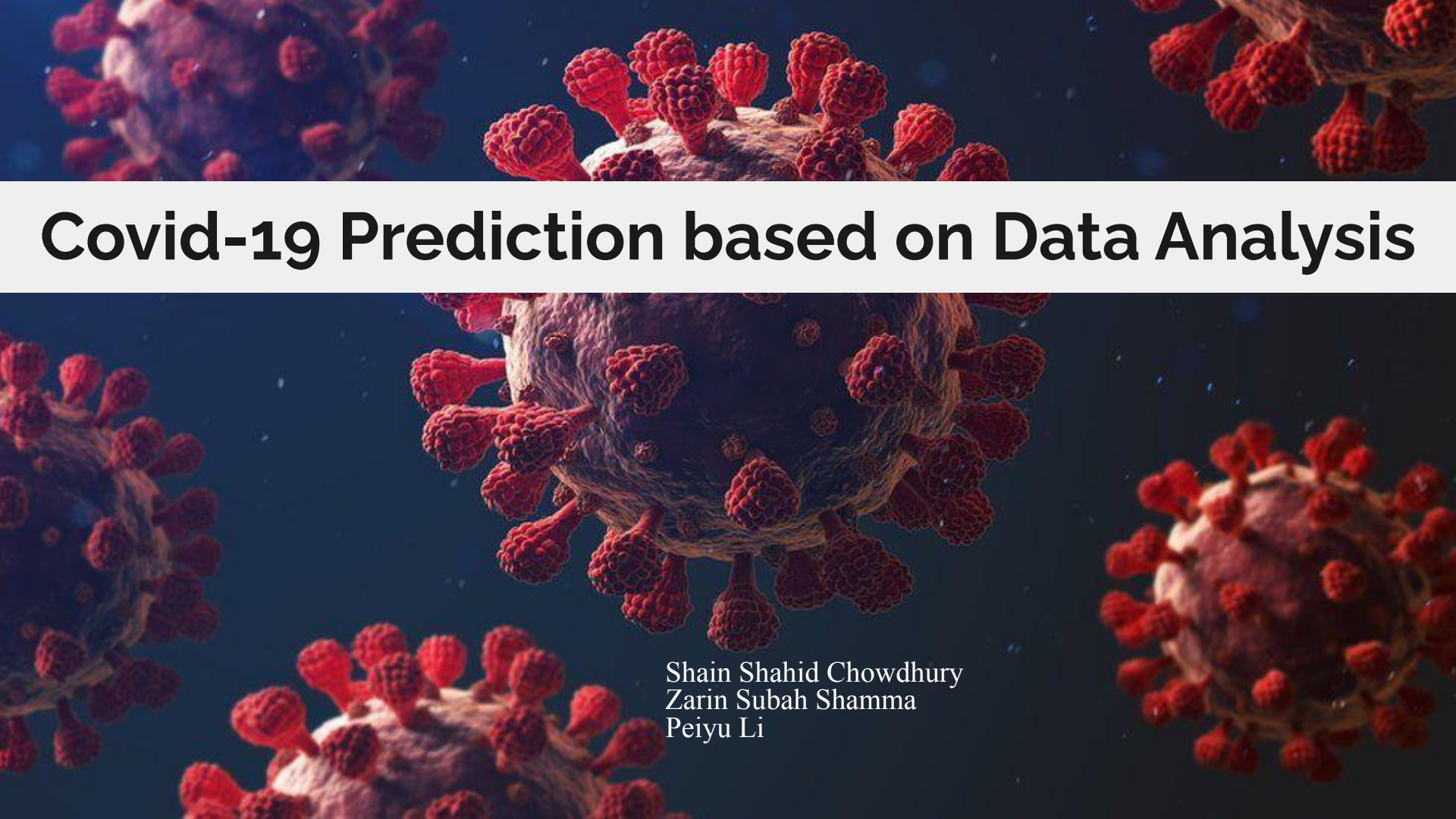
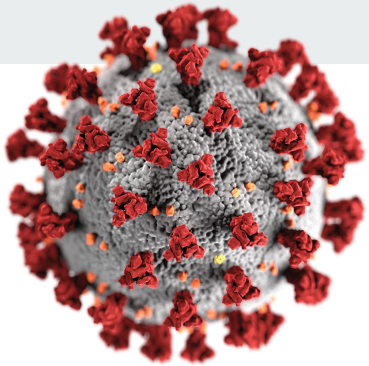


Covid-19 Prediction based on Data Analysis

Shain Shahid Chowdhury
Zarin Subah Shamma
Peiyu Li

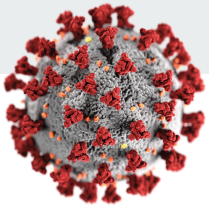


Introduction

In late December 2019, a new coronavirus was identified in China causing severe respiratory disease including pneumonia. The disease caused as a result of infection is named - coronavirus disease (COVID-19).[1]

The COVID-19 pandemic is spreading between people globally, which has led to various bad impacts for people, ranging from psychological well-being, mental health, economic and social disruption to the education system disruption.

[1] *Background to Coronavirus (COVID-19)*. (n.d.). ICM Anaesthesia COVID-19. Retrieved February 15, 2022, from https://icmanaesthesiacovid-19.org/background



Background (Important Timeline)

January 9 — WHO Announces Mysterious Coronavirus-Related Pneumonia in Wuhan, China

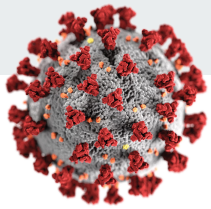
January 21 — CDC Confirms First US Coronavirus Case

February 2 — Global Air Travel Is Restricted

February 3 — US Declares Public Health Emergency

March 11 — WHO Declares COVID-19 a Pandemic

December 11- FDA issued the first emergency use authorization (EUA) for use of the Pfizer-BioNTech COVID-19 vaccine in persons aged 16 years and older for the prevention of COVID-19.

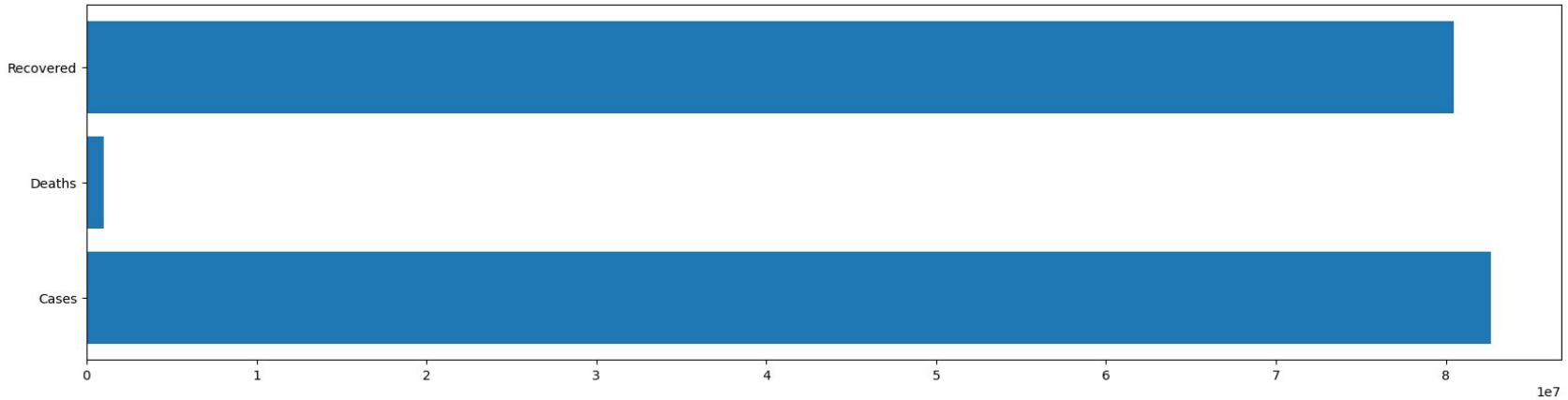


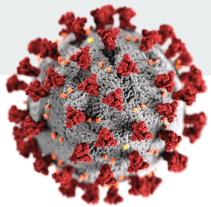
Covid-19 Statistics in USA (01/20/2020 - 04/29/2022)

Coronavirus Cases:
~82M

Coronavirus Deaths:
~1M

Coronavirus Recovered:
~80M

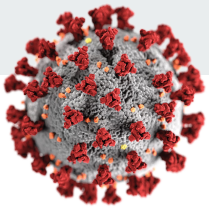




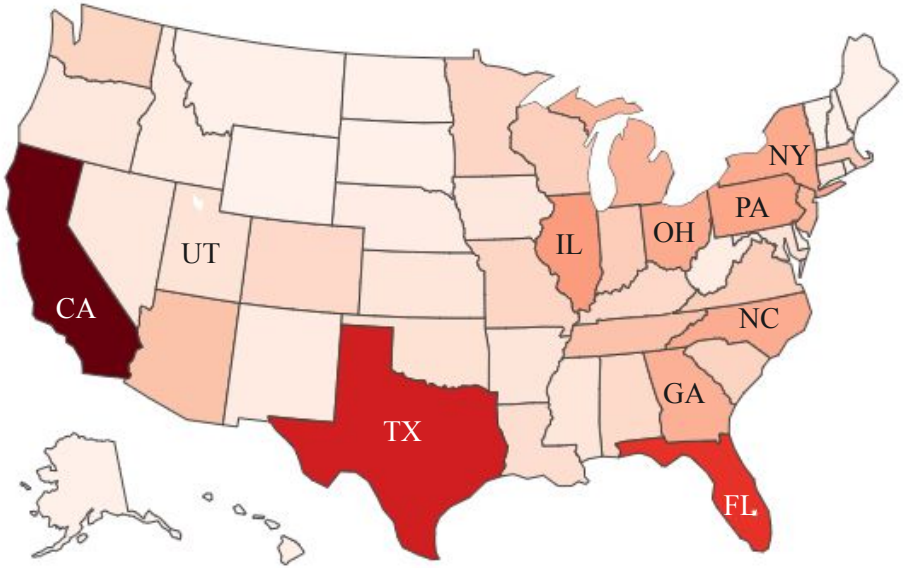
Data Collection

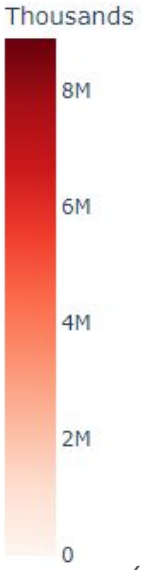
1. Reported COVID-19 Cases and Deaths in the USA dataset: Link (CDC)
2. Reported COVID-19 Cases and Deaths in the World dataset: Link (Github)
3. Vaccination in the USA dataset: Link (Github)
4. Vaccination in the World dataset: Link (Github)
5. Stock dataset: Link (Yahoo Finance)

Choropleth Maps of Covid-19 Cases

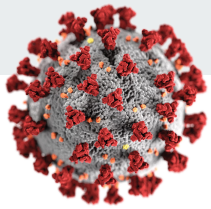


Covid Cases by States

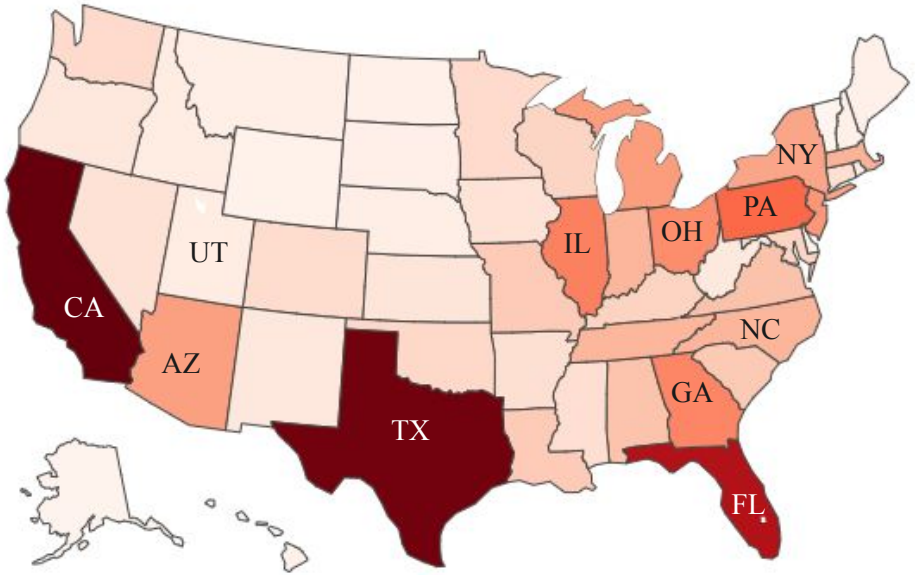


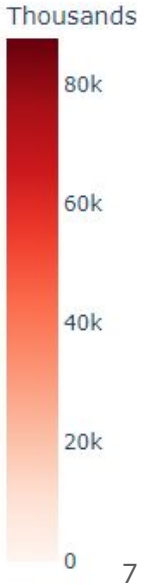


Choropleth Maps of Covid-19 Deaths



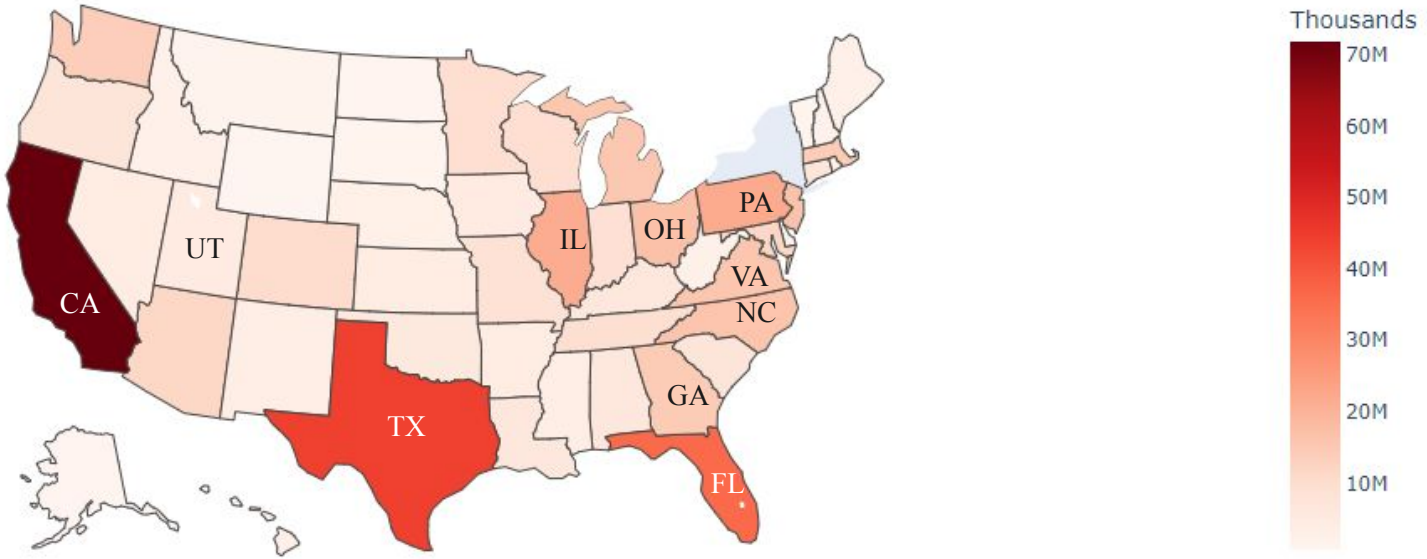
Covid Deaths by States



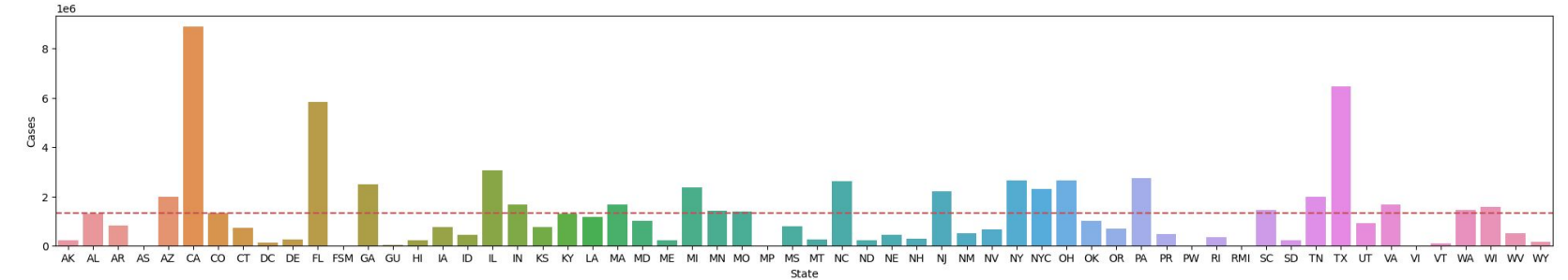


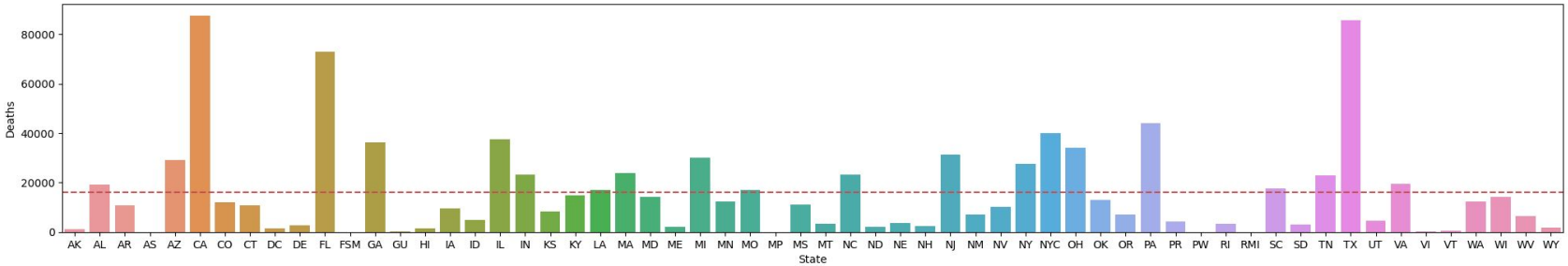
Choropleth Maps of Covid-19 Vaccination

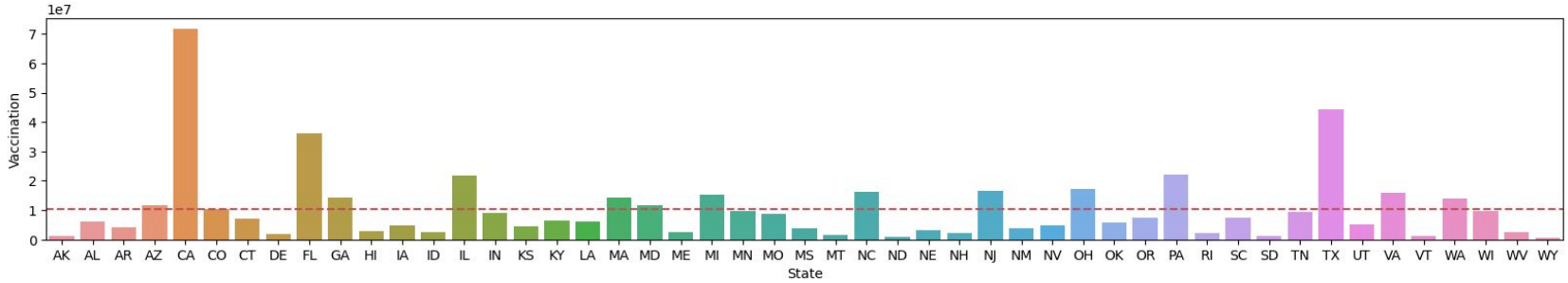
Vaccination by States



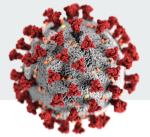
Overall Cases, Deaths and Vaccination by States

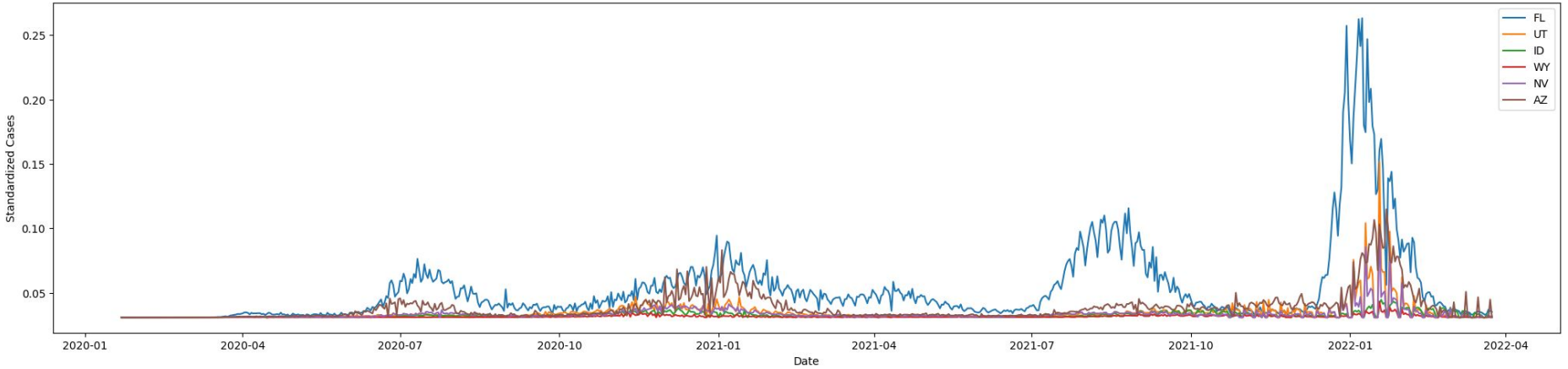


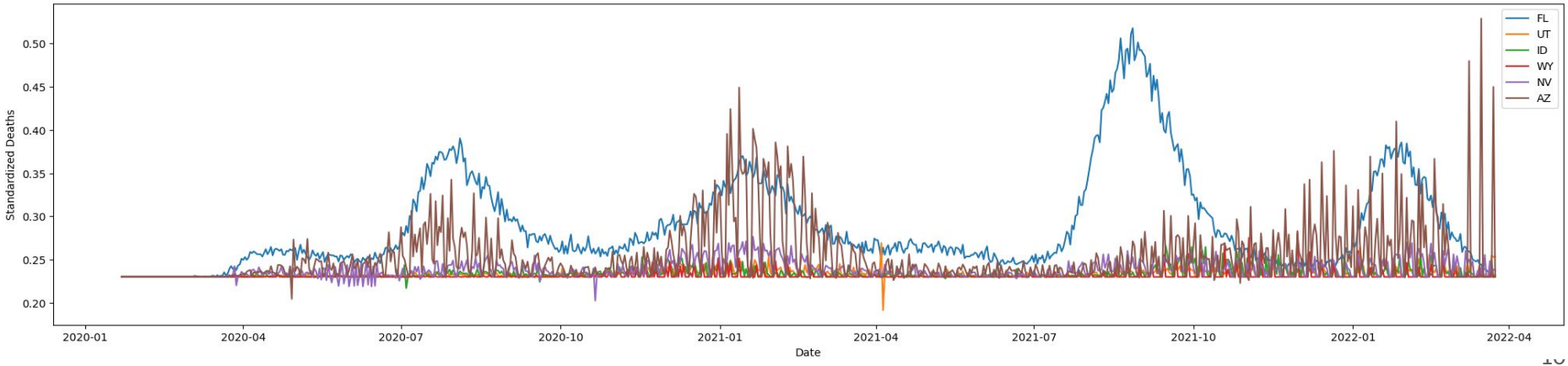




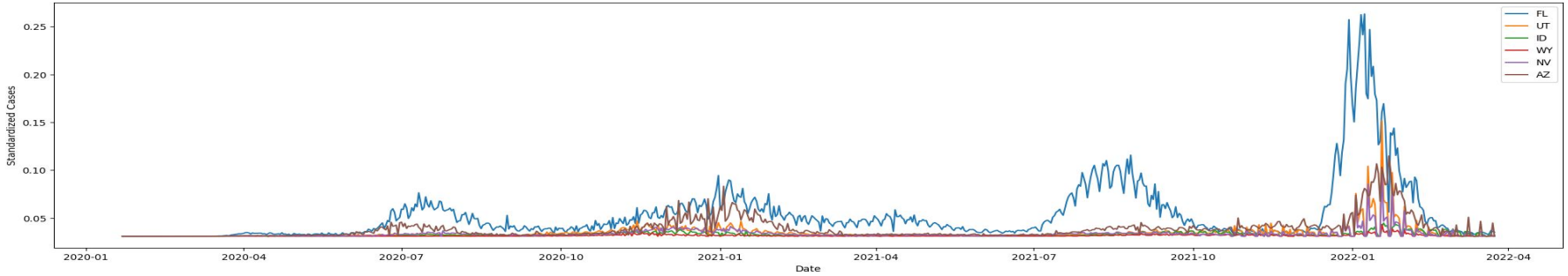
Daily Cases and Deaths by Six States

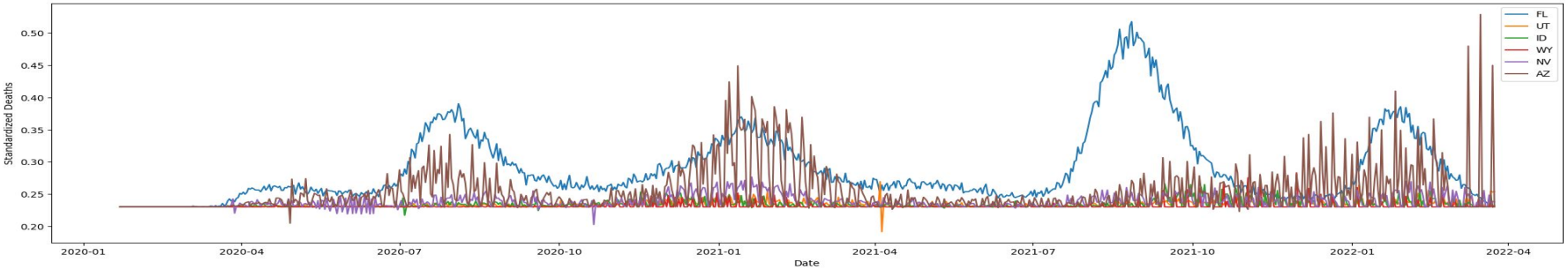


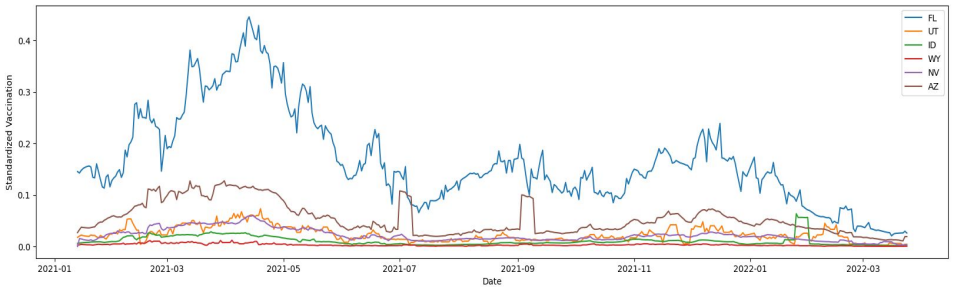


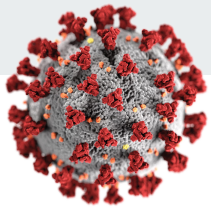


Daily Cases, Deaths and Vaccination by Six States

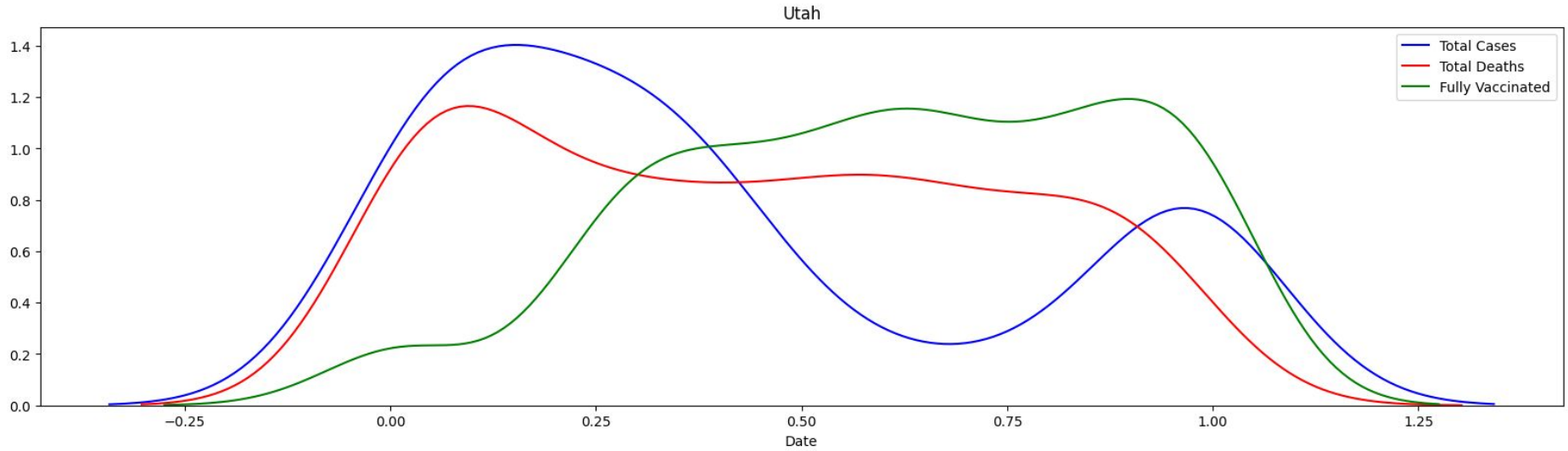




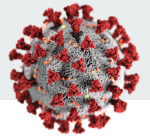


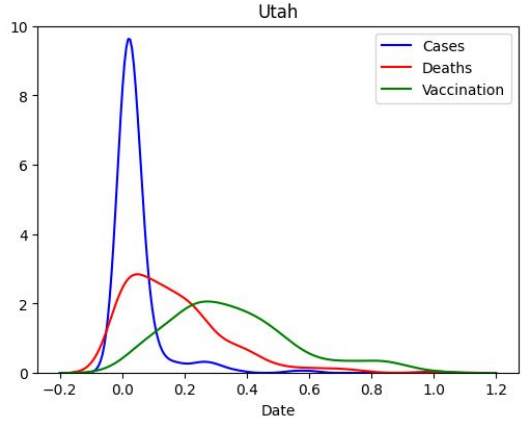


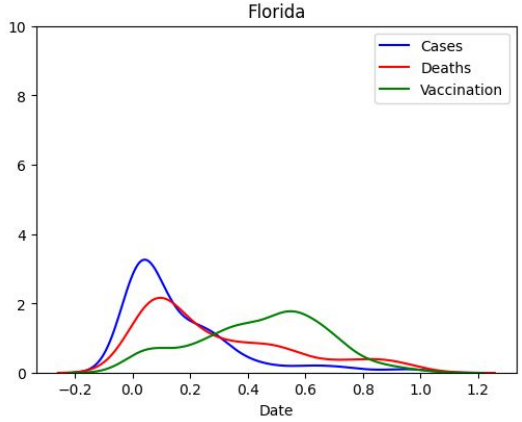
Covid-19 Cases, Deaths and Vaccinations in Utah

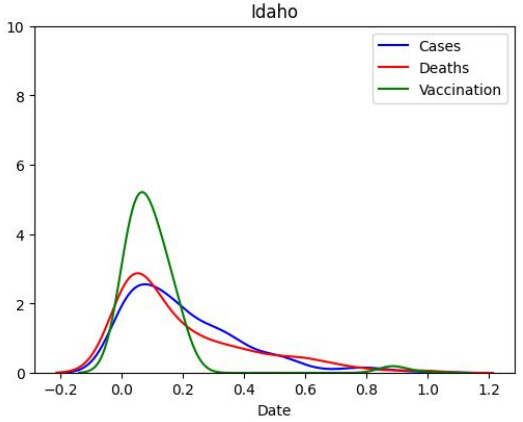


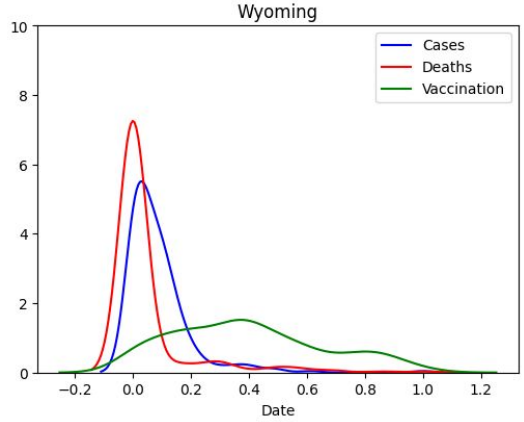
Covid-19 Trends in Six States of USA

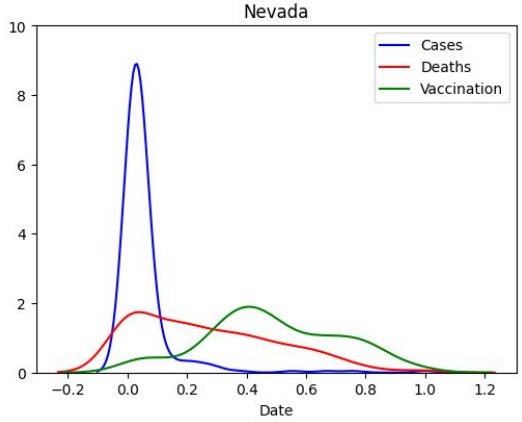


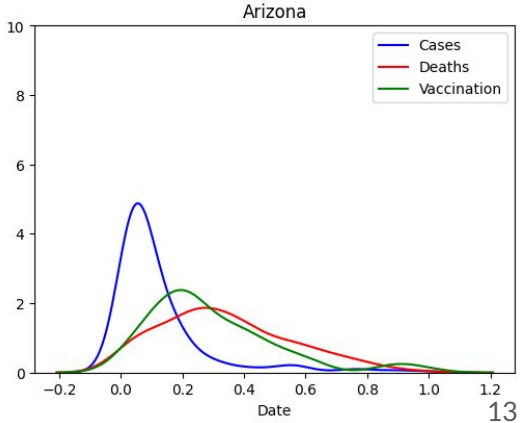




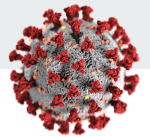


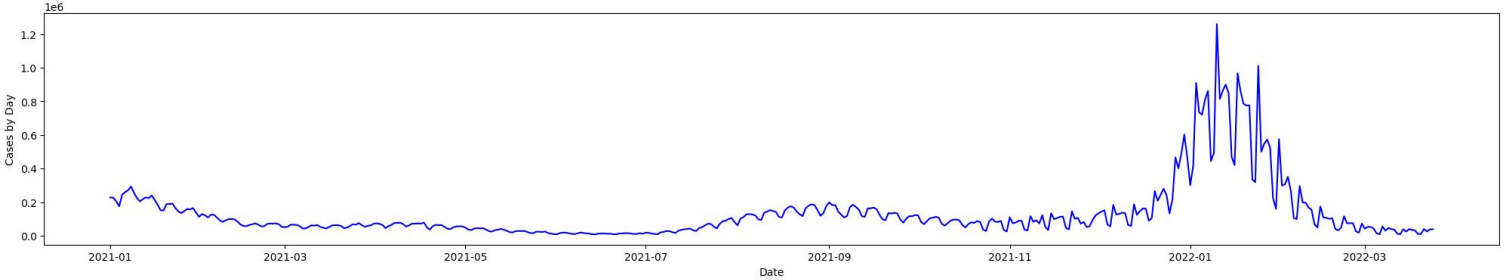


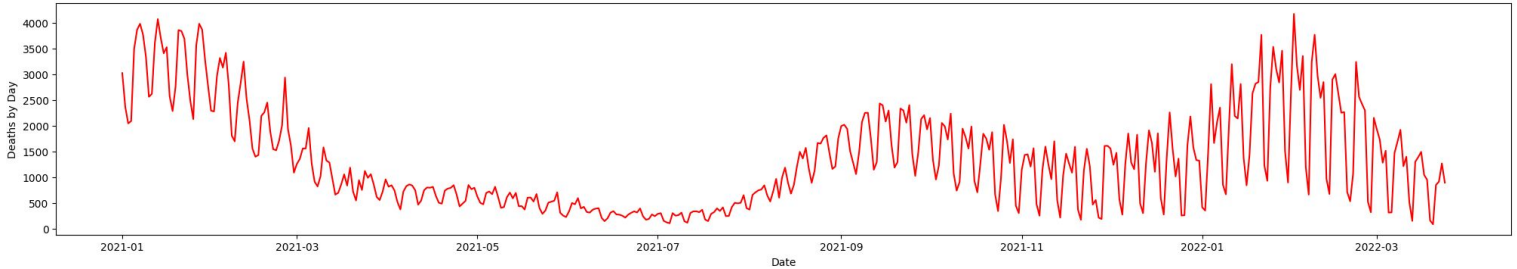


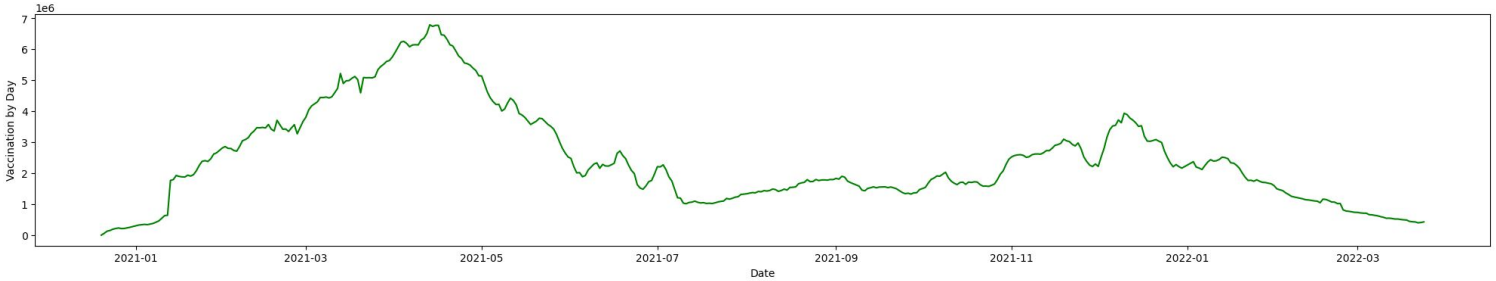


Covid-19 Trends in the USA

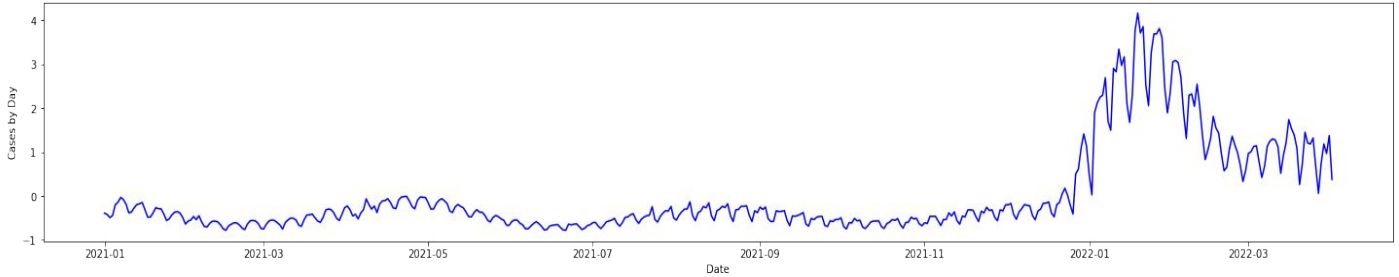


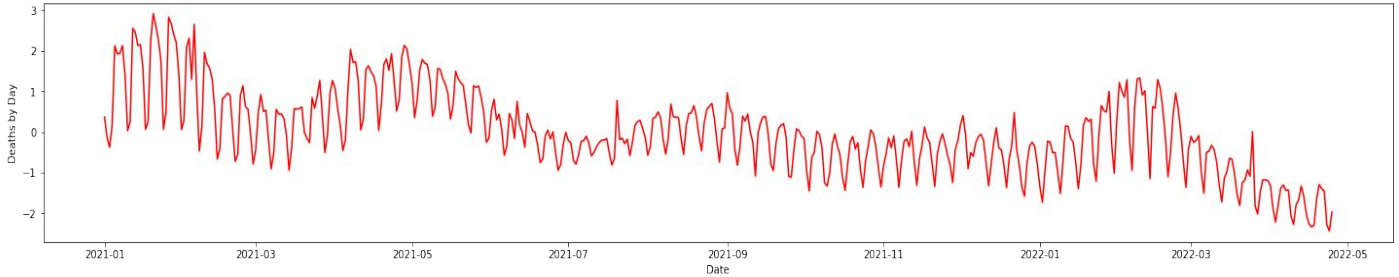


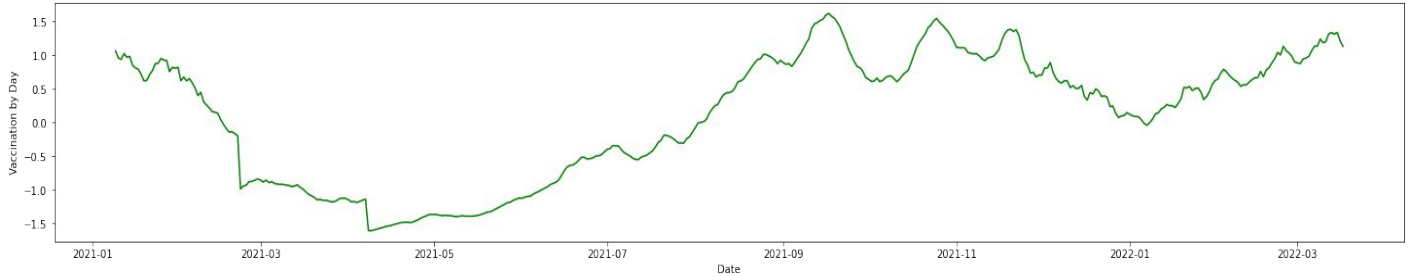




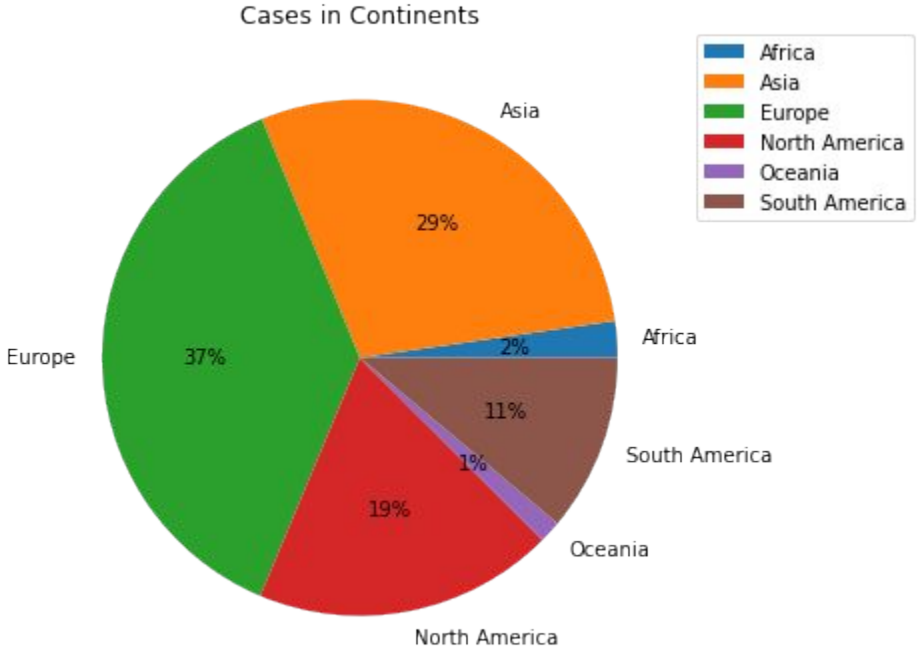
Covid-19 Trends in the World

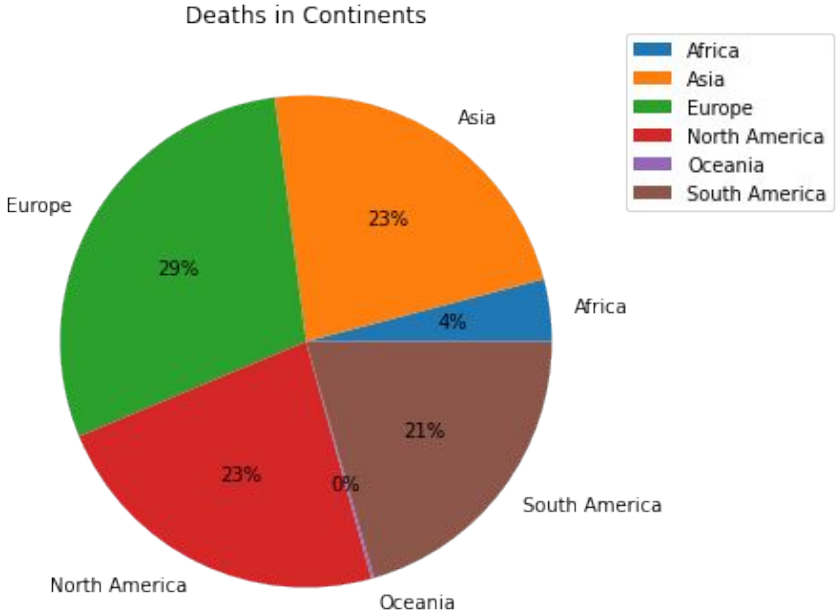


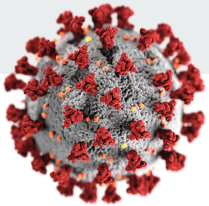




Covid-19 Trends in Continents



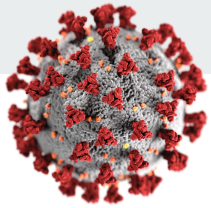


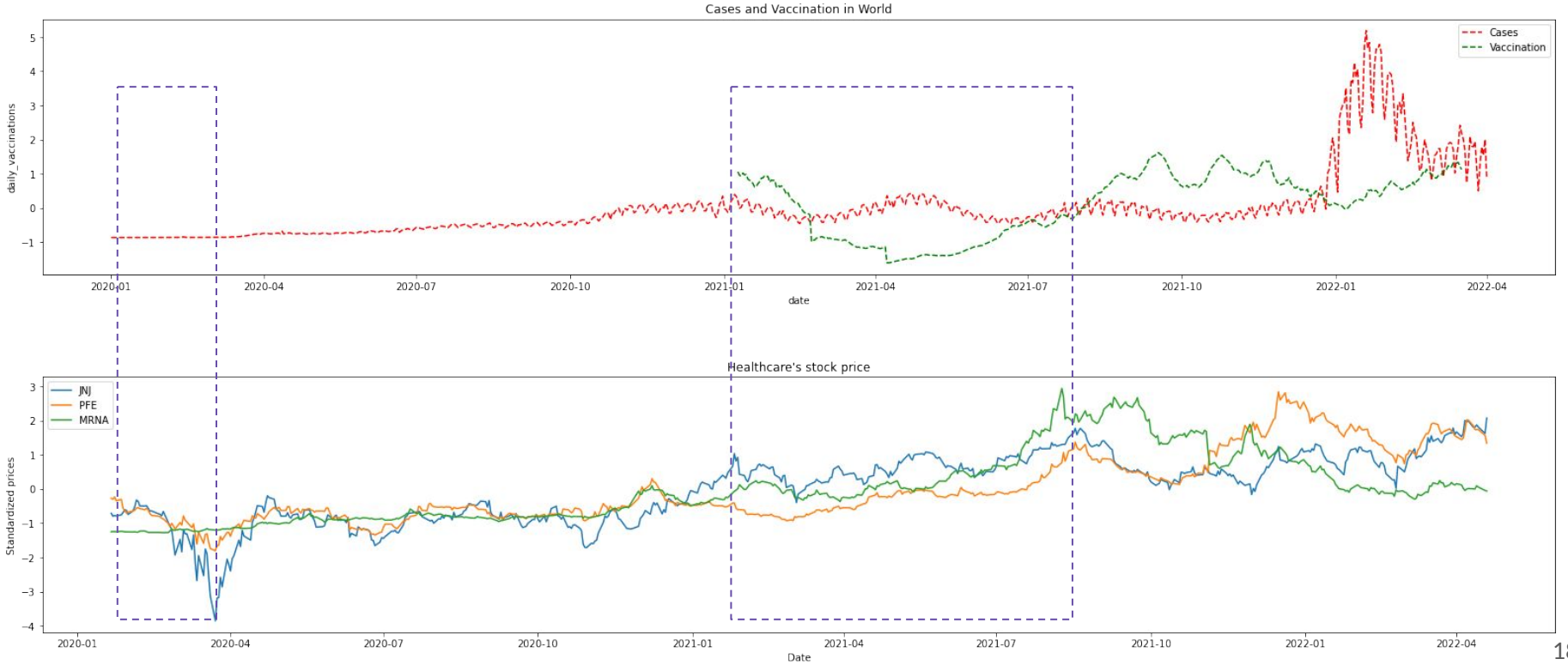


How did covid-19 impact the Stock Market?

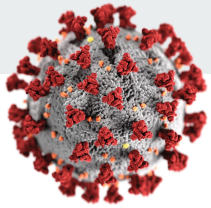
- Health care
- Education
- Social media & Entertainment
- Technology
- Online shopping
- Travel (flight)

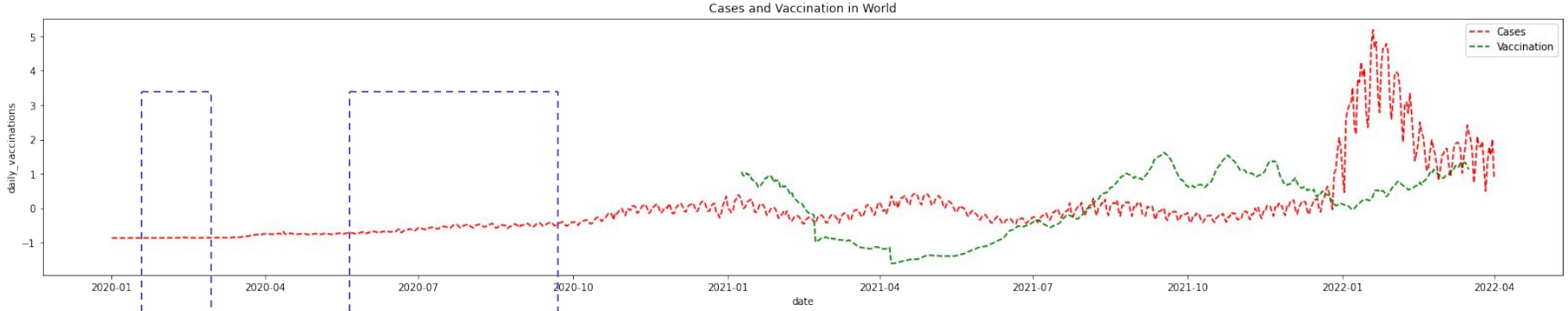
Health care

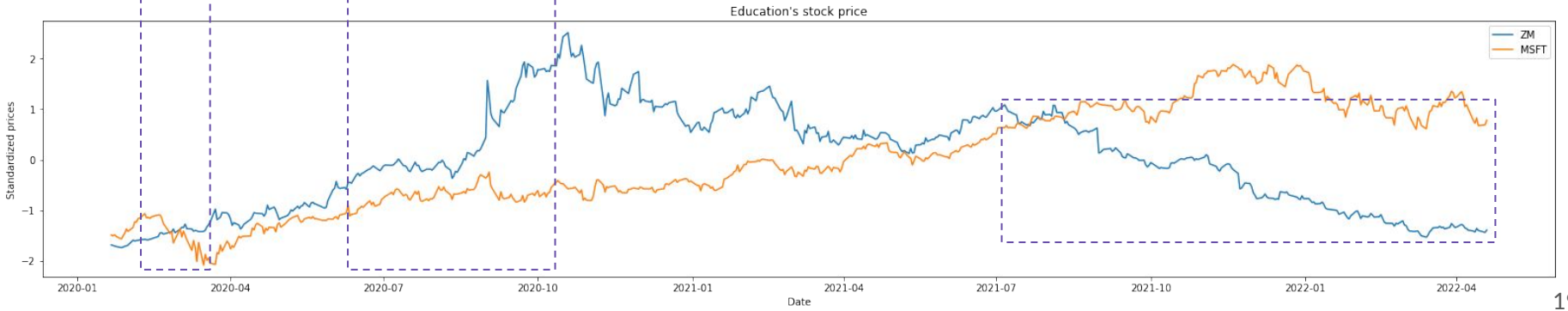



Cases and Vaccination in World
Cases
Vaccination
daily_vaccinations
date
Healthcare's stock price
JNJ
PFE
MRNA
Standardized prices
Date

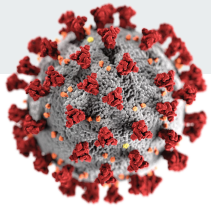
Education



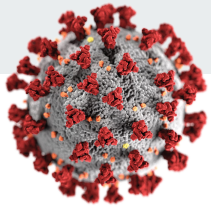

Cases and Vaccination in World
Cases
Vaccination
daily_vaccinations
5
4
3
2
1
0
−1
2020-01
2020-04
2020-07
2020-10
2021-01
2021-04
2021-07
2021-10
2022-01
2022-04
date


Education's stock price
ZM
MSFT
Standardized prices
2
1
0
−1
−2
2020-01
2020-04
2020-07
2020-10
2021-01
2021-04
2021-07
2021-10
2022-01
2022-04
Date

Social media & Entertainment

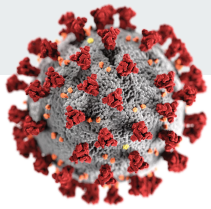


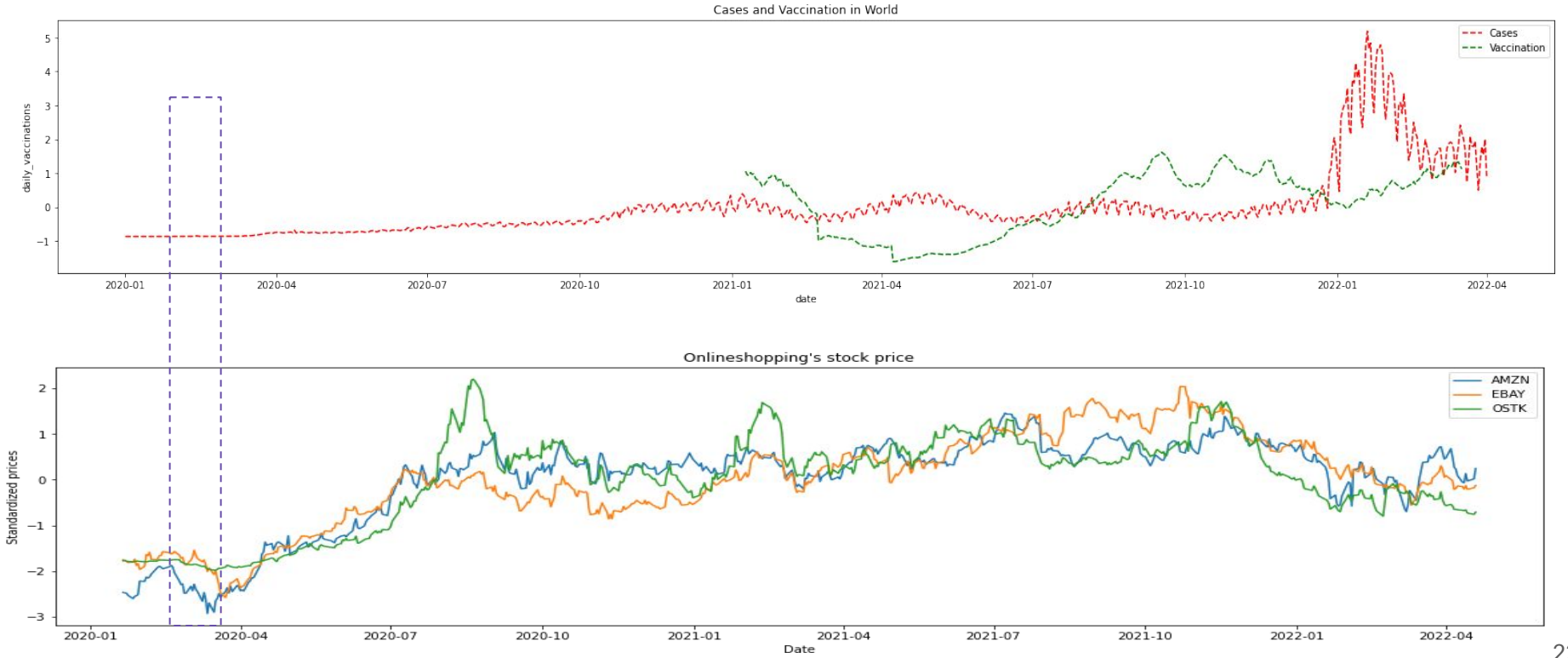
Technology



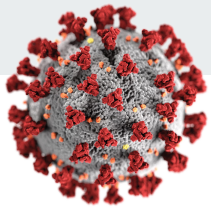

Cases and Vaccination in World
Cases
Vaccination
daily_vaccinations
5
4
3
2
1
0
−1
2020-01
2020-04
2020-07
2020-10
2021-01
2021-04
2021-07
2021-10
2022-01
2022-04
date
Tech's stock price
AAPL
AMZN
MSFT
Standardized prices
2
1
0
−1
−2
−3
2020-01
2020-04
2020-07
2020-10
2021-01
2021-04
2021-07
2021-10
2022-01
2022-04
Date

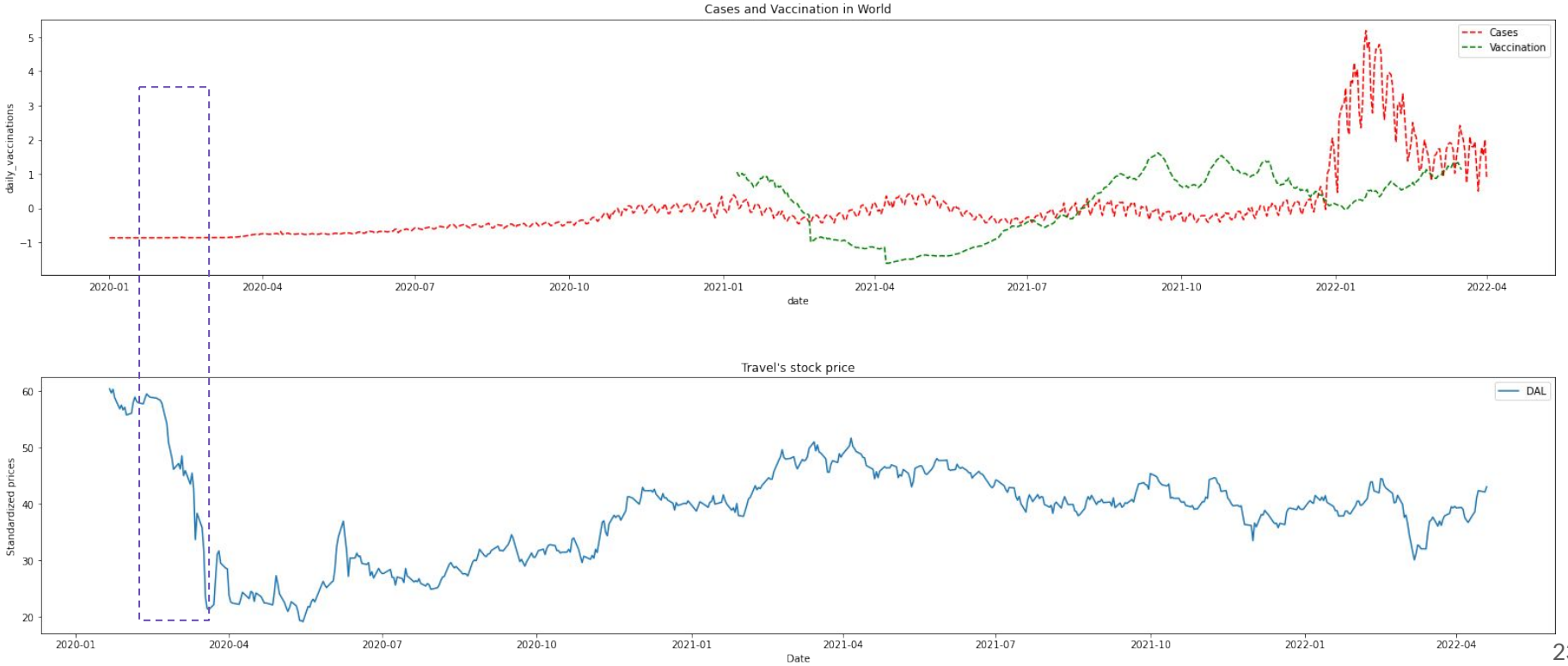
Online Shopping





Travel




Cases and Vaccination in World
Cases
Vaccination
daily_vaccinations
5
4
3
2
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0
−1
2020-01
2020-04
2020-07
2020-10
2021-01
2021-04
2021-07
2021-10
2022-01
2022-04
date
Travel's stock price
DAL
Standardized prices
60
50
40
30
20
2020-01
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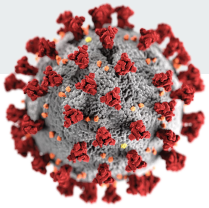
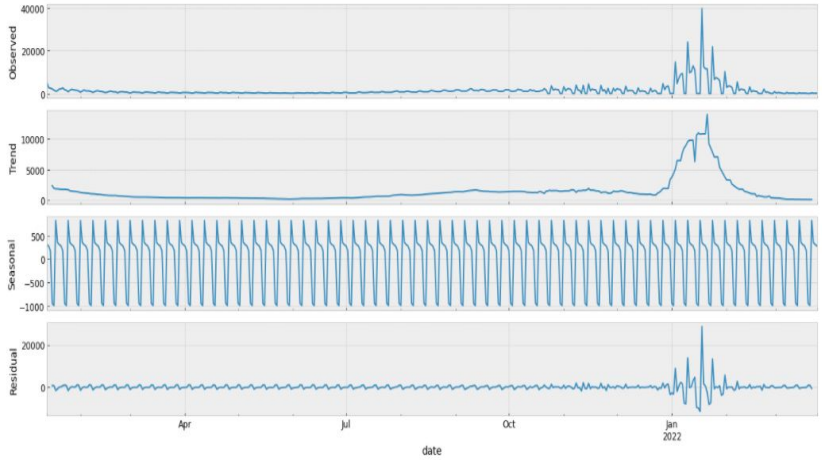
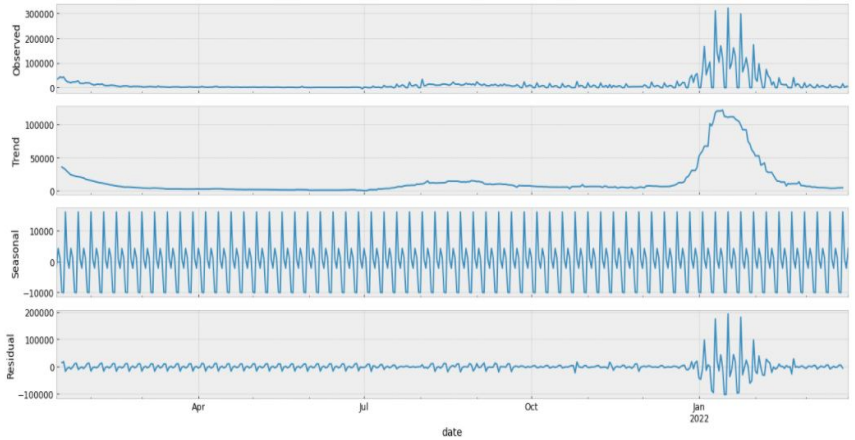
2022-04
Date



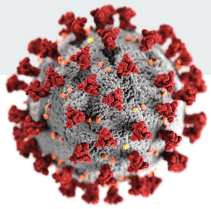
Covid Data Analysis and Prediction (TS Decomped)



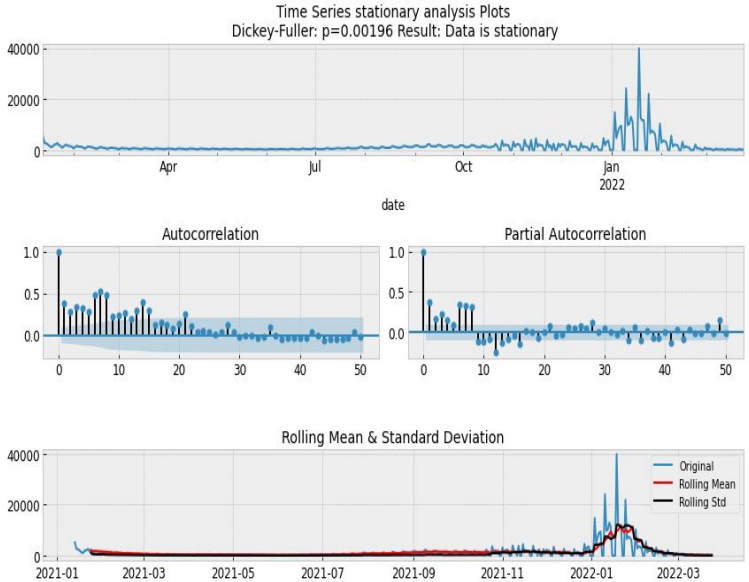
Utah



California



Covid Data Analysis and Prediction



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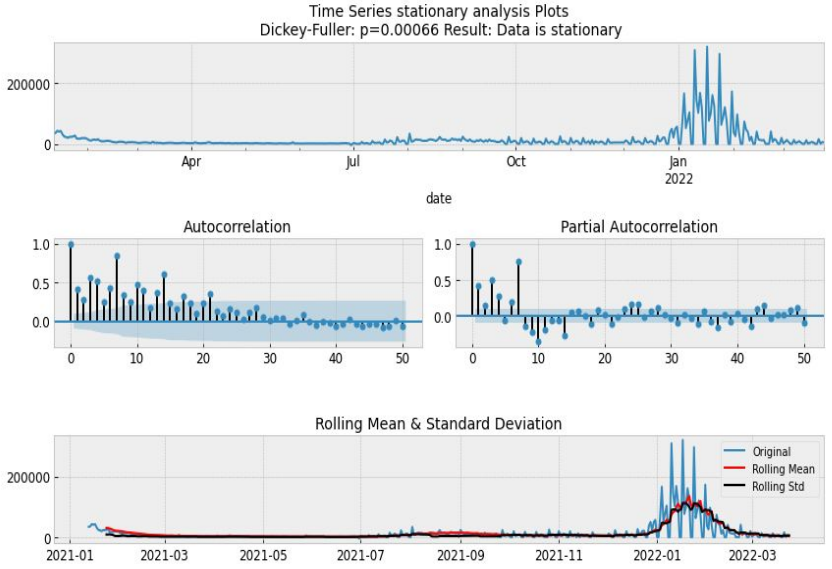
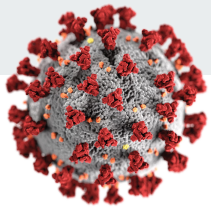
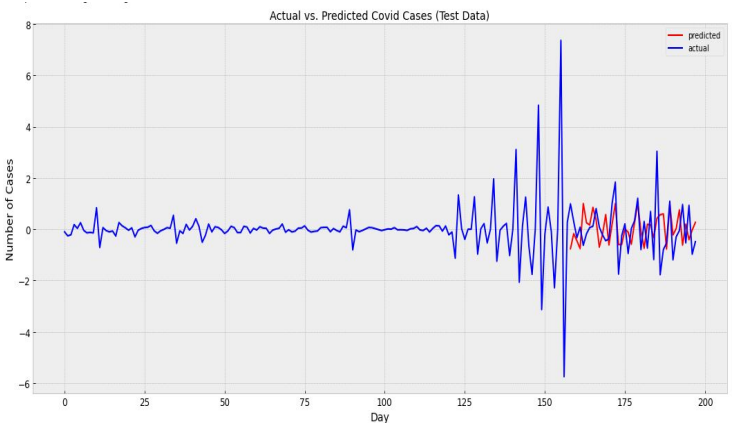


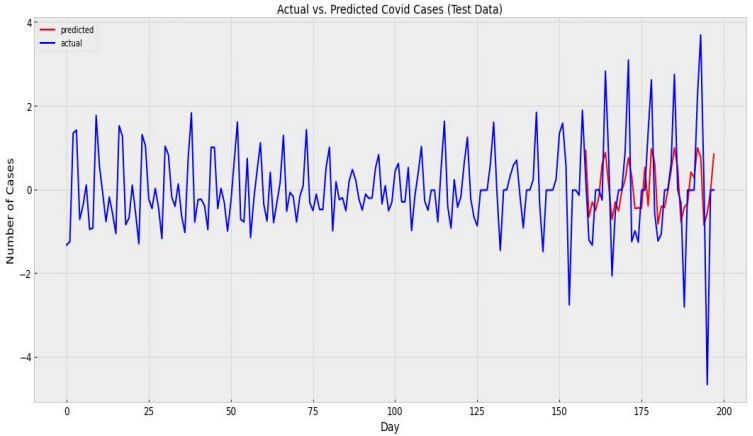
California



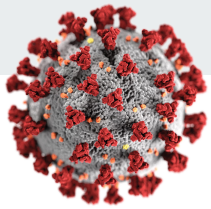
Prediction With LSTM (CA and UT)



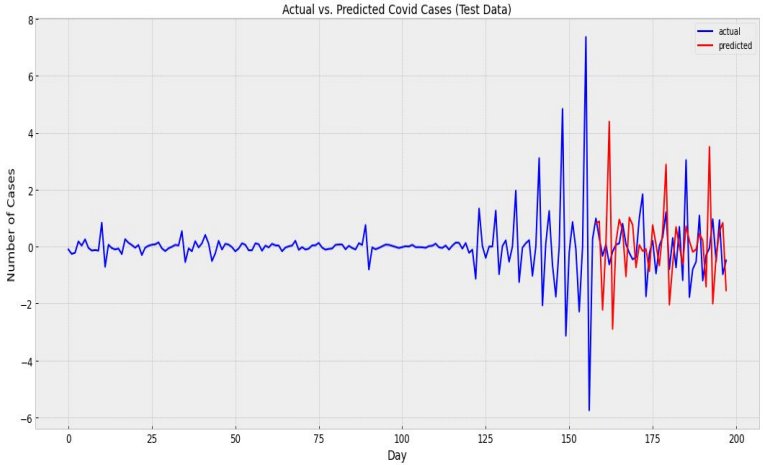
CA



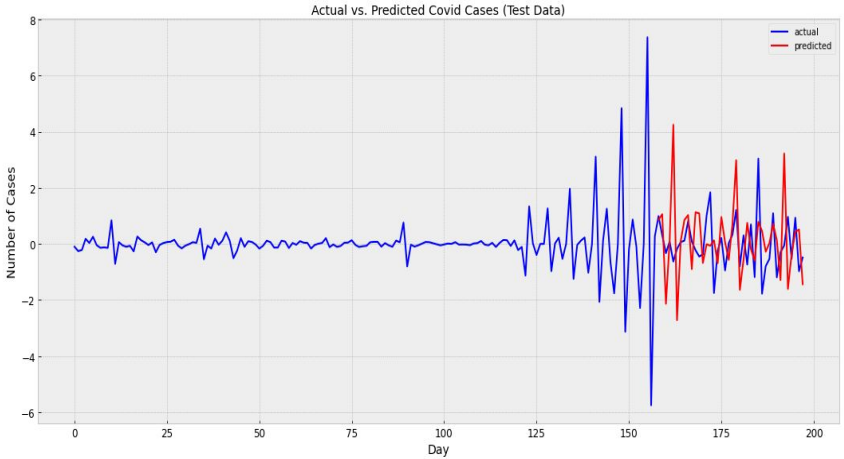
UT



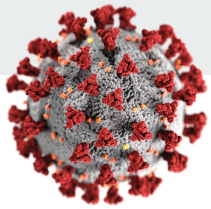
Prediction With Random Forest and XgBoost(CA)



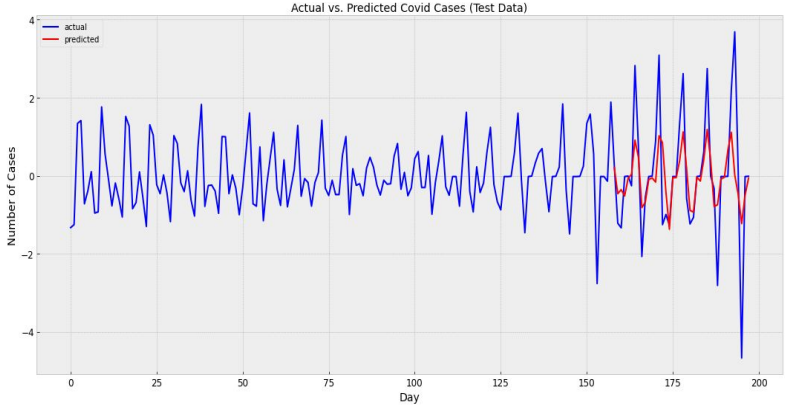
XgBoost



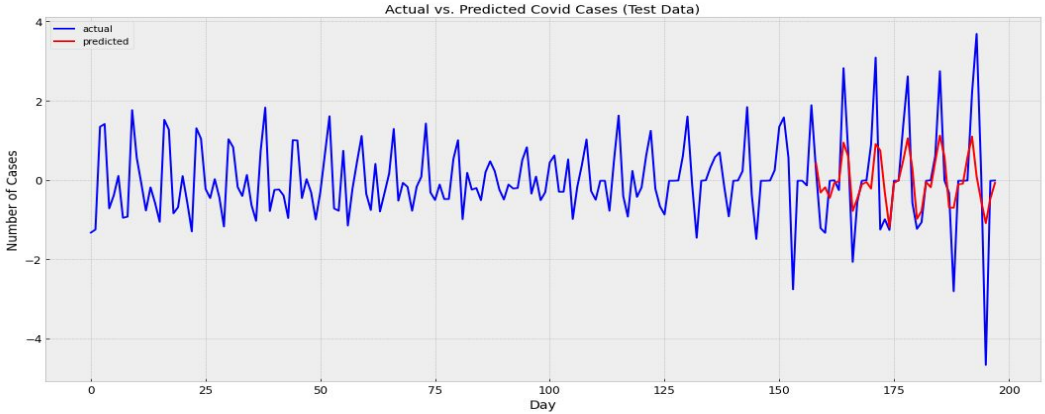
Random Forest



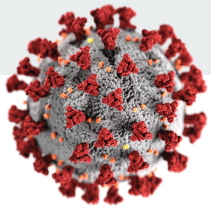
Prediction With Random Forest and XgBoost(UT)



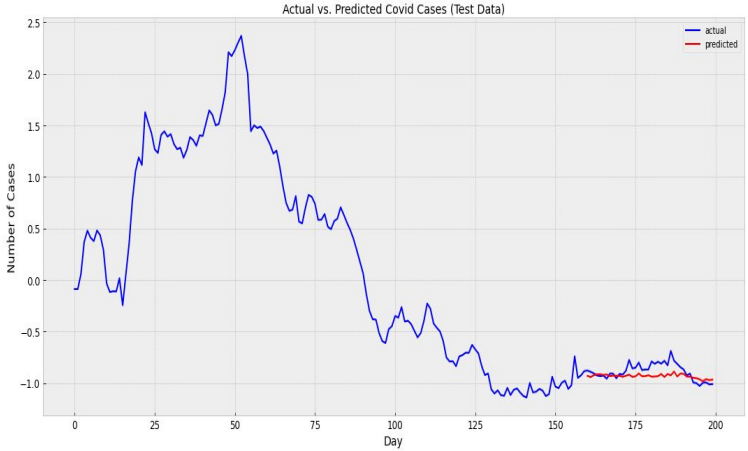
XgBoost



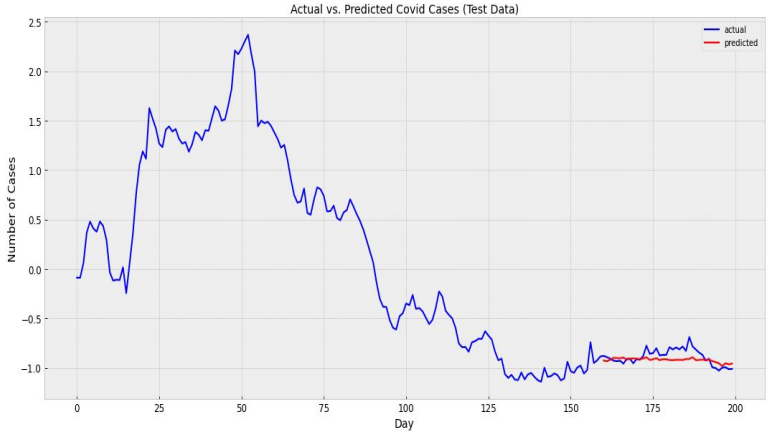
Random Forest



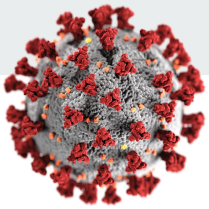
Vaccination Data + Covid Case (Random Forest and XGBoost) CA



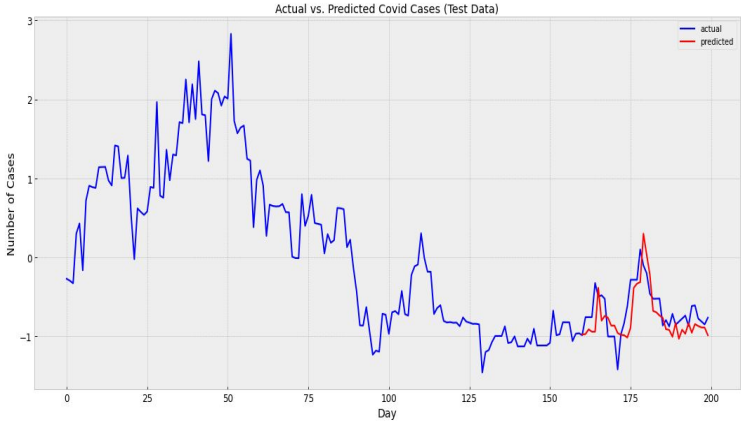
Xgboost



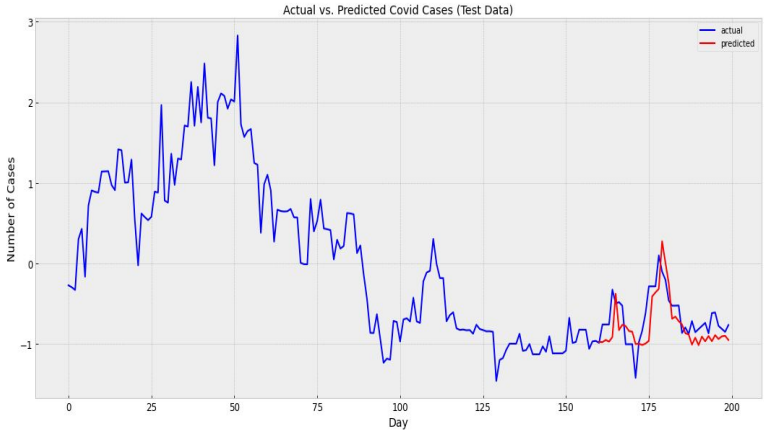
Random Forest



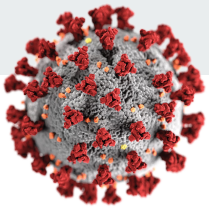
Vaccination Data + Covid Case (Random Forest and XGBoost) UT



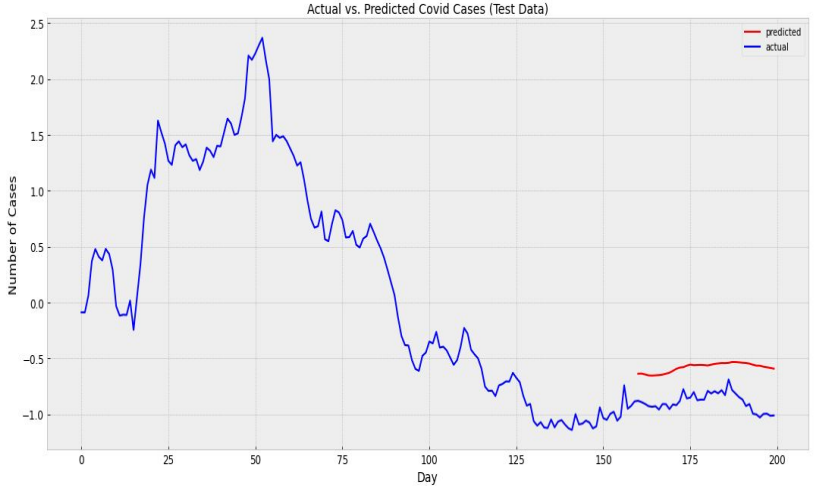
Xgboost



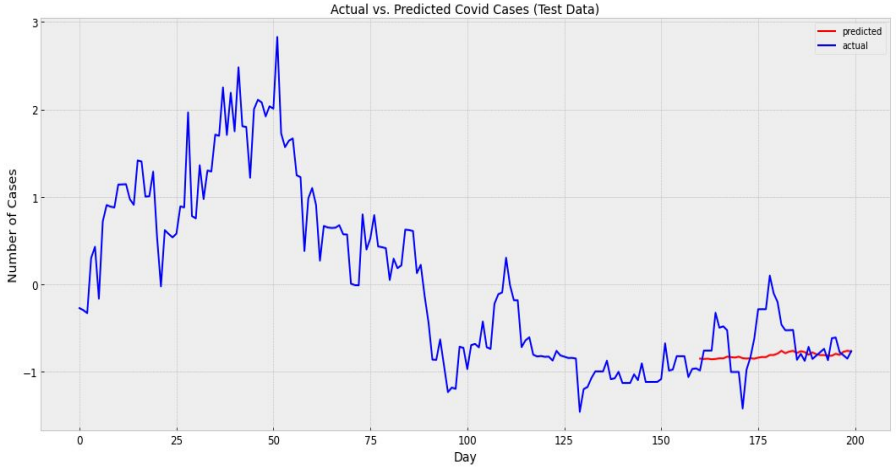
Random Forest



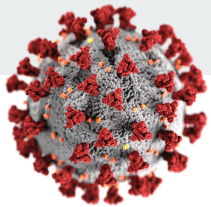
Vaccination Data + Covid Case (LSTM)



CA



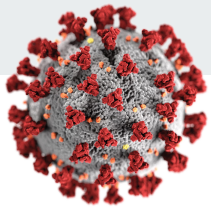
UT



RMSE Table (CA)

time_step = 45

	With Vaccination Data	Without Vaccination Data
XGBoost	.08	1.57
LSTM	.31	.959
RandomForest	.0764	1.51



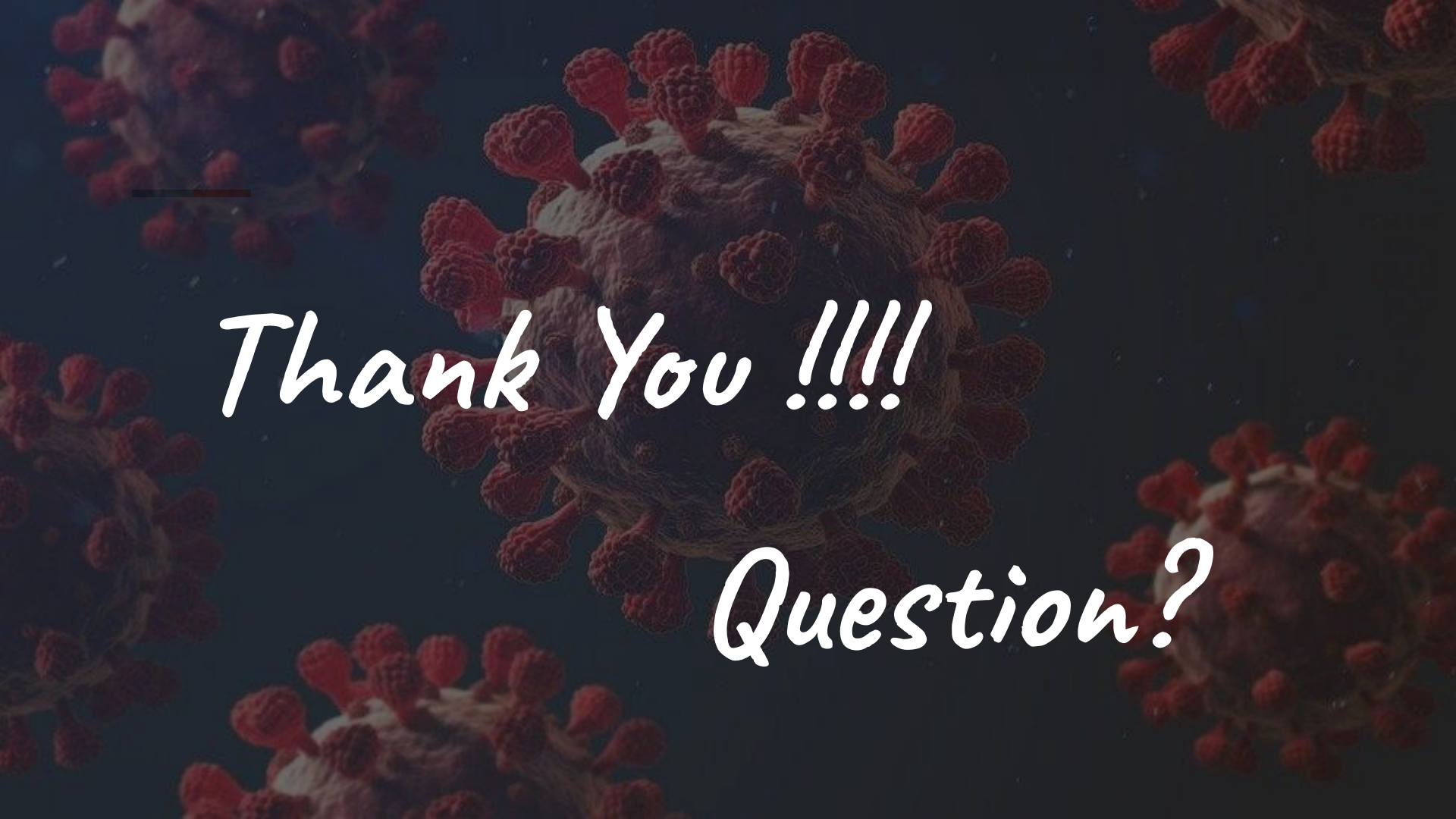
RMSE Table (UT)

time_step = 45

	With Vaccination Data	Without Vaccination Data
XGBoost	.25	1.18
LSTM	.31	1.27
RandomForest	.25	1.20

Future Works

- Use more complex model to predict
- Need more data preprocessing for time series to make it non-stationary


Thank You !!!!
Question?