**S4 Research Proposal: Visualizing U.S. COVID-19 Cases**

**Background**

Nothing in recent history has dramatically reshaped social habits, financial markets, and medical technology as much as the COVID-19 pandemic. Living in an ever more globalized environment has created an unprecedented interdependence between nations around the world. This means that everything as benign as a social media trend, to as deadly as novel viruses are potential worldwide phenomena. This new globalized era therefore brings with it an increased need for shared data, statistics, and education in order to combat increasingly complex international challenges. One key aspect of promoting such data sharing is effectively visualizing data for use by both researchers and the general populace, which is the purpose of this research.

**What is COVID-19?**

According to the U.S. Center for Disease Control and Prevention (CDC), “COVID-19 is a respiratory disease caused by SARS-CoV-2, a new coronavirus discovered in 2019.” Symptoms can range from cough and shortness of breath to fever, chills, loss of taste, and even gastrointestinal upset (CDC 2021). While the virus can be dangerous for all groups, adults 65 years and older or those with underlying conditions are “at higher risk for severe illness” (CDC 2021). Due to the infectious nature of the virus, many researchers have worked tirelessly to learn more about how it is transmitted, how to prevent infection, and what the long-term effects of the virus may be. Still, more data and research are required since "[t]he full spectrum of the disease is yet to be unraveled" (Honavar et al.).

**Data on COVID-19**

While the global nature of the virus has caused immense suffering, that same nature may be able to be utilized to prevent similar outbreaks in the future. Large swaths of data and records have been logged on the number of active COVID-19 cases across myriad geographic locations and dates. This data can be used by researchers to retroactively follow the spread of the virus and how it may have been affected by various policies and factors. This will facilitate more informed decision-making and improve health policies should a future pandemic occur. Organizations such as the Center for Disease Control, World Health Organization (WHO), and New York Times provide excellent open-source data points to aid with these goals.

**Research Goals**

While raw data is a first step, it has been shown that when “learners mentally connect words and pictures, they are engaged in meaningful learning that is more likely to support understanding” (Clark 2016). Visualizations are thus vital to making raw information more digestible, which in turn promotes more public awareness and education. This research project therefore seeks to:

1. Download and extract daily Covid data from public sources and format the data for processing
2. Plot a single day of data in a Choropleth map of the United States using open-source Python Packages (Plot.ly)
3. Develop a Graphical User-Interface to allow users to traverse the Choropleth through time
4. Create automatic forward and backward animations through time to visualize the progression of the virus

**Research Timeline**

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| **Task** | **Completion Date (Tentative)** |
| Develop automatic pull request of latest COVID-19 data from New York Times online repository and format as needed | September 10th, 2021 |
| Plot a single day of COVID-19 cases on a Choropleth map of the U.S. | October 1st, 2021 |
| Develop a Graphical User-Interface allowing users to traverse forwards and backwards through time | October 22nd, 2021 |
| Implement automatic forward and backward animations through time to visualize the progression of the virus | November 19th, 2021 |
| Concluding Report | November 26th, 2021 |

References

Centers for Disease Control and Prevention. (2021, February 25). *Coronavirus disease 2019 (COVID-19)*. Centers for Disease Control and Prevention. https://www.cdc.gov/dotw/covid-19/index.html.

Clark, Ruth Colvin, and Richard E. Mayer. *E-Learning and the Science of Instruction: Proven Guidelines for Consumers and Designers of Multimedia Learning*. 4th ed., Wiley, 2016.

Honavar, Santosh G, et al. “COVID-19 and Eye: A Review of Ophthalmic Manifestations of COVID-19.” *Indian Journal of Ophthalmology*, vol. 69, no. 3, 17 Feb. 2021, p. 488., doi:10.4103/ijo.ijo\_297\_21.