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AN INTERACTIVE VISUALIZATION DASHBOARD TO TRACK COVID-19 IN REAL TIME

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ABSTRACT

The devastating covid-19 pandemic has created an urgent need for data analysis on the number of verified cases, fatalities, and recoveries recorded around the globe. This article allows for the examination of daily reports on overall covid19 cases, fatalities, and recoveries. This document discusses how to create a dashboard and how to use it. The dashboard was created with the jupyter notebook IDE and the python3 language. The collecting of data from repository sites is the initial stage in creating this dashboard. The data is then cleansed, and the labels Provinces/States and Nation/Region are renamed to state and country, respectively. We created an interactive dashboard to show not just current trends but also critical metrics and forecasts.

Keywords: Dashboard, Interactive Visualization, Data Analytics, COVID-19, Temporal Data.

I. INTRODUCTION

The Coronavirus (COVID-19) outbreak is currently the most serious event on the planet. By the end of January 2020, the World Health Organization (WHO) has labelled it a Global Public Health Emergency, followed by a global pandemic in March 2020. The virus's rapid spread is unusual, and it has far exceeded all forecasts. Containment of the virus is becoming increasingly difficult as practically every country on the planet becomes infected. The virus has spread from China's Wuhan district, where the first confirmed case was recorded on November 17, 2020 [2]. Initially, the number of confirmed cases in China was steadily rising. On January 31, the overall number of confirmed cases had dropped below 10,000, with 214 cases recovered.

Despite Chinese authorities' gradual and prompt preventive actions to avoid an exponential epidemic, the virus continued to spread not only within China's borders but also globally. The infection is caused by a virus.

The fact that the Coronavirus has an incubation period of 2-14 days during which the patient transmits the virus without showing any symptoms is one of the most harmful elements of the virus. All of these factors have aided the infection's exponential proliferation, resulting in a global health emergency.

Almost every country on the planet is currently infected, yet the COVID-19 virus's impact varies greatly across continents, regions, and countries. This is the driving force behind this data analytics research. Our goal is to learn more about the COVID-19 virus and how it has evolved around the world. We want to know how confirmed and fatality cases are distributed among continents, regions, and countries, as well as the association between them. People have been looking for reliable details of confirmed cases, fatalities, and recoveries documented since the covid-19 epidemic wracked the world, in order to learn the seriousness of the long-standing crisis. As a result, many healthcare and individual groups created online dashboards that collected up-to-date Covid 19 reports and made them available for public analysis from all over the world.

Several health organizations, including the World Health Organization (WHO), the Centers for Disease Control and Prevention (CDC), the National Center for Disease Control (NCDC), and others, have created dashboards on their websites and operate as credible sources of Covid19 data. ArcGIS has now launched its own version of the Covid 19 dashboard. A covid19 dashboard often contains bar charts, bubble charts, plot graphs, and other visual representations of the status of covid 19 cases, as well as a quick overview of how the cases grow and fall over time.

II. METHODOLOGY

Details of Packages used

The ipywidget interact() method is used to provide a slider option to modify the number of nations we want to display for visualizing the top countries that are worse affected by the epidemic. We may also use bar plots to depict all of the countries that have been hit the most in terms of mortality, verified deaths, and reported recoveries. The Python data is visualized on an interactive leaflet map using the Folium tool. By giving the beginning coordinates, the tiles we wish to use, and the zoom levels, we can create a Map() class object. The

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folium is what we use. Create markers with the required parameters such as radius, colour, and filling colour using the Circle() class. Voilà converts the entire notebook into a standalone dashboard. The dark theme is used in this case.

Data set

The JHU resource centre [2] provided the most up-to-date information on the COVID-19 instances. The dataset includes data on confirmed cases, deaths, and recovered cases, broken down by country/region and province/state. Confirmed cases, deaths, and recovered cases are the fields that are most important. We can deduce the following from these three fields:

- Cases in progress
- The death rates
- New confirmed cases are reported every day.
- Every day, there are more deaths.
- Every day, new cases are discovered.
- Cases expected in the coming week
- The moving average of new cases over the last seven days

Data Processing

When the website is loaded, data processing is done dynamically. Each of the excel-formatted input datasets is read into the application as a panda Data Frame [3] and merged together. New fields are created by executing mathematical operations on the Data Frame after the useless fields have been removed. New Cases for each day, for example, are calculated by applying the difference operator to the rows of cumulative cases ordered by date.

COVID-19 Dashboard Application structure

Our Dash programme was constructed with the goal of including as many user interactions as possible. We chose Dash and Plotly as our visualisation platform mostly due to the data's tabular format, which could be effectively processed using pandas Data Frame and quickly integrated to Dash using the Plotly library. The dashboard was designed to give consumers as many opportunities to interact as feasible.

Click-data enabled on the Choropleth, hover information presented on the Choropleth, play/pause button on the Bubble map, and two drop downs to pick the data to be viewed are among the user interactions in this tab. The user can change the title, color scale, and selected data, as well as the animation's play/pause buttons and refresh the graphs.

The overall worldwide covid19 figures are given in a section at the top. The user can look at them and assess the gravity of the situation throughout the world.

Following that, customers will see a textbox where they may type in the name of the country for which they desire information.

III. MODELING AND ANALYSIS

When a user types in a country's name, the dashboard provides the most recent Covid-19 numbers for that country. On a bubble chart, users may see where countries stand in terms of their range of cases and deaths. Users can adjust the slider to see the desired number of top-affected nations. Users can view the reported details by hovering over the bubbles representing each country. On a plot graph, readers may also see whether a country is reporting an increase or decrease in cases and deaths.

The user must first enter the name of a country, after which a plot graph depicting the increase and decline of cases and deaths will show. When the user hovers over the plot line, the user can view the most recent caseload and deaths.

In the style of bar charts, the viewer can see the 20 most impacted nations in the globe in terms of confirmed cases and deaths reported. The user may also see the top 20 countries in the world with the highest recovery rates in the form of bar charts.

Users can view a global map that shows the affected parts of the world with circles drawn over them. Users can hover over nations to read about the cases that have been reported.

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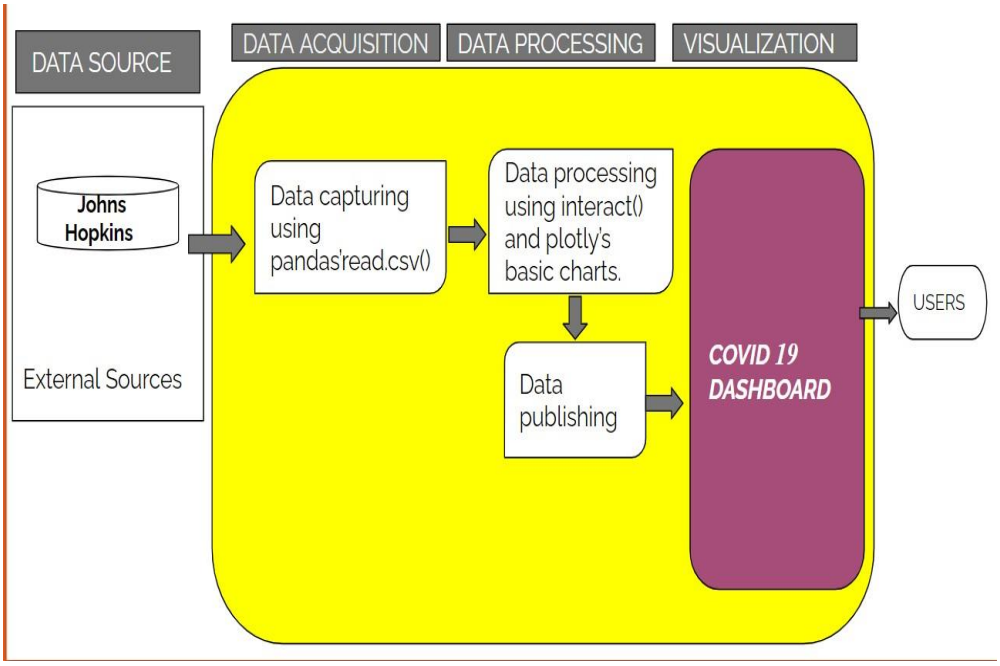

Figure 1: System diagram showing different processes and workflow of the proposed COVID-19 dashboard implementation.

IV. RESULTS AND DISCUSSION

This tab's user interactions include primarily drop-down menus for selecting the number of countries to be visualized, the country name, and the data to be visualized. The axis title, annotations, colour scales, data, and graphs are all affected by user involvement. The user can interact with this tab by selecting nations, case types, and adjusting the y-axis scale between log and linear. The y-axis scale, data to be selected for certain countries and cases, and the graph itself reflect the changes.

The first graph compares the number of days since the first case was recorded to the most recent cumulative numbers for the top 20 or 30 nations. This research helps us understand how different countries have effectively fought back.

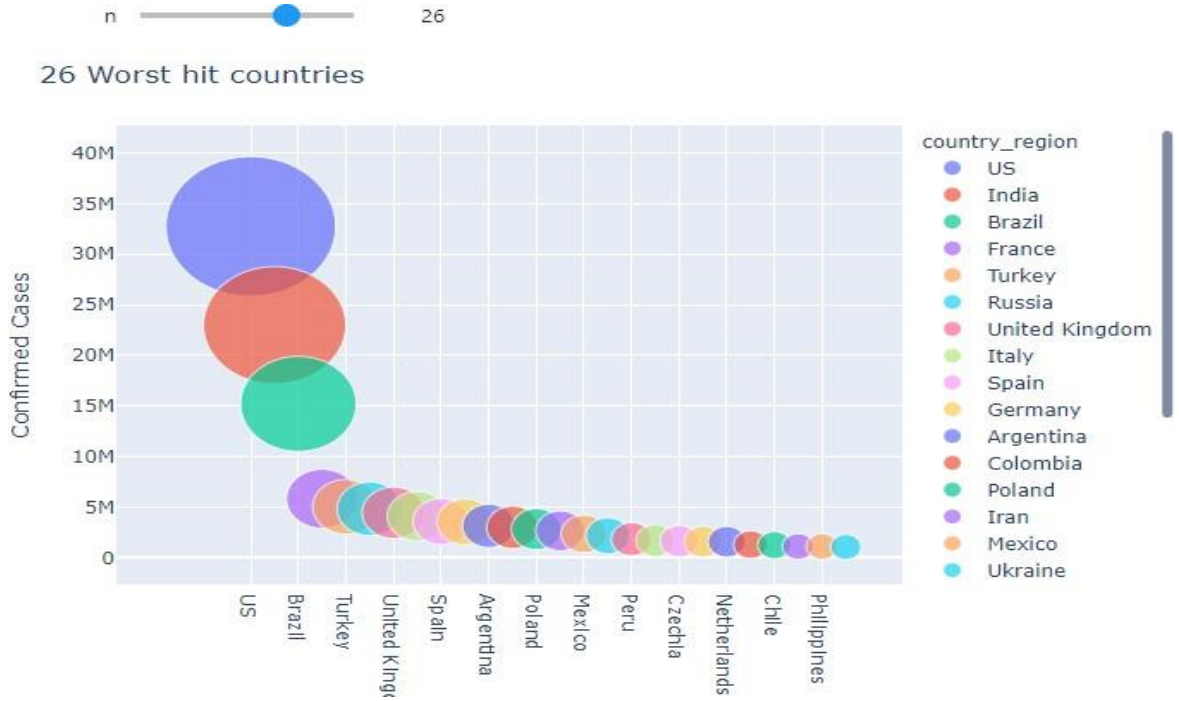

Figure 2: Worst hit countries

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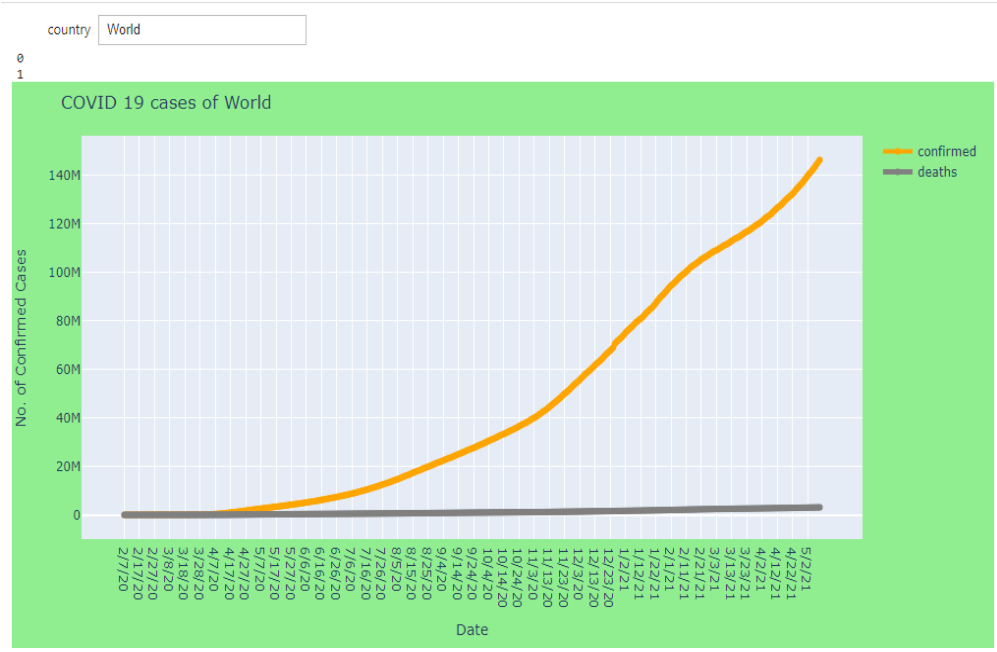

Figure 3: Covid19 cases

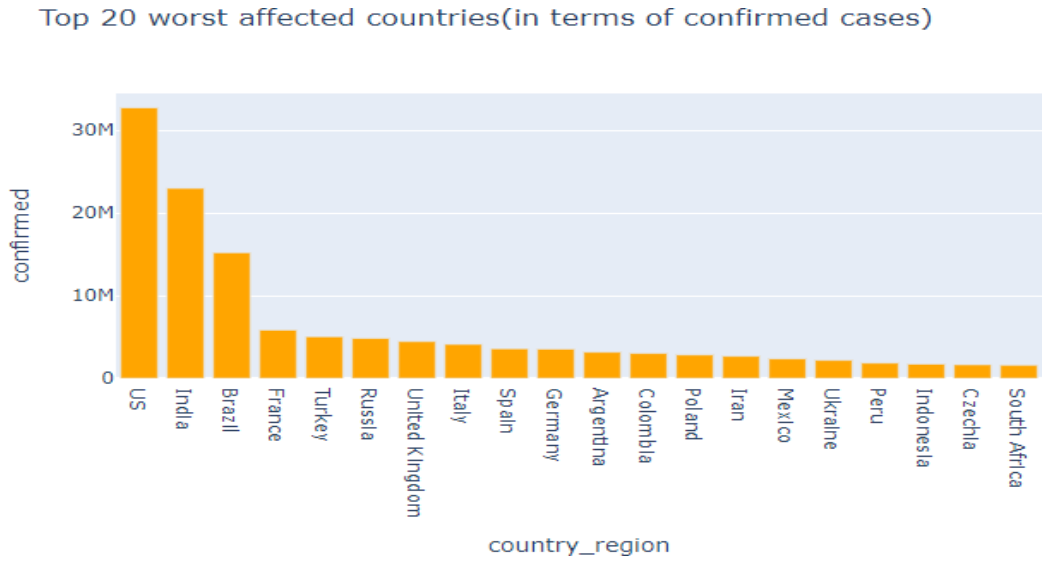

Figure 4: Worst affected countries

V. CONCLUSION

In terms of website performance score (PageSpeed and YSlow score), page size, and number of HTTP requests, our solution outperformed all of the other compared alternatives. It displays more information in a lightweight framework on a faster platform with minimal overhead. In the near future, we'd like to update the website's aesthetics and how it renders on mobile devices to make it more responsive. We want to further optimize code for a faster page load, even though our dashboard is on par with others in terms of page speed. This would imply reducing the number of dynamic computations and predictions for each page load, which might be accomplished by adding another worker to pre-calculate the relevant data for each page load.

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