COVID-19 TIMESERIES FORECASTING

on vaccination data with deep learning

Eric Rodriguez 4/19/21

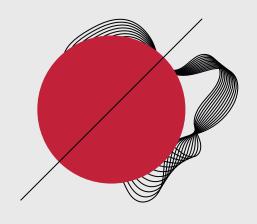


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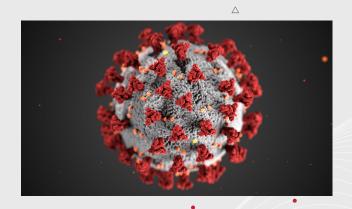
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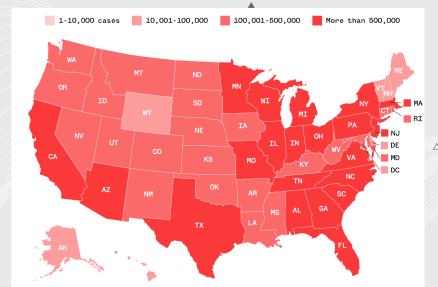
01. INTRODUCTION

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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 economy¹



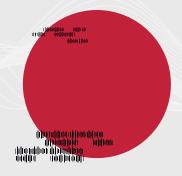


Vaccines!



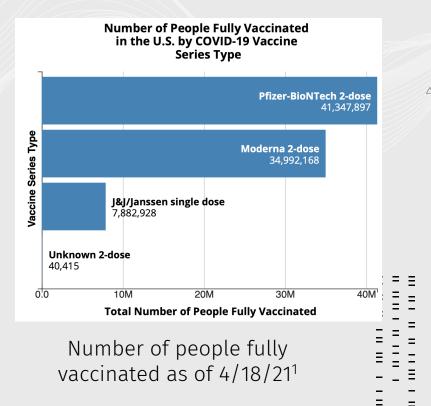
There are currently three vaccines that have received emergency authorization from the FDA²

- Pfizer
- Moderna
- Johnson & Johnson*



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Total doses administered as of 4/18/21¹

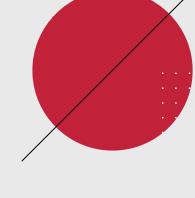


Massachusetts Reopening Plan

Current state: Phase 1: Phase 2: Phase 3: Phase 4: Vigilant **New normal** Stay at home Start Cautious Essential business Limited industries Additional industries Additional industries Development of vaccines and / or and services only resume operations resume operations resume operation with severe with restrictions and with guidance treatments enable restrictions capacity limitations resumption of "new normal"

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

02. Methodology



Methodology



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Data Import

Pulled from "Our World in Data" github repository⁴



EDA

Data checked for missing values, autocorrelation, stationarity



Pre-processing

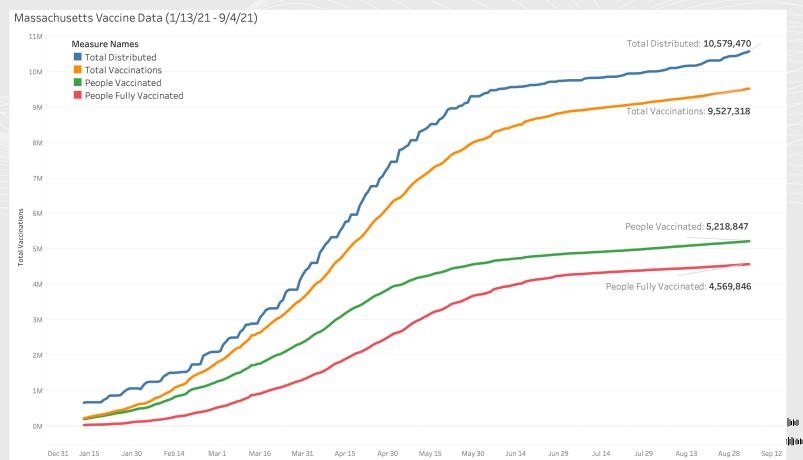
Data set up in three dimensions to be processed by RNN



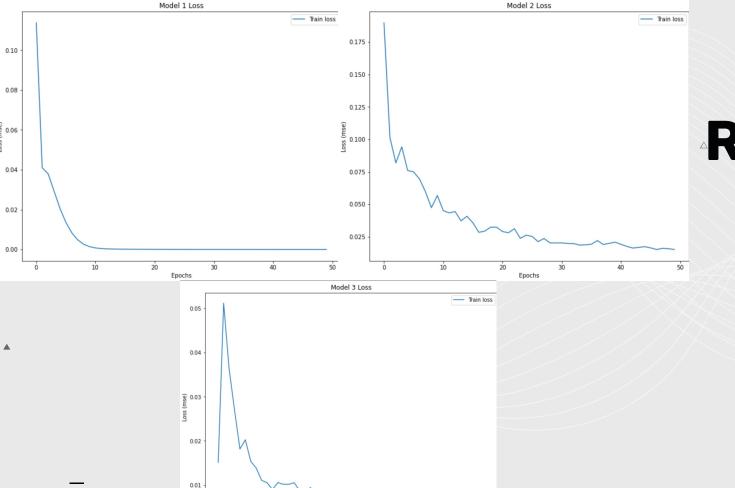
Models

Three LSTM RNN models with different hyperparameters

Massachusetts Vaccinations



Date [2021]



Epochs

03. Results

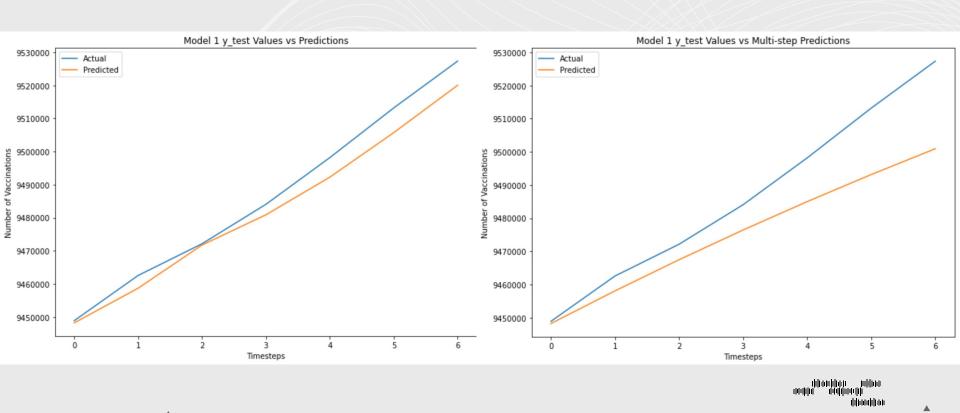


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Root Mean Squared Error and MAPE

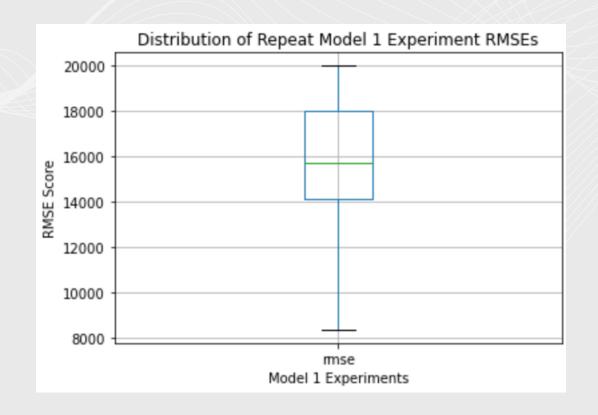
	One- RMSE	Step MAPE	Multi- RMSE	Step MAPE
Model 1	4917.93	0.04%	13999.36	0.12%
Model 2	105338.02	1.11%	458262.63	4.32%
Model 3	138232.56	1.46%	532559.40	5.09%

Model 1 Seven-Day Forecast



What If We Repeat The Forecast?

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04. Conclusion

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Conclusions

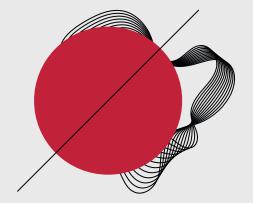
Future Work

- 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

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

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- 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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