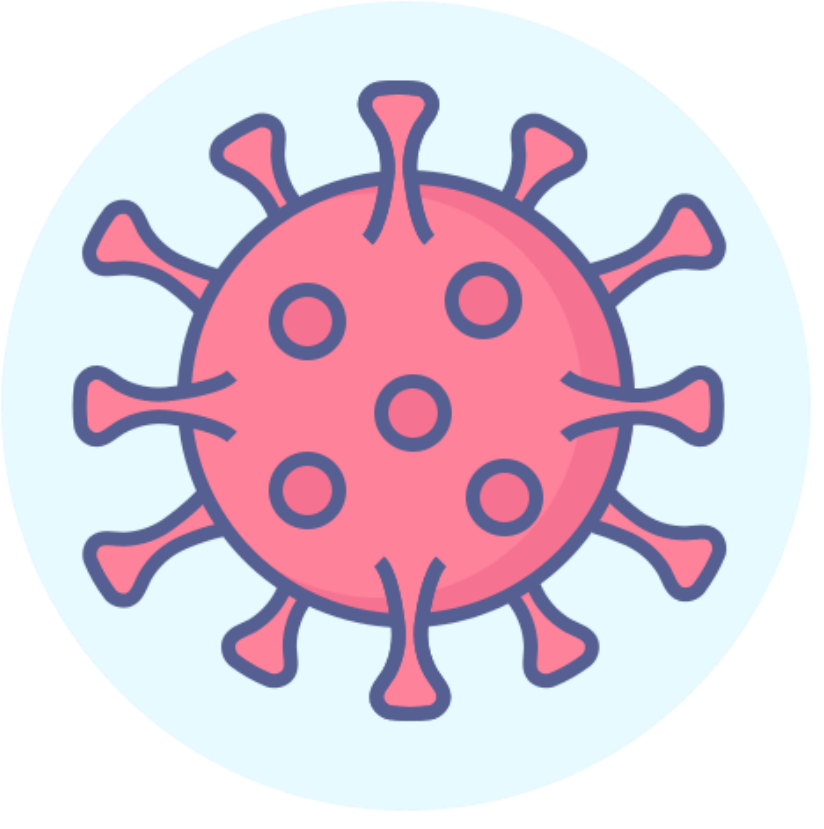


Economic Impacts of Pandemics for Businesses: An Analysis and Defensive Strategies

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Summary

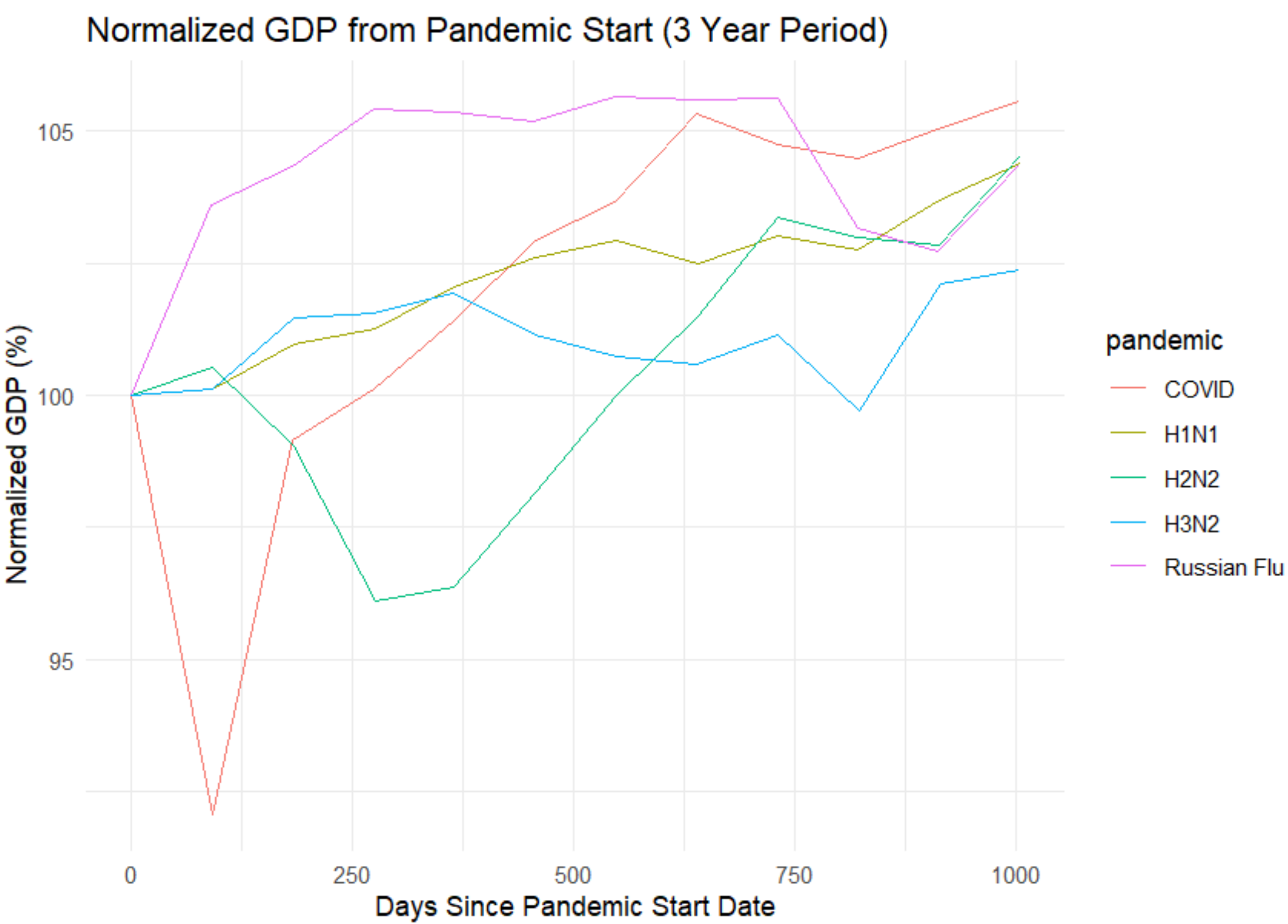
While pandemics bring negative economic ripple effects that impact every person in globalized society, there is little easy to understand data-based research for businesses to refer to. Our team aims to identify which United States economic sectors are most impacted and have the slowest rate of recovery from pandemics and provide insights to businesses. Current analyses are limited to general economic indicators such as GDP and stock performance but do not account for health and technological influences. These limitations will be addressed through relief index scores to further the insights provided by traditional economic analyses.

Approaches

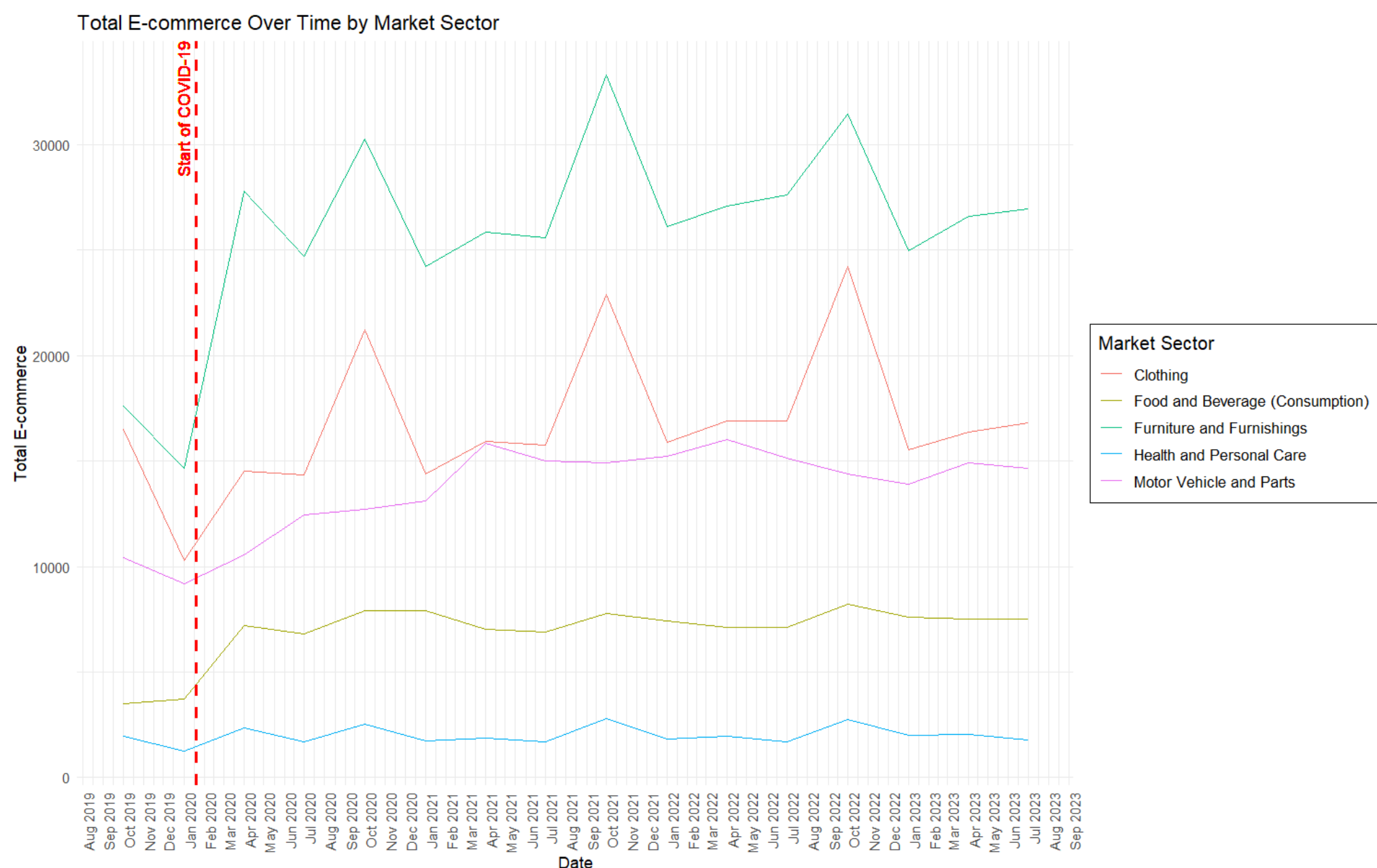
- Exploratory Data Analysis on Pandemics
- Indexes
- Interactive Dashboard

Exploratory Data Analysis on Pandemics

Exploratory analysis on previous pandemics in the United States was done by normalizing three economic indicators (S&P 500 Market Index, Employment Rate, and GDP) and plotting a time series for each indicator. Each plot showed COVID-19 causing a sharp decrease and other pandemics having far less impact. This prompted the team to focus the analysis on COVID-19.



Standard linear regression, stepwise regression, and LASSO regression were used to build five models on a dataset of pandemic and technological aspects during the COVID-19 period. Each model found Total E-commerce to be the only statistically significant factor. A plot of Total E-Commerce by market sector shows an increase in e-commerce for all industries.



In conclusion, businesses of any industry should prioritize e-commerce during a pandemic since historical data shows online sales will likely grow.

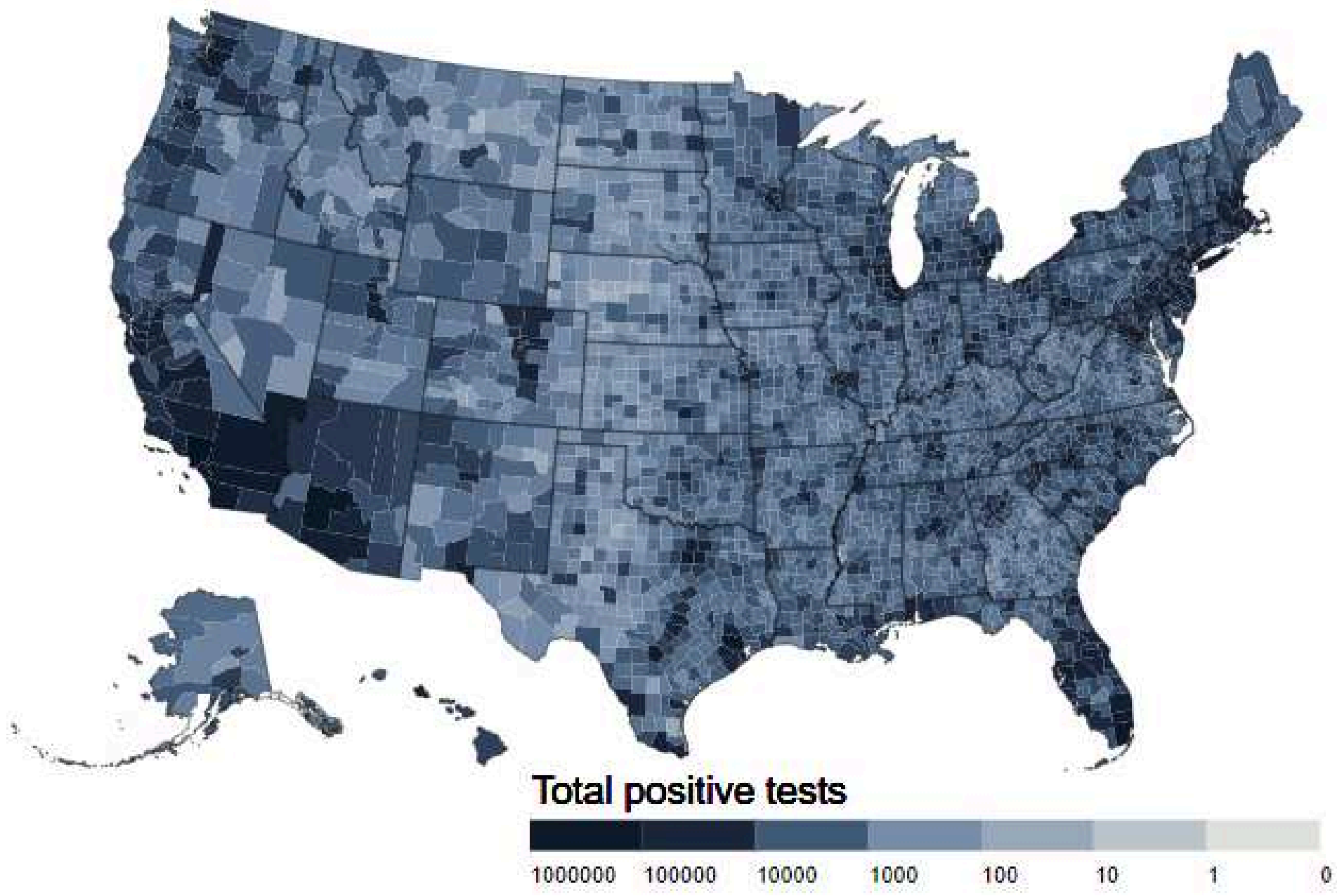
Indexes

Neural networks have been widely used for time series forecasting in the context of financial markets and data. These networks can effectively capture complex patterns and relationships within time series data, making them suitable for predicting various economic and social indicators affected by the pandemic.

In order to summarize potential relief solutions, Indexes were created by leveraging Neural Networks, producing 14 distinct index relief scores to portray potential solutions of technology to reduce economic impact of a pandemic.

Interactive Dashboard

The intuitive dashboard is built with D3.js. It provides an easy-to-consume interface that shows the impact of the COVID-19 pandemic on different indicators. The user is presented with a date slider that syncs the selected date across all charts providing an easy way to analyze multiple indicators at once.



Data

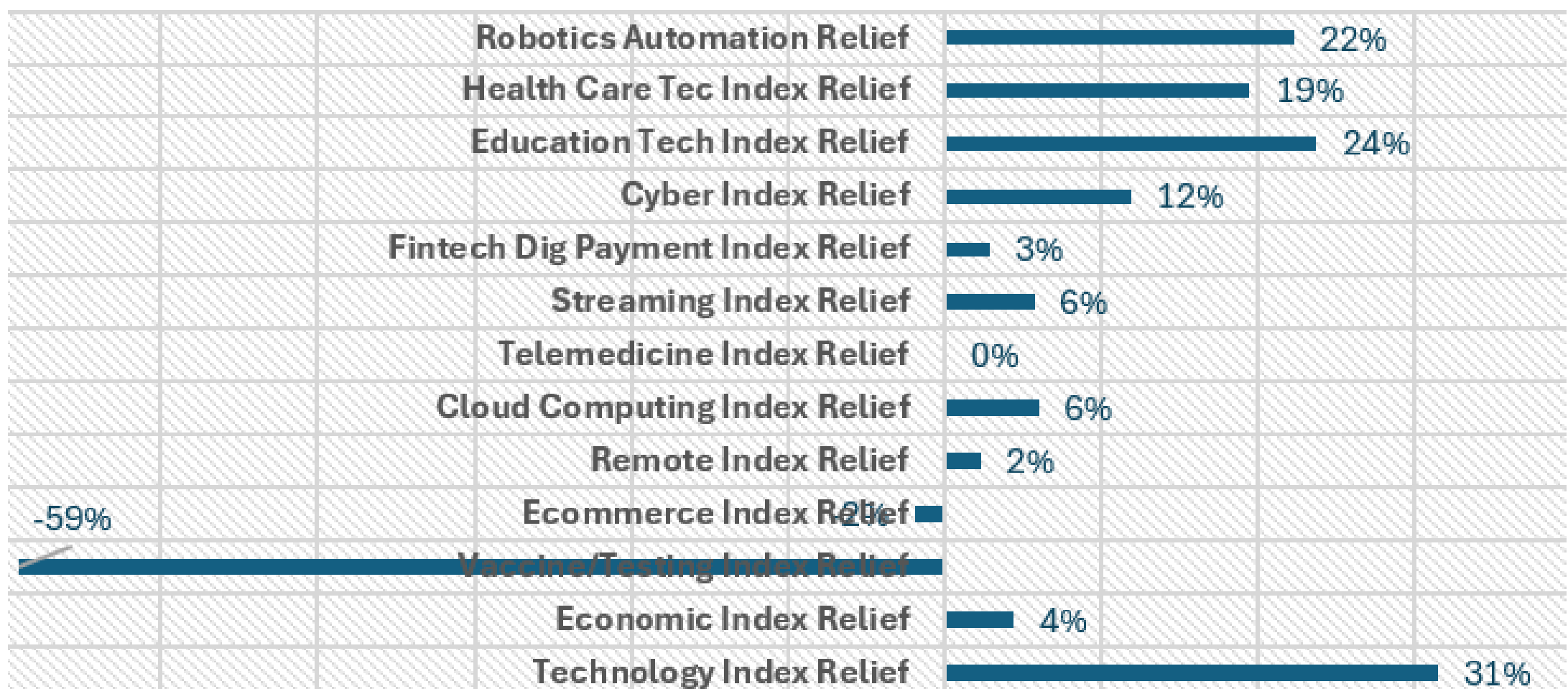
The project consisted of 15 datasets. All datasets were downloaded from various open source online repositories and stored in a csv format. All records are dated and dates range the year 1928 to 2024.

Experiments and Results

Upon assessing the complete set of 14 index relief solutions times 10 economic sectors using Wavelet Coherence visualizations, we qualitatively interpreted the graphs, categorizing interrelation as High, Medium, Low, or Negligible. Scores of 3, 2, 1, and 0 were assigned to these categories, respectively. Hence, we derived our Pandemic Relief Score.

The robust interrelations observed in the cloud computing, fintech, and healthcare technology relief indices signify their pivotal roles in driving economic vitality. These sectors, characterized by higher relief index scores, have demonstrated their capacity to provide essential tools and solutions that fuel innovation, efficiency, and resilience within the economy.

PCA Variance %vs Neural Network Variance %



Pandemic Relief Score

