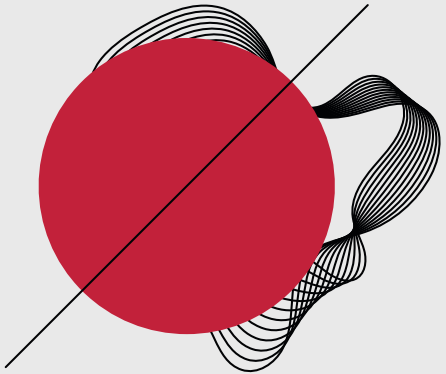
COVID-19 TIMESERIES FORECASTING

on vaccination data with deep learning

Eric Rodriguez
4/19/21



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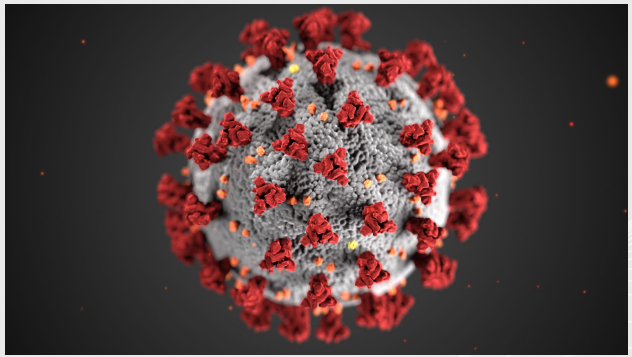


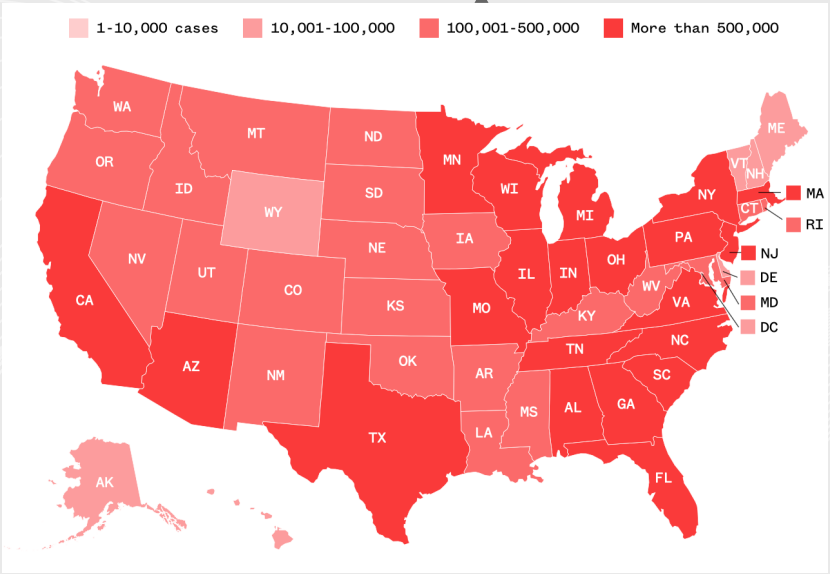
01.

INTRODUCTION

INTRODUCTION

The COVID-19 pandemic prevails as an ultimatum to the global economic growth and the wellbeing of society

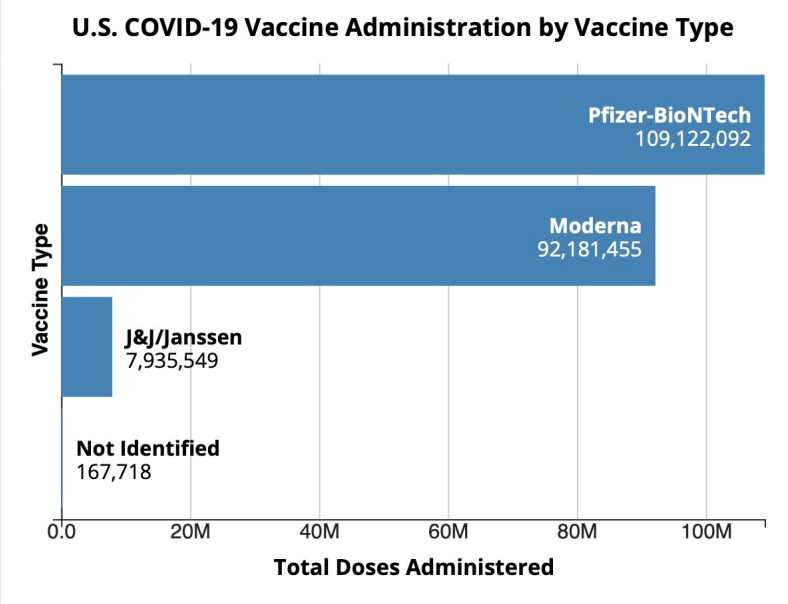
The global spread of COVID-19 is increasing day by day, creating a larger risk of disease or death as well as a strain on the economy[1]



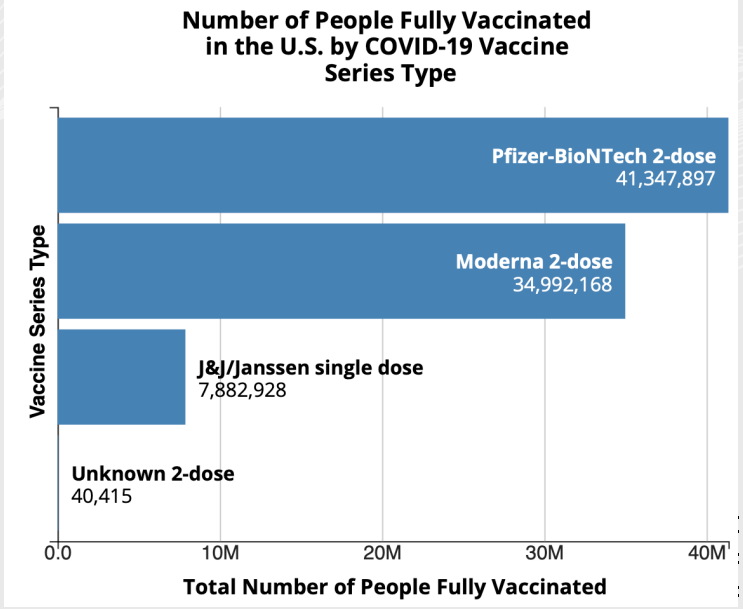
Vaccines!

There are currently three vaccines that have received emergency authorization from the FDA[2]

- Pfizer
- Moderna
- Johnson & Johnson*

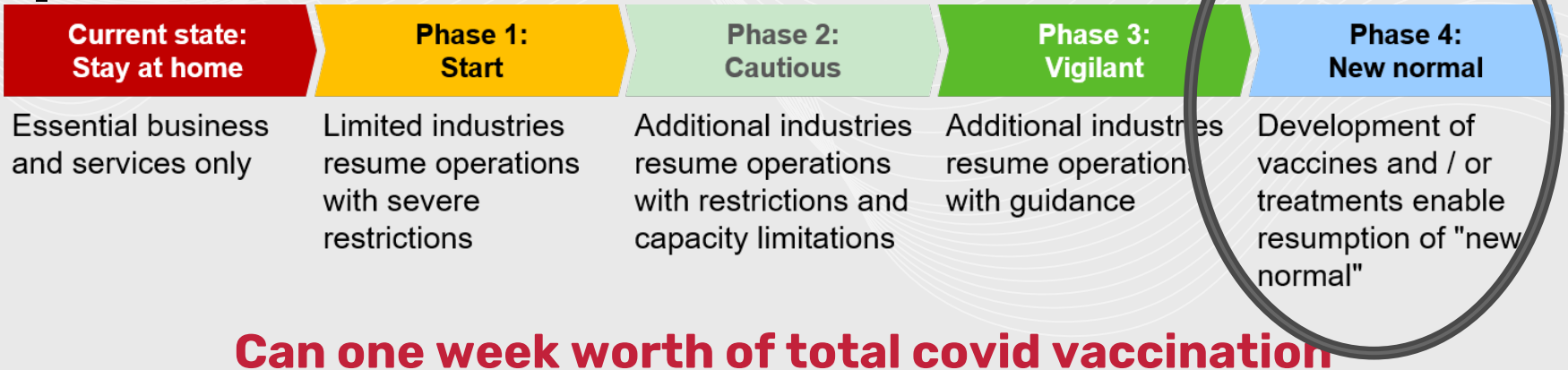


Total doses administered as of 4/18/21[1]



Number of people fully vaccinated as of 4/18/21[1]

Massachusetts Reopening Plan



Can one week worth of total covid vaccination data be predicted with a lower RMSE than a baseline?

02.

Methodology

Methodology

Data Import

Pulled from “Our World in Data” github repository[4]

EDA

Data checked for missing values, autocorrelation, stationarity

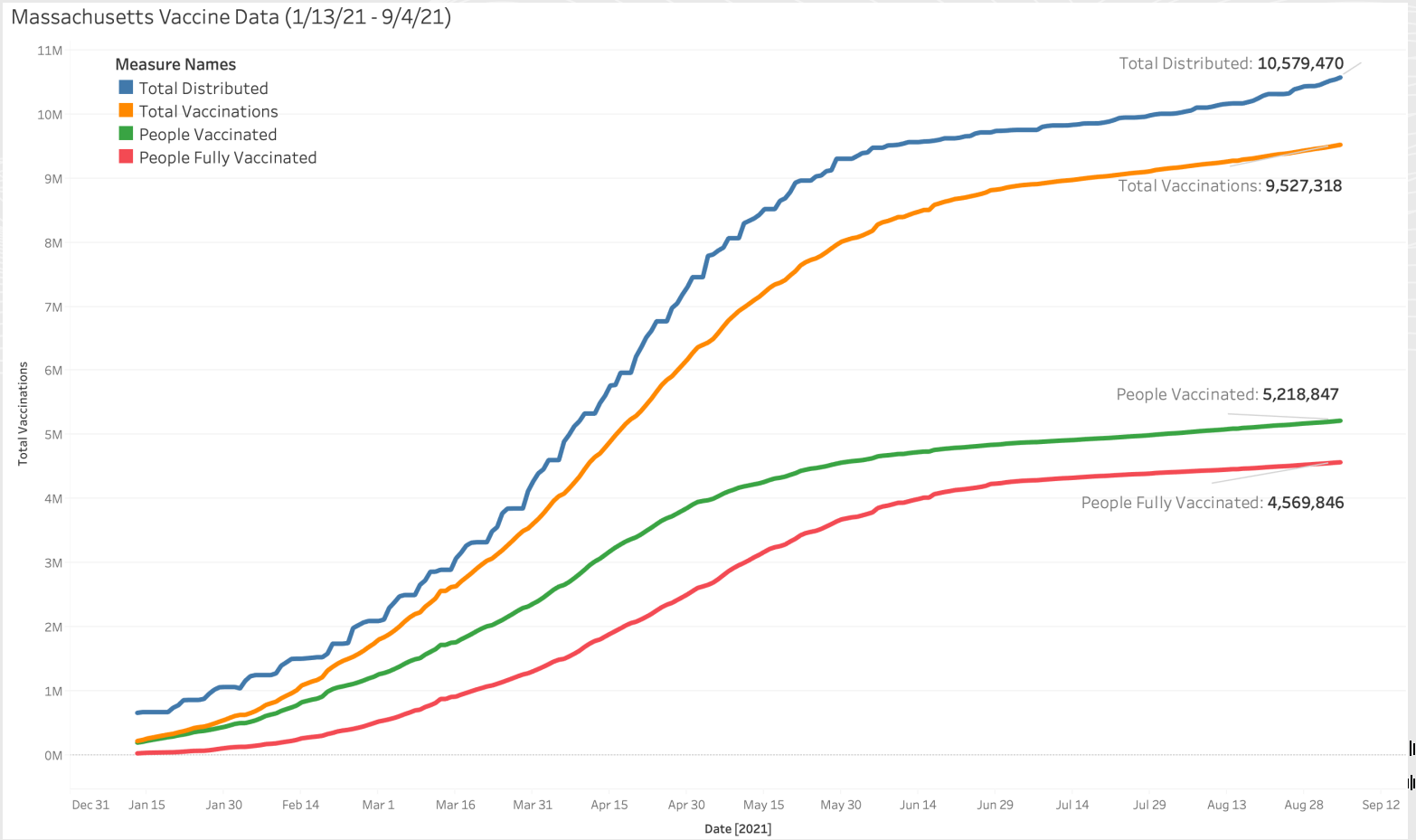
Pre-processing

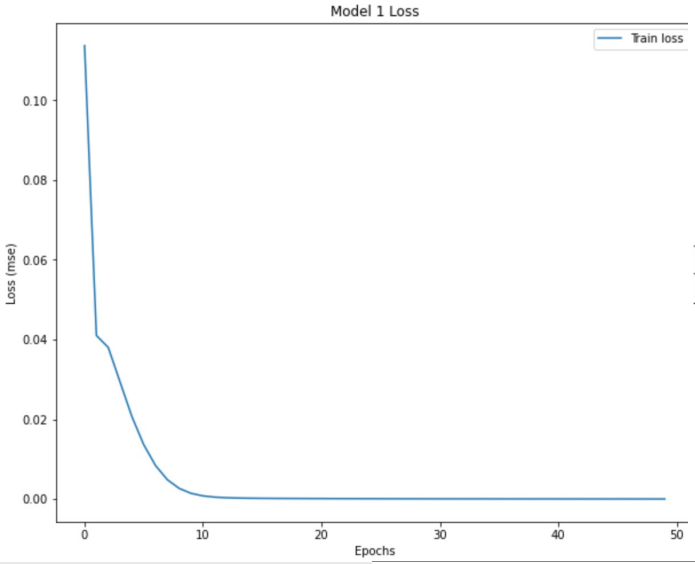
Data set up in three dimensions to be processed by RNN

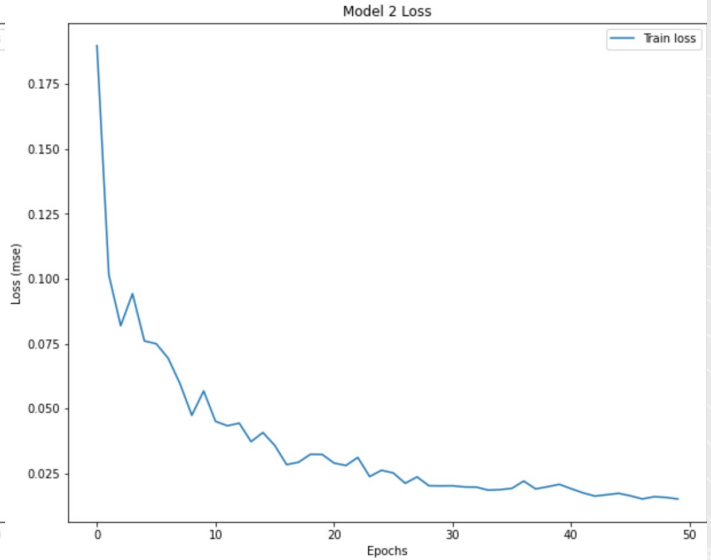
Models

Three LSTM RNN models with different hyperparameters

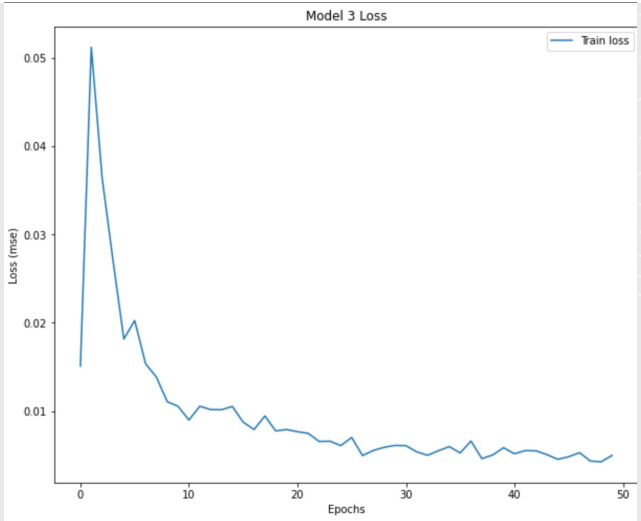
Massachusetts Vaccinations




Model 1 Loss
Train loss
Loss (mse)
Epochs


Model 2 Loss
Train loss
Loss (mse)
Epochs

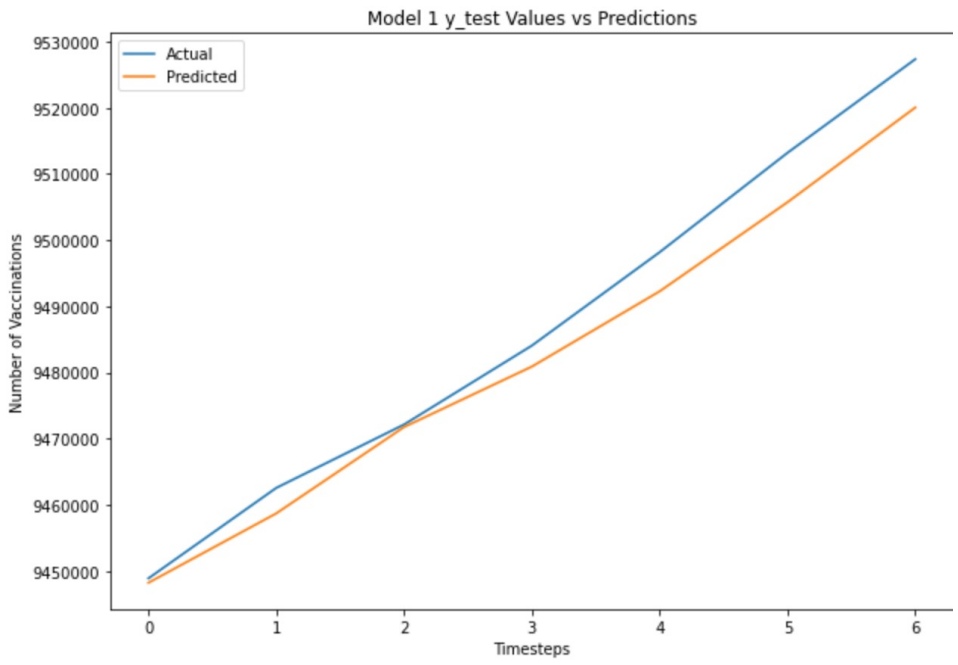
03. Results

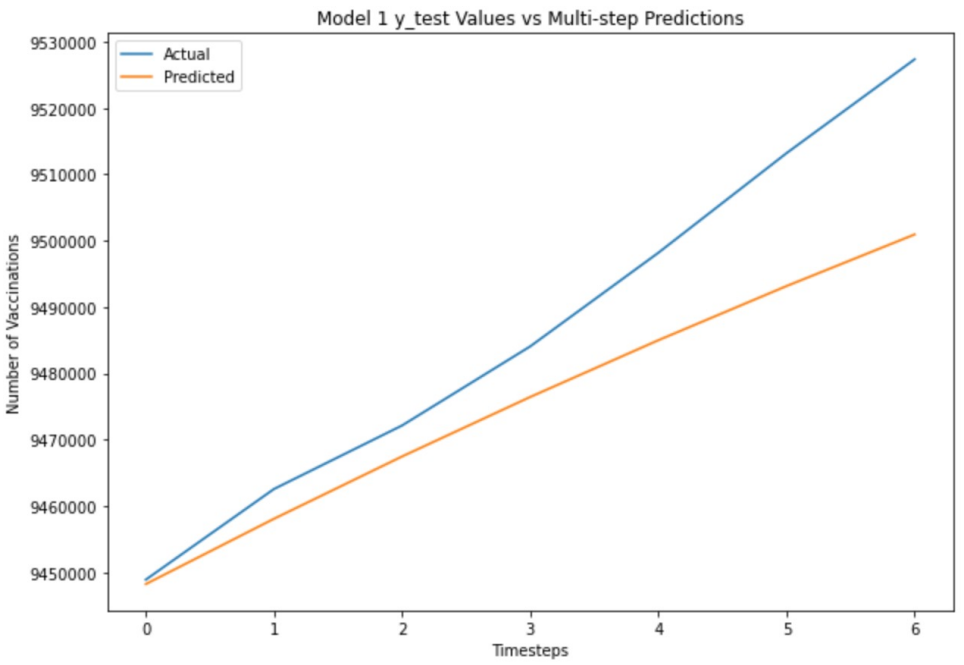

Model 3 Loss
Train loss
Loss (mse)
Epochs

Root Mean Squared Error and MAPE

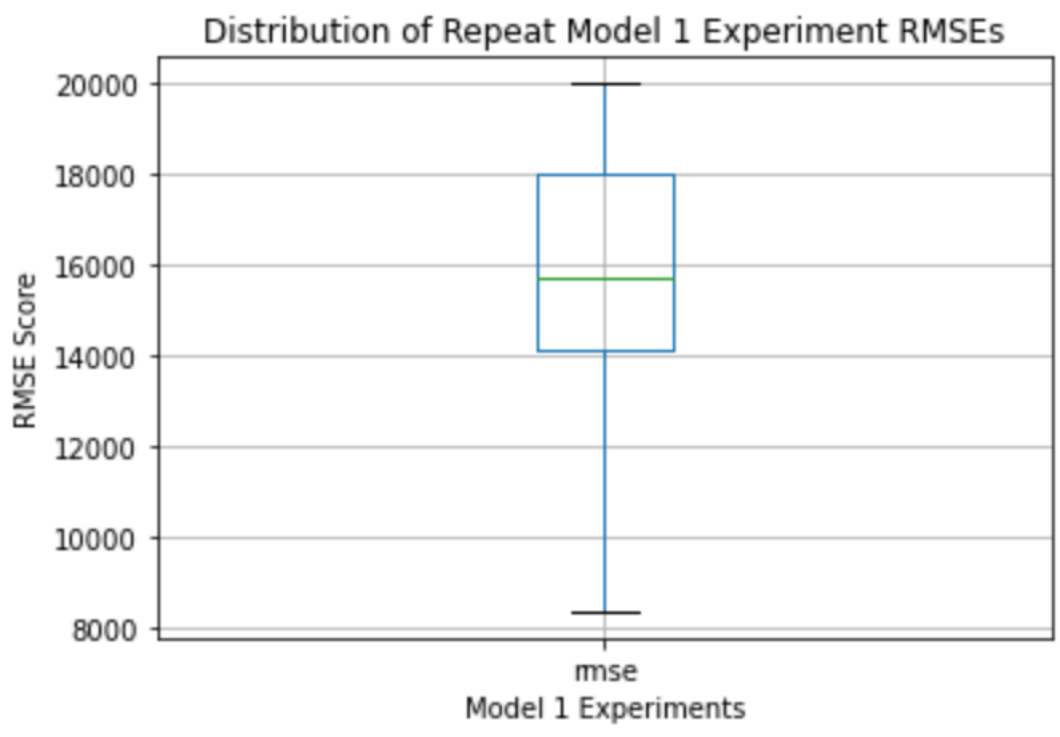
	One-Step RMSE	One-Step MAPE	Multi-Step RMSE	Multi-Step MAPE
Model 1	4917.93	0.04%	13999.36	0.12%
Model 2	105338.02	1.11%	458262.63	4.32%
Model 3	138232.56	1.46%	532559.40	5.09%

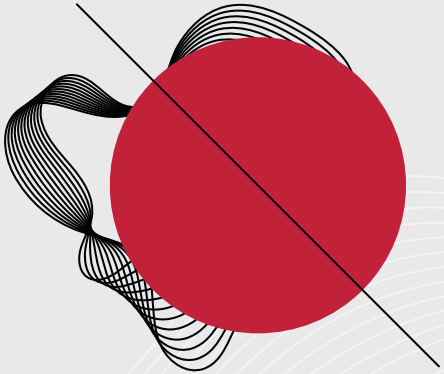
Model 1 Seven-Day Forecast





What If We Repeat The Forecast?





04.
Conclusion

Conclusions

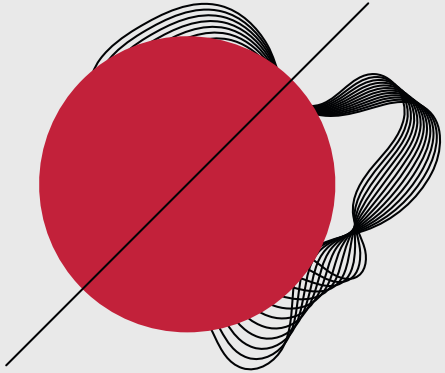
- LSTM RNNs can be used to perform timeseries forecasting on vaccination data
- The simplest model worked the best, most likely because of the size of the data set

Future Work

- Differenced Data
- Multivariate Model
- Larger Windows/Timesteps
- Streamlit that updates weekly to visualize predictions

Citations

1. https://covid.cdc.gov/covid-data-tracker/#datatracker-home
2. https://www.fda.gov/vaccines-blood-biologics/vaccines/emergency-use-authorization-vaccines-explained
3. https://www.mass.gov/info-details/reopening-massachusetts
4. https://github.com/owid/covid-19-data



THANKS!

Do you have any questions?

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