**Big Data Analytics for Tracking COVID-19 Spread and Mortality Trends Across Regions**

**Abstract**

Each geographic region has seen significant changes in daily life, economics, and global health because of the COVID-19 pandemic. Significant regional differences in the virus’s transmission and fatality have surfaced despite massive crisis management measures. It is essential to comprehend these distinctions to enhance future pandemic preparedness and public health responses. Using Big Data analytics approaches, this paper attempts to investigate the global prevalence and death trends of COVID-19 across all continents.

A structured data pipeline that can clean, filter, and visualise time-series data on confirmed COVID-19 cases and deaths by continent is built using publicly accessible datasets. Data wrangling and analysis are carried out using Jupyter Notebook and Python programming, which makes it possible to identify peak infection periods, regional differences, and changing trends in the pandemic’s progression. By pointing out important continental patterns, pinpointing regions with high death rates, and providing comparative data, the study helps determine the scope and timing of COVID-19’s effects. These finding are presented in an understandable manner using data visualisation like line graphs and heat maps.

Through a better knowledge of the global dynamics of COVID-19, our research helps the global health community make data-driven decisions and improves readiness for future pandemics.

**Background of the Study**

Novel coronavirus (COVID-19) is highly infectious and requires early detection, isolation, and treatment. We tried to find some useful information by analysing the COVID-19 screening data, so as to provide help for clinical practice​Big Data. The novel coronavirus Covid-19 originated in China in early December 2019 and has rapidly spread to many countries around the globe, with the number of confirmed cases increasing every day. Covid-19 is officially a pandemic. It is a novel infection with serious clinical manifestations, including death, and it has reached at least 124 countries and territories​.

Starting in December 2019, cases of pneumonia with unknown causes began to appear in Wuhan, Hubei province, China. Subsequently, the outbreak of this pneumonia quickly spread throughout the Hubei province, country, and world. This pneumonia was confirmed to result from a novel coronavirus infection according to whole-genome sequencing. On January 13, 2020, the World Health Organization tentatively named the virus as 2019 novel coronavirus (2019-nCoV). On February 7, 2020, China officially named this novel coronavirus pneumonia as NCP. Later, on February 11, 2020, the World Health Organization officially renamed the NCP as coronavirus disease 2019 (COVID-19)​Big Data.

The COVID-19 epidemic has caused a large number of human losses and havoc in the economic, social, societal, and health systems around the world. Controlling such epidemic requires understanding its characteristics and behaviour, which can be identified by collecting and analysing the related big data. Big data analytics tools play a vital role in building knowledge required in making decisions and precautionary measures.

Modelling the COVID-19 pandemic spread is challenging. But there are data that can be used to project resource demands. Estimates of the reproductive number (R) of SARS-CoV-2 show that at the beginning of the epidemic, each infected person spreads the virus to at least two others, on average. A conservatively low estimate is that 5% of the population could become infected within 3 months. Preliminary data from China and Italy regarding the distribution of case severity and fatality vary widely. About 15% of patients infected with COVID-19 have severe illness and 5% have critical

illness​.

Despite massive crisis management measures, significant regional differences in the virus’s transmission and fatality have surfaced. It is essential to comprehend these distinctions to enhance future pandemic preparedness and public health responses​Big Data.

Reliable and real-time analysis using big data techniques became critical for understanding virus hotspots, mortality risks, and intervention effects. Using big data analytics tools for combining available information of an infectious disease process enables researchers and policymakers to transform such information into practical knowledge, helping to detect and predict disease epidemics.

A regular monitoring and remote detection system for individuals assists in the fast-tracking of suspected COVID-19 cases. Such systems generate a huge amount of data, providing many opportunities for applying big data analytics tools. These tools are designed to operate in a cloud computing and distributed environment to assist in the development of scalable pandemic responses​.

Analysing health data in real-time using artificial intelligence (AI) techniques plays a vital role in predictive and preventive healthcare. For example, it helps predict the sites of infection and the flow of the virus. It also helps estimate the needs for hospital beds, medical specialists, and resources during such pandemic crises as well as in the diagnosis and characterization of the virus

Although the ultimate course and impact of COVID-19 are uncertain, it is not merely possible but likely that the disease will produce enough severe illness to overwhelm the worldwide health care infrastructure. Emerging viral pandemics can place extraordinary and sustained demands on public health and health systems and on providers of essential community services. Modelling the COVID-19 pandemic spread is challenging. But there are data that can be used to project resource demands​.

The rapid spread of the pandemic, with its continuous evolving patterns and the difference in its symptoms, makes it more difficult to control. Moreover, the pandemic has affected health systems and the availability of medical resources in several countries around the world, contributing to the high death rate. A regular monitoring and remote detection system for individuals will assist in the fast-tracking of suspected COVID-19 cases. Moreover, using such systems will generate a huge amount of data, which will provide many opportunities for applying big data analytics tools​.

Because of its protracted asymptomatic period and virulence, COVID-19 can spread quickly unless strategic precautions are taken. This infection period would also be marked with an asymptomatic characteristic, meaning a host is infected but no symptoms are presenting. Public health efforts depend heavily on predicting how diseases such as those caused by COVID-19 spread across the globe. During the early days of a new outbreak, when reliable data are still scarce, researchers turn to mathematical models that can predict where people who could be infected are going and how likely they are to bring the disease with them.

One of the key challenges in managing the pandemic has been the dynamic and regionally varied nature of its spread and impact. Understanding when and where the virus surged, how mortality rates evolved, and how different regions responded provides critical insight into managing current and future pandemics. However, making sense of massive, multi-source datasets requires big data analytics​Big Data.

This report aims to provide a comparative analysis of COVID-19 spread and mortality across all continents. By leveraging time-series data from reliable public sources, the study seeks to highlight trends, disparities, and commonalities in how the pandemic unfolded globally.

The contributions of this report include:

* Data acquisition from global repositories (e.g., Johns Hopkins, WHO)
* Data cleaning and preparation for time-series analysis
* Visualization of COVID-19 cases and death trends by continent
* Identification of peak periods and regional impact

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