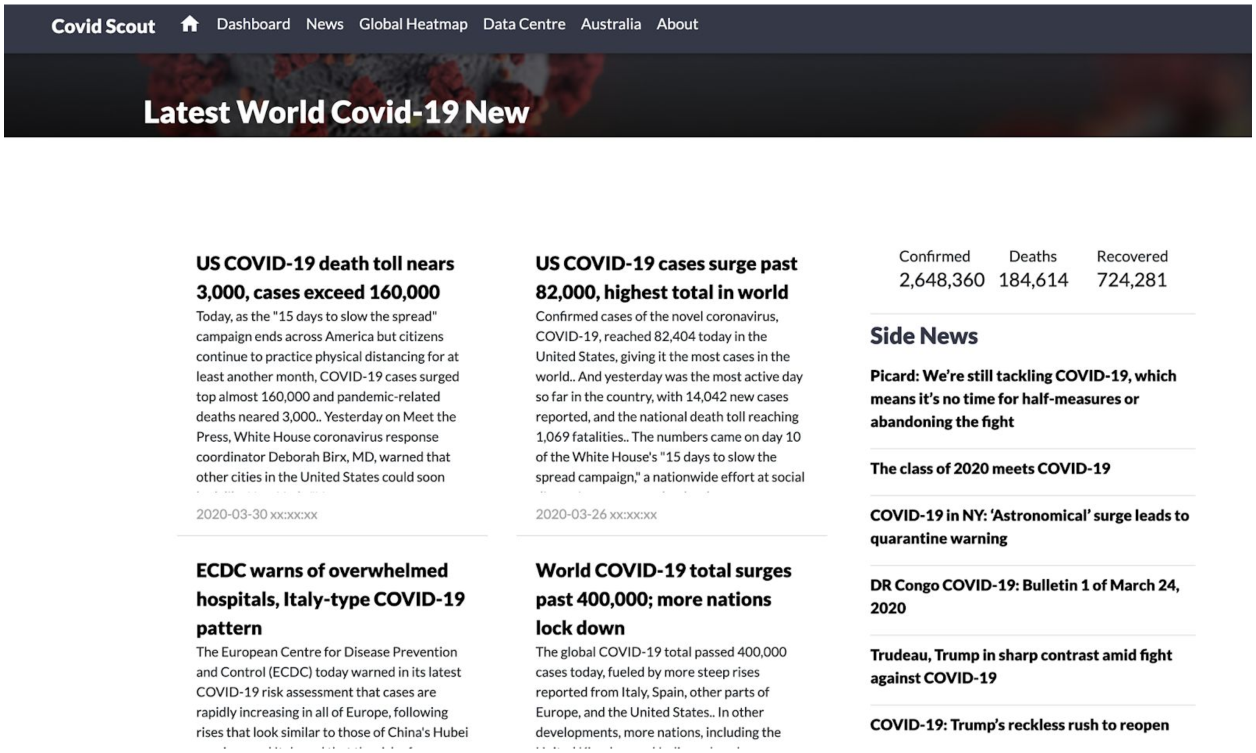
2,556,745	177,619	690,393	1,688,733
Confirmed	Deaths	Recovered	Active

New confirmed cases daily

Image 4.1.2 Dashboard

4.1.3 News

Latest articles are listed in this page from latest to earliest in format header, summary then date. The articles are pulled from our own team's api and when the articles header is clicked, the user will be redirected to the article. On the top right hand of the page, there is a table displaying the total number of confirmed cases, deaths recovered globally and this data is pulled from corona-virus-stats api. Under this is the side news section which contains the latest articles pulled from code ”SIXTYHWW”'s team API. This is displayed in a header only format and when the link is clicked, the page will be redirected to the article.



Latest World Covid-19 New

US COVID-19 death toll nears 3,000, cases exceed 160,000

Today, as the "15 days to slow the spread" campaign ends across America but citizens continue to practice physical distancing for at least another month, COVID-19 cases surged top almost 160,000 and pandemic-related deaths neared 3,000.. Yesterday on Meet the Press, White House coronavirus response coordinator Deborah Birx, MD, warned that other cities in the United States could soon

2020-03-30 xx:xx:xx

US COVID-19 cases surge past 82,000, highest total in world

Confirmed cases of the novel coronavirus, COVID-19, reached 82,404 today in the United States, giving it the most cases in the world.. And yesterday was the most active day so far in the country, with 14,042 new cases reported, and the national death toll reaching 1,069 fatalities.. The numbers came on day 10 of the White House's "15 days to slow the spread campaign," a nationwide effort at social

2020-03-26 xx:xx:xx

ECDC warns of overwhelmed hospitals, Italy-type COVID-19 pattern

The European Centre for Disease Prevention and Control (ECDC) today warned in its latest COVID-19 risk assessment that cases are rapidly increasing in all of Europe, following rises that look similar to those of China's Hubei

World COVID-19 total surges past 400,000; more nations lock down

The global COVID-19 total passed 400,000 cases today, fueled by more steep rises reported from Italy, Spain, other parts of Europe, and the United States.. In other developments, more nations, including the

Confirmed	Deaths	Recovered
2,648,360	184,614	724,281

Side News

Picard: We're still tackling COVID-19, which means it's no time for half-measures or abandoning the fight

The class of 2020 meets COVID-19

COVID-19 in NY: 'Astronomical' surge leads to quarantine warning

DR Congo COVID-19: Bulletin 1 of March 24, 2020

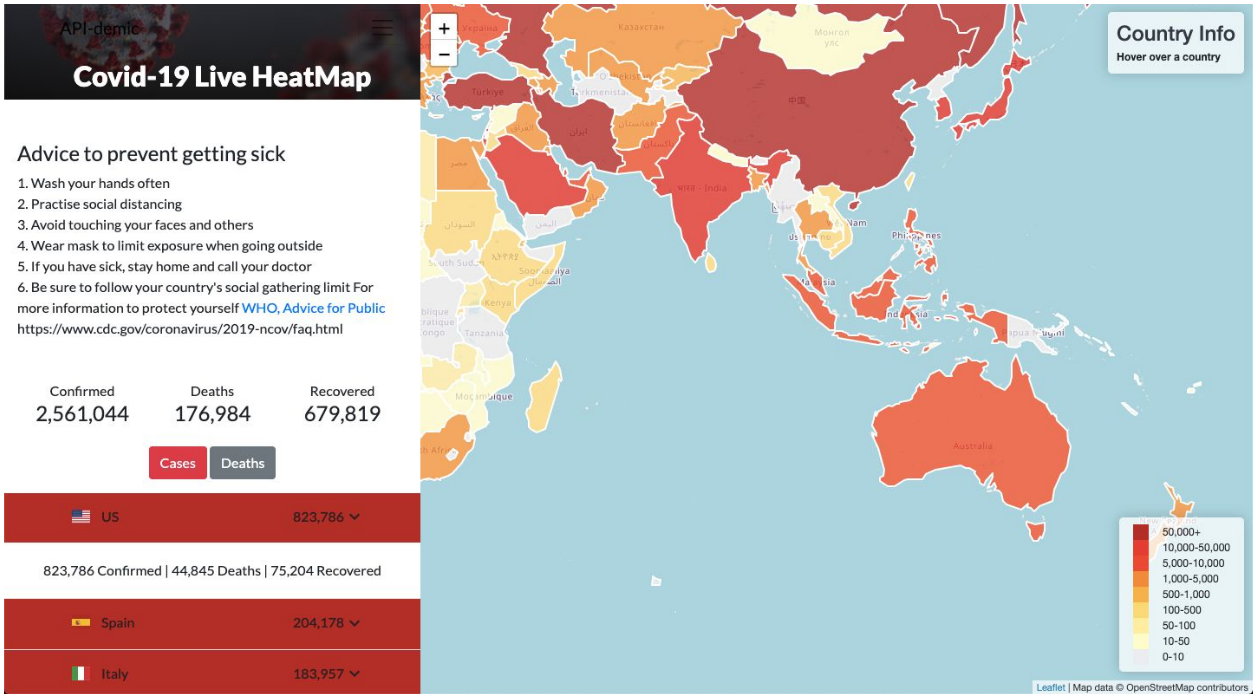
Trudeau, Trump in sharp contrast amid fight against COVID-19

COVID-19: Trump's reckless rush to reopen

Image 4.1.3 News page

4.1.4 Covid-19 Live Map

Our interactive live geo heat map using Leaflet to load the geoJson. The dataset used comes from cssegisanddata covid-19 csv. The page is divided into two parts. The left side contains relevant information on covid-19 global case, as well as a list of cases by country sorted by descending order and are colourised to match the severity of covid-19 cases.. The listed countries are collapsibles, where users can click to access more information about the selected country. There is also the ability to toggle the death cases, dynamically changing the geo heatmap to correspond to the deaths numbers


API-demic

Covid-19 Live HeatMap

Advice to prevent getting sick

1. Wash your hands often
2. Practise social distancing
3. Avoid touching your faces and others
4. Wear mask to limit exposure when going outside
5. If you have sick, stay home and call your doctor
6. Be sure to follow your country's social gathering limit For more information to protect yourself WHO, Advice for Public https://www.cdc.gov/coronavirus/2019-ncov/faq.html

Confirmed	Deaths	Recovered
2,561,044	176,984	679,819

Cases Deaths

US 823,786

823,786 Confirmed | 44,845 Deaths | 75,204 Recovered

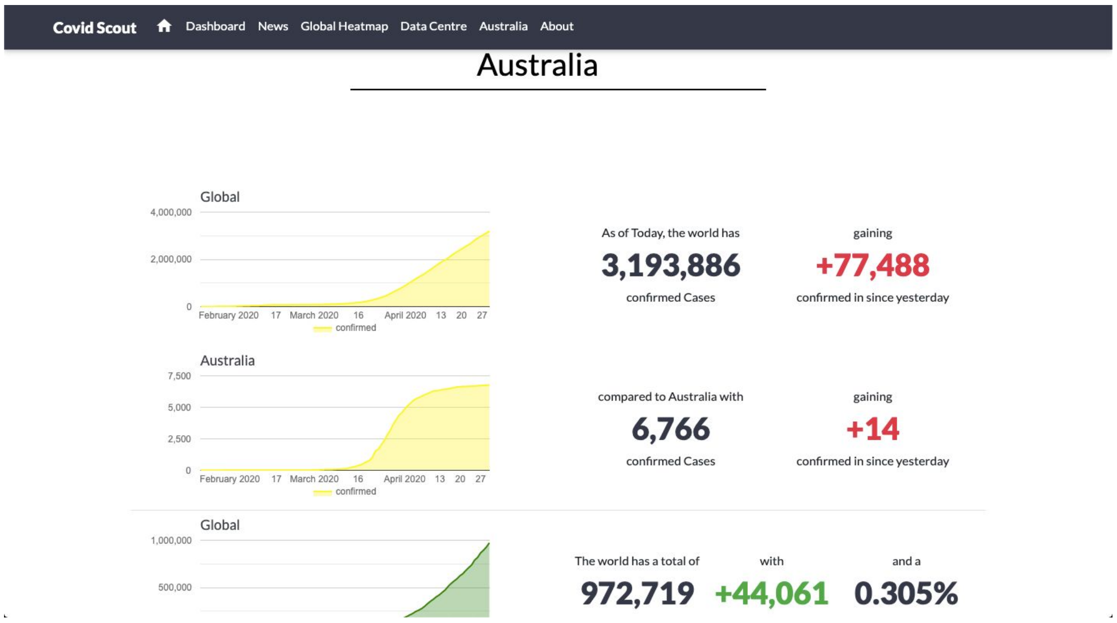
Spain 204,178

Italy 183,957

Image 4.1.4 Heat map page

4.1.5 Data Center

The data center is there for users to get a visual understanding about Covid-19. It contains a search feature that allows users to select a given country to compare to the global cases. Following down the page, users can read about the situations of Covid-19 and how the most affected countries curves are trending. If users decide to read more on how to protect themselves during the pandemic, there is also a myth and advice section, followed by trusted links to official government and organisation website


Covid Scout Dashboard News Global Heatmap Data Centre Australia About

Australia

As of Today, the world has 3,193,886 confirmed Cases gaining +77,488 confirmed in since yesterday

compared to Australia with 6,766 confirmed Cases gaining +14 confirmed in since yesterday

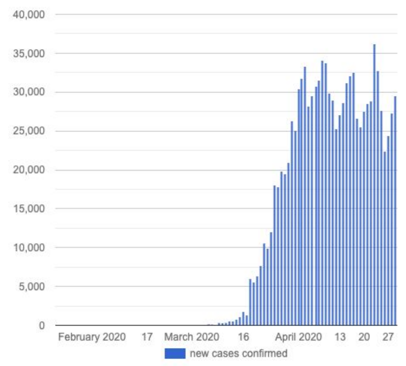
The world has a total of 972,719 with +44,061 and a 0.305%

s.

Daily new confirmed cases [10 Most Affected]

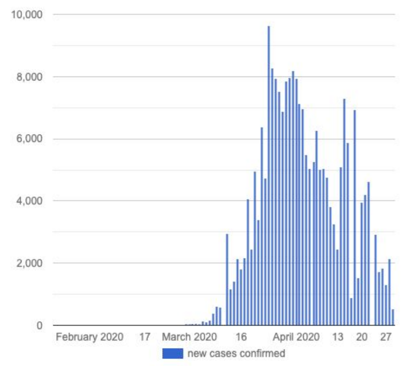
US

US's first case was report 99 days ago on 23/01/2020. Currently US has reported 1069424 cases and 62996 deaths



Spain

Spain's first case was report 89 days ago on 02/02/2020. Currently Spain has reported 213435 cases and 24543 deaths



Italy

Italy's first case was report 90 days ago on 01/02/2020. Currently Italy has reported 205463 cases and 27967 deaths

United Kingdom

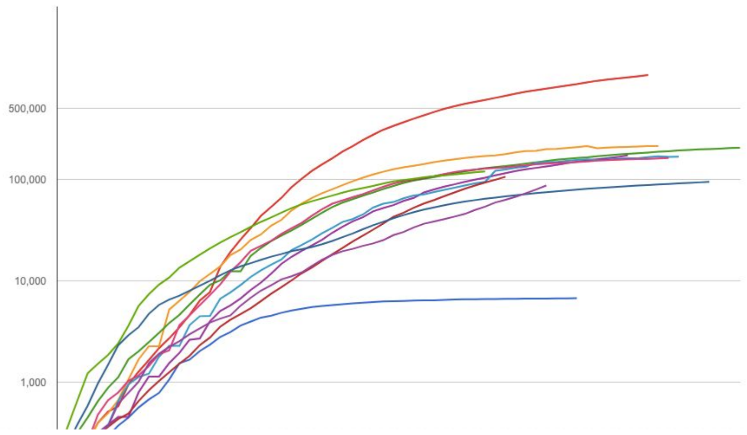
United Kingdom's first case was report 90 days ago on 01/02/2020. Currently United Kingdom has reported 172481 cases and 26842 deaths

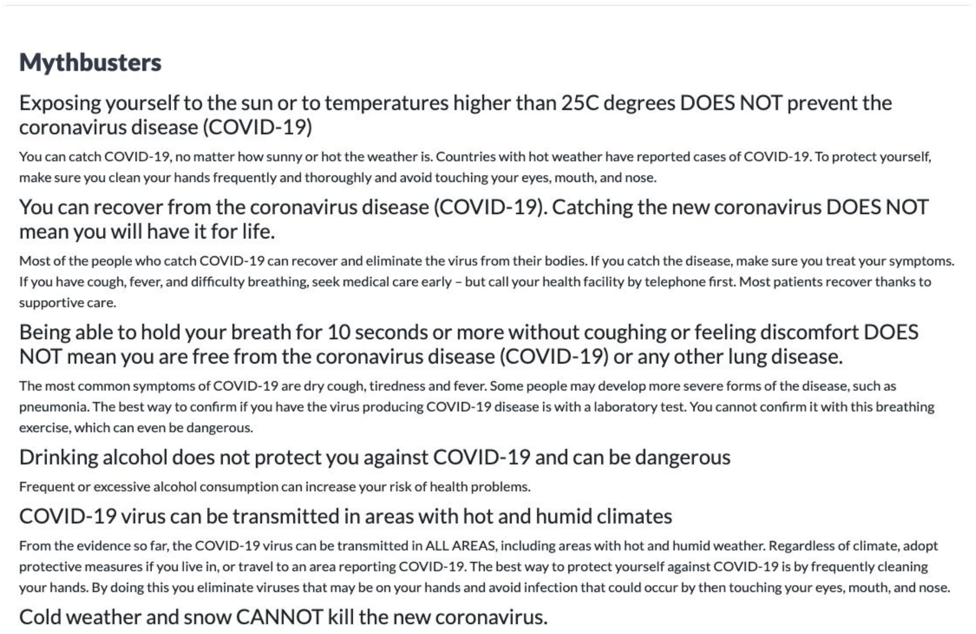
Advice and Resources

Flatten The Curve

Click to view Gif

10 countries most affected + selected country





Mythbusters

Exposing yourself to the sun or to temperatures higher than 25C degrees DOES NOT prevent the coronavirus disease (COVID-19)

You can catch COVID-19, no matter how sunny or hot the weather is. Countries with hot weather have reported cases of COVID-19. To protect yourself, make sure you clean your hands frequently and thoroughly and avoid touching your eyes, mouth, and nose.

You can recover from the coronavirus disease (COVID-19). Catching the new coronavirus DOES NOT mean you will have it for life.

Most of the people who catch COVID-19 can recover and eliminate the virus from their bodies. If you catch the disease, make sure you treat your symptoms. If you have cough, fever, and difficulty breathing, seek medical care early – but call your health facility by telephone first. Most patients recover thanks to supportive care.

Being able to hold your breath for 10 seconds or more without coughing or feeling discomfort DOES NOT mean you are free from the coronavirus disease (COVID-19) or any other lung disease.

The most common symptoms of COVID-19 are dry cough, tiredness and fever. Some people may develop more severe forms of the disease, such as pneumonia. The best way to confirm if you have the virus producing COVID-19 disease is with a laboratory test. You cannot confirm it with this breathing exercise, which can even be dangerous.

Drinking alcohol does not protect you against COVID-19 and can be dangerous

Frequent or excessive alcohol consumption can increase your risk of health problems.

COVID-19 virus can be transmitted in areas with hot and humid climates

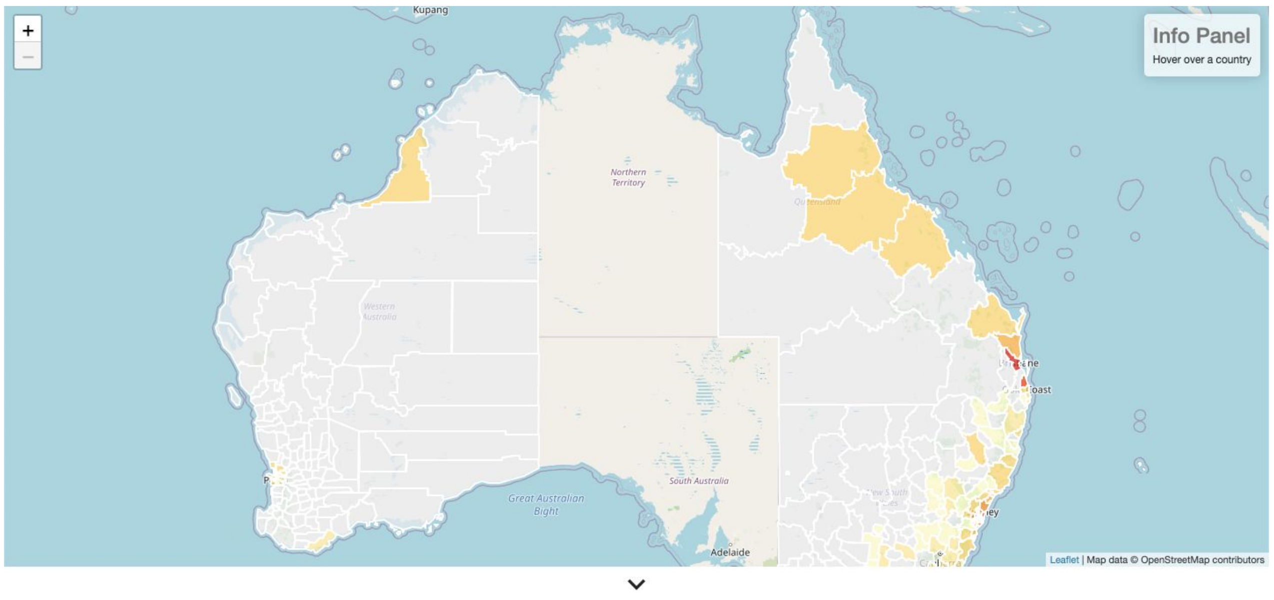
From the evidence so far, the COVID-19 virus can be transmitted in ALL AREAS, including areas with hot and humid weather. Regardless of climate, adopt protective measures if you live in, or travel to an area reporting COVID-19. The best way to protect yourself against COVID-19 is by frequently cleaning your hands. By doing this you eliminate viruses that may be on your hands and avoid infection that could occur by then touching your eyes, mouth, and nose.

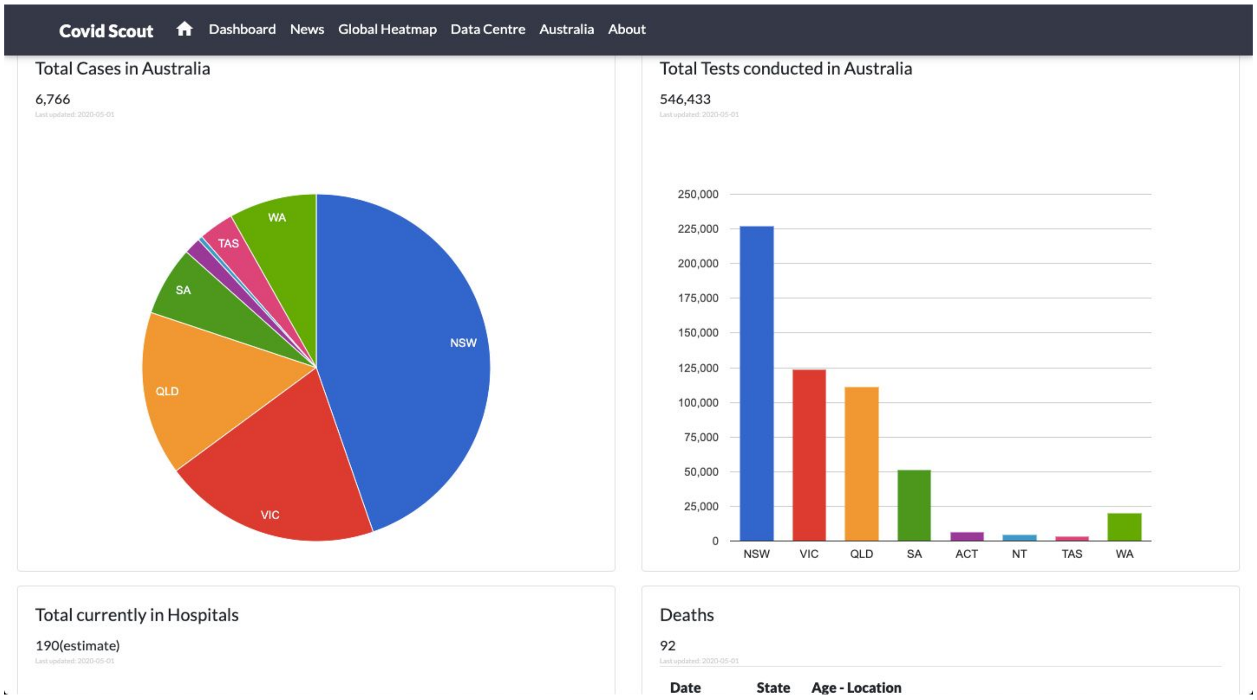
Cold weather and snow CANNOT kill the new coronavirus.

Images 4.1.5 Data center page

4.1.6 Australia

This page is focused for Australians but can be for anyone who wants to know in depth details about covid-19 in Australia. The page consist of the heatmap of covid-19 cases in Australia by Local Government Area (LGA). The arrow down button will href users down the page to information cards, displaying charts of Australia and tables displaying the number of cases in different states by their LGA.





Images 4.1.6 Australia Heatmap and Charts

4.2 Back End

Our backend is written in both Python. Python was also used as our Backend for the API due its ease of creating dynamic url routing and to perform some server side data extraction. Flask was our main framework for developing Covid-Scouts' backend. With this, we could easily call APIs using Python and manipulate the JSON and dataset in which Flask calls and redirects the requested URL response with the JSON objects. This architecture meant that there was low coupling from the web browser and the API calling.

However parsing json objects to JS for rendering was risky due to encoding values to prevent any escape characters. Hence along with Flask, another important library was Jinja; a python template engine used to parse data from backend to frontend, so that JS and Jquery could render HTML. This was important because our web app is based on the backend fetching JSON, manipulating the data to fit our requirements and passing it on as a string to the frontend. Hence it was crucial to have a connection. An example of this is Python editing Local Government Area (LGA) values from a dataset to match LGA in the GeoJson to ensure that no problem arises when Jinja loads those dataset in JS so that Leaflet in the frontend can render.

5. Analytical Platform Design

5.1 API

Our analytical platform consists of many different API. Since we didn't have time to scrape datasets, integrate to our API, we decided to just obtain data from other sources.

5.1.1 Covid-19 APIs

We used many external APIs to obtain our covid19 data. Since there was no API that contained all our requirements. We have to find different types. APIs such as,

- Covidapi.info, an API that contains timeseries of covid-19 cases by country
- Pomber, an API that contain timeseries covid-19 of the world
- Data.nsw, an API that provides the latest confirmed cases in Australia.

Along with the APIs information that couldn't be retrieved by an API was scraped at our backend, using reliable datasets from,

- John Hopkin University, latest covid-19 cases
- The Guardian Australia, in depth information about covid-19 cases, death in Australia.

5.1.2 New Articles API

For new reports in our news page of our web app, we used two APIs,

- API-demic, our API for obtaining H5N1 news reports
- Sixtyhww, another team's API for obtaining news reports sourced from Global incident map
- Google Trends, using an API from pytrend to obtain search terms for uses

Both the news APIs allowed us to combine our JSON which made it easy for us to render onto the DOM. Since our web app is based on updated and latest covid-19 news, our parameters were the same in terms of the time period and key_terms.
The Google Trends API was a minor feature in the news articles pages to make use of the most frequent searches made by people around the world. The purpose of including this was to give users an idea of what others are looking for in time of the pandemic.

5.2 Graphing Algorithm

Since our analytical platform aims for a user friendly design, it is important that we display information in a form that is simple and doesn't contain a lot of words. For that used charts and geocharts, to visually aid users with information. However the problem in geocharts is that geoJSon data is very large, and adding multiple to one map will take a long time to load. To fix this we used an online map tool that generalised our polylines using the visvalingam algorithm. This way this reduce our loading time for map generation by a lot without losing the shape

5.3 Key benefits/achievements

Our key achievements throughout the project was the ability to host an API, and use various datasets and data for analytical purposes. The ability to efficiently transform large data into useful information that can help from an average internet user to researchers obtain a visualisation Covid-19 around Australia and the world. Since our dataset is large, given they are GeoJSON files or JSON files of time series of every country. Maximising the speed was important, to ensure user friendliness. We managed to reduce loading times through, reducing the GeoJSON polygon points and minifying our frontend code, as well as refactoring some JS.

The key benefit of our app is that users are able to just use our app in order to receive all their covid-19 info as Covid Scout collectively brings many features such as news articles, live tracker maps and graphs into one clean web app that is easy to navigate and use. This allows our app to become the go to source for Covid-19 related information and news.

Another key achievement was creating a user friendly web application that was flexible to both desktop and mobile devices. This allows our project to be scalable to almost all devices, and allows for easy accessibility.

6. Team organisation

6.1 Conclusion Appraisal

The team works hard throughout the project. Due to covid-19, we were forced to online meetings, where most of the time people showed up. Those who missed meetings were regularly checked on and informed so they know what is happening. We also had time to time offline meetings through Facebook group chat, and frequent use of software like Trello to keep track and show our team effort into the project.

6.2 Ultimate breakdown of team composition and responsibilities

Since a team member dropped the course, we had to reissue responsibilities to fit the 4 members. The workload is distribution according to strength, but throughout the project, we would help each other.

Peter Tran	Web Scraper API API Testing

	API Documentation Frontend Backend (Flask, JS) Report Writing
Aaron Ly	API Testing Frontend Backend (JS) Report Writing
Kevin Well	API API Database
Logann Guiney	Report Writing API Testing

6.3 Project Opinion

6.3.1 Major achievements in project

Major achievement in the project was the team's effort to produce interactive, responsive and live features of the pandemic that is worsening by the day. This means we need to have more up to date data and provide new information from sources to our users. And we were able to do that by delivering a web simple web application that had those features.

6.3.2 Issues/problems encountered

Issues and problems encountered were the data parsed from Flask into Javascript. Since we used JQuery render of DOM. It was important that the JSON parse was in the correct format. However, in some cases, the JSON in Flask passed into JS required a lot of manipulation of Unicode characters, such as changing &#34; into its '. Other problems included responsiveness of google chart. We had to tweak it to recreate the charts every time the user resizes their browser. Time was also an issue, as founding the right API was crucial to obtain the latest news and update on covid-19 in Australia. If time was available, we could have implemented a scraper that of multiple government sites in Australia and create a JSON about the covid-19 in Australia. Instead, we luckily found a API that had a lot of information we needed to help Australians with covid-19 cases.

6.3.3 Skills you wish you had before the workshop

Skills the team wish they had were a much more in depth knowledge of AI. We felt like with that knowledge we would be able to implement Natural Language to our web scraper and use python's scikit-learn to predict and analyze trends and the number of cases of covid-19 for our charts.

6.3.4 Would you do it any differently now

A major difference we could have applied was using a different framework. In the application, we would like to add more advanced features to our data center (infographic). Since we didn't have the time as mentioned above, we relied on using different API sources to obtain our information, meaning we were limited to what information was given. It would be better if we were able to scrape our own data, since the sources were all available, making it much more flexible in terms of creating our JSON responses for our web app.