Project 5: COVID19 Vaccination

a race of injection vs. infection

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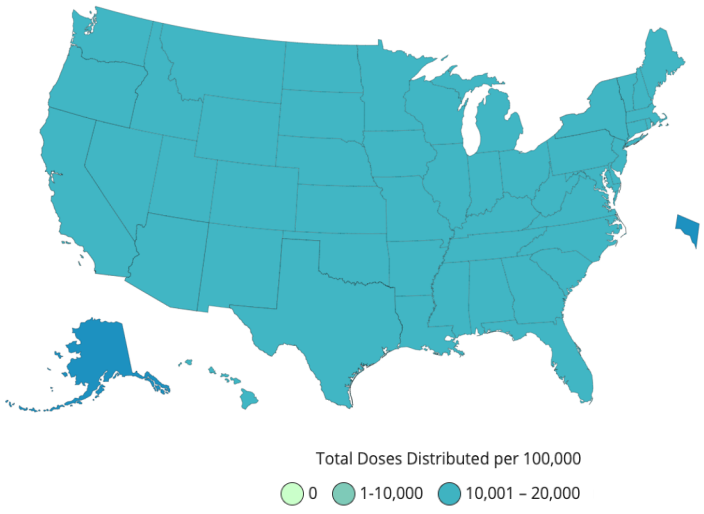
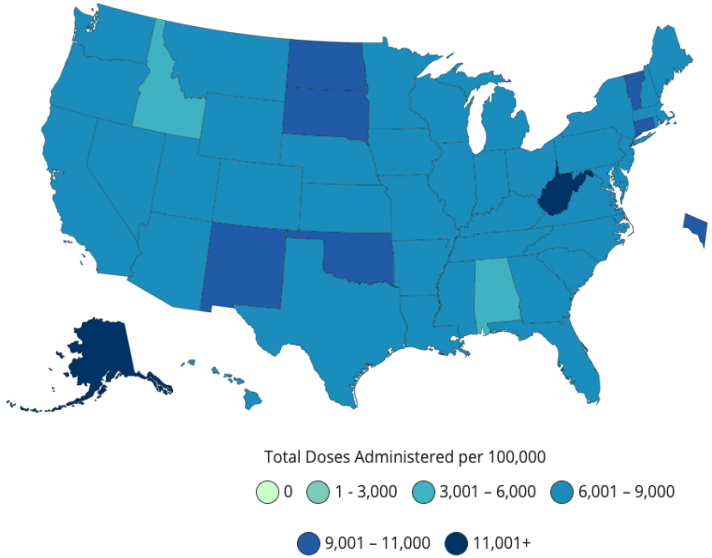
How are we doing on vaccine distribution?

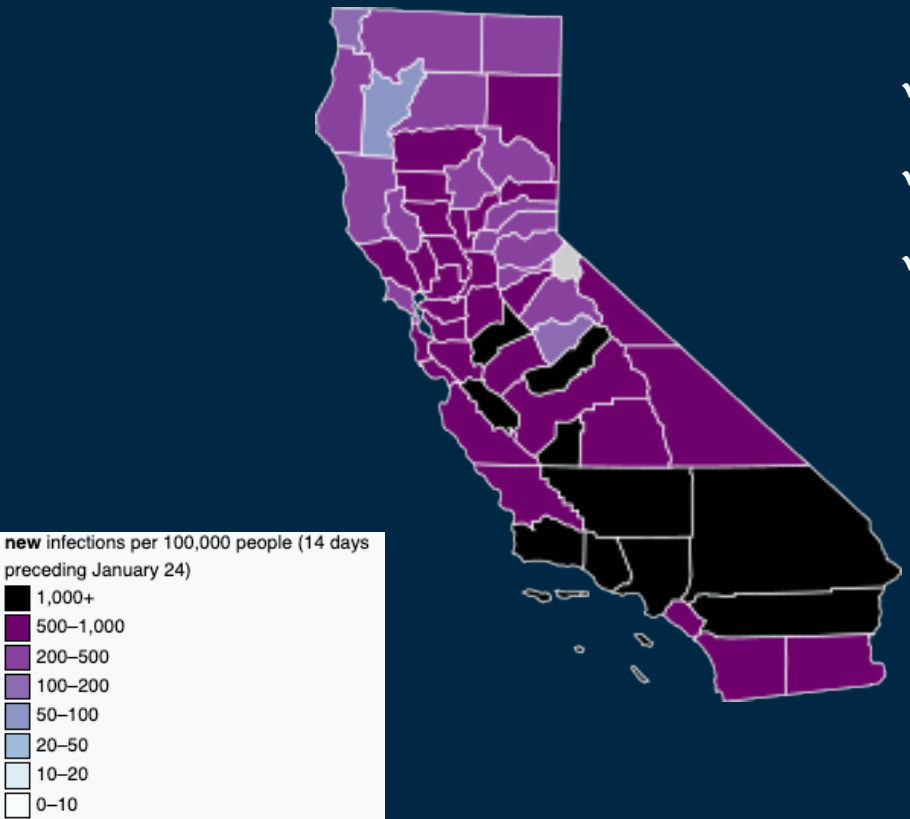




Federal Allocation
14,000-16,000 / 100K

State Distribution
3,000-11,000+ / 100K

Highly Impacted States like CA – Slow in Vaccine Distribution



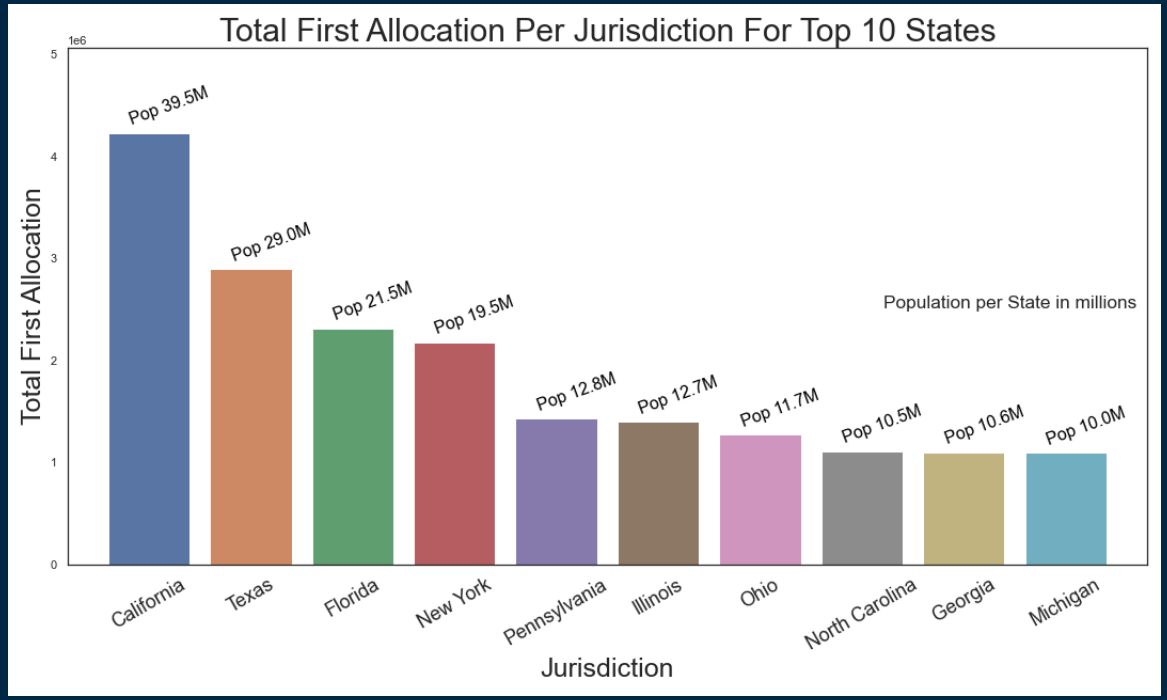
- ✓ Total vaccines administered = 5200 per 100k
- ✓ New cases = 1142.3 per 100k in the last 14 days
- ✓ *Speed matters*

1. Costs lives
2. Costs money
3. Virus mutates
   - new variants may spread faster
   - escape current vaccines

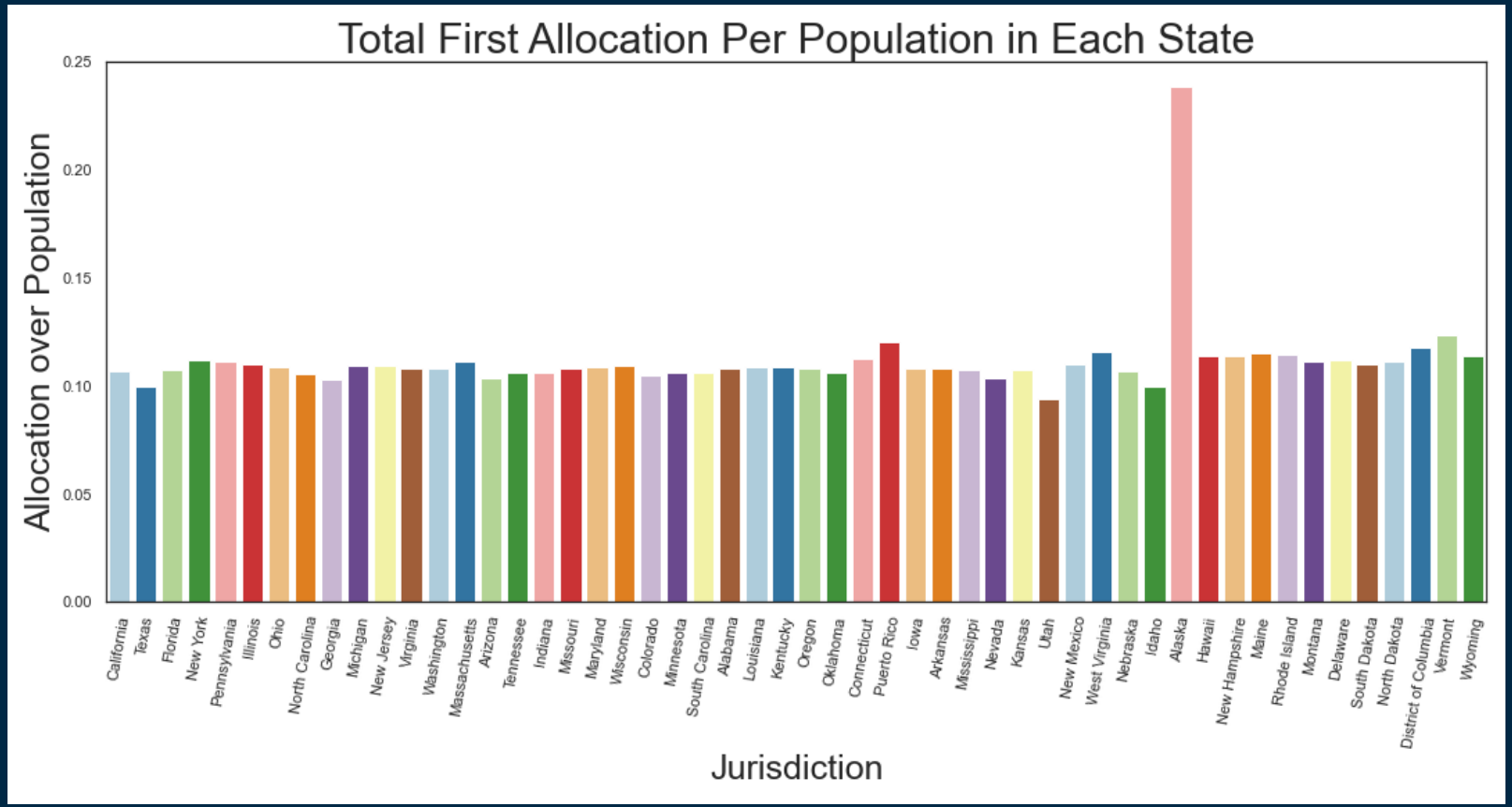
Problem Statement

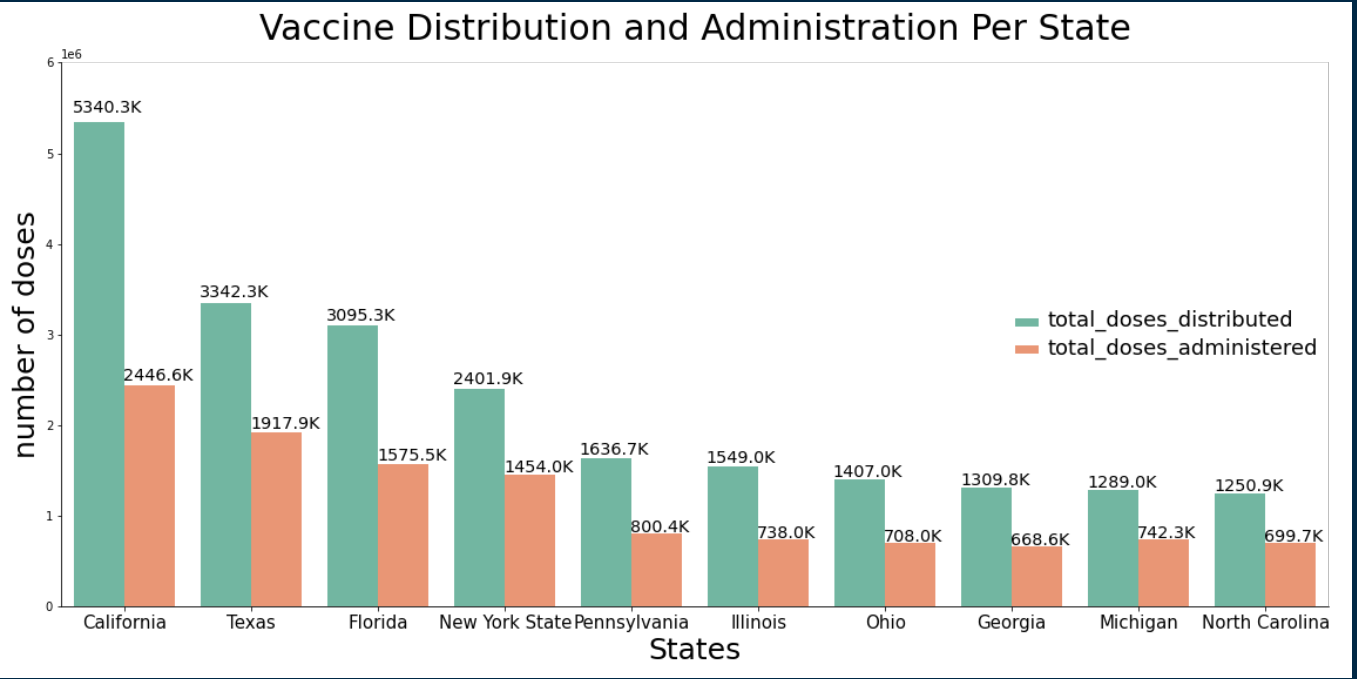
Can we optimize vaccine distribution by forecasting the next hot spots?

1. can we develop a model to forecast hot spots?
2. what is the current distribution protocol and how to modify it?
3. should we make the change?



- Pfizer and Moderna are vaccine suppliers
- From 12/14/2020 to 02/01/2021
- Vaccine Allocation: California: 4,226,100; Texas: 2,894,925; Florida: 2,313,050


Total First Allocation Per Population in Each State
Allocation over Population
0.25
0.20
0.15
0.10
0.05
0.00
California
Texas
Florida
New York
Pennsylvania
Illinois
Ohio
North Carolina
Georgia
Michigan
New Jersey
Virginia
Washington
Massachusetts
Arizona
Tennessee
Indiana
Missouri
Maryland
Wisconsin
Colorado
Minnesota
South Carolina
Alabama
Louisiana
Kentucky
Oregon
Oklahoma
Connecticut
Puerto Rico
Iowa
Arkansas
Mississippi
Nevada
Kansas
Utah
New Mexico
West Virginia
Nebraska
Idaho
Alaska
Hawaii
New Hampshire
Maine
Rhode Island
Montana
Delaware
South Dakota
North Dakota
District of Columbia
Vermont
Wyoming
Jurisdiction



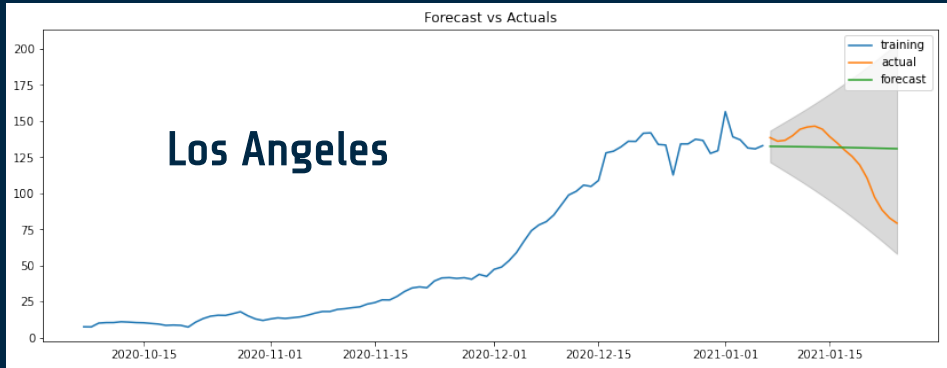
- From 1/16 to 1/27
- California got 5,340,275 distribution, but only 2,446,577 got administered

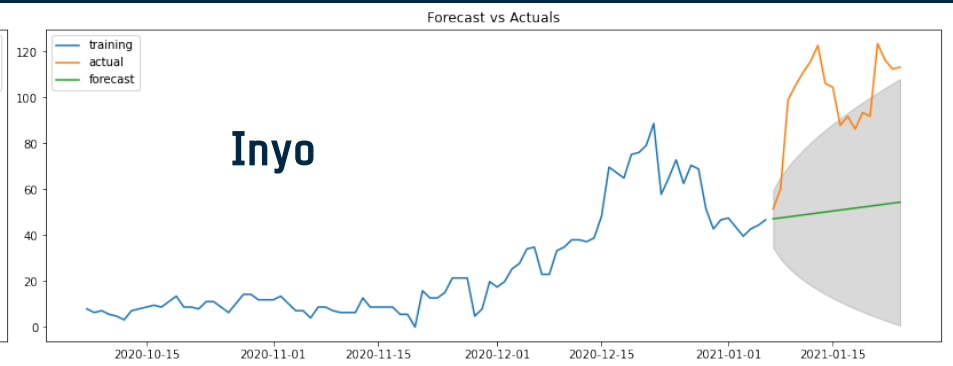
Modeling - RNN

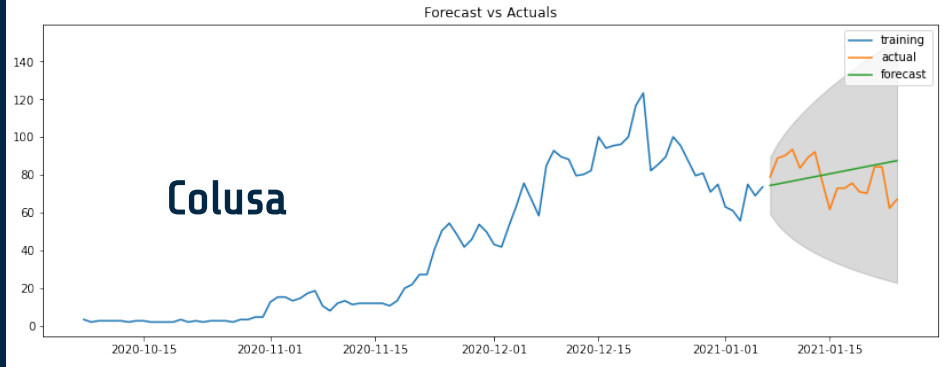
- As time series and geospatial data is hard to visualize in slides, we will be using an interactive web app to go through our modeling process

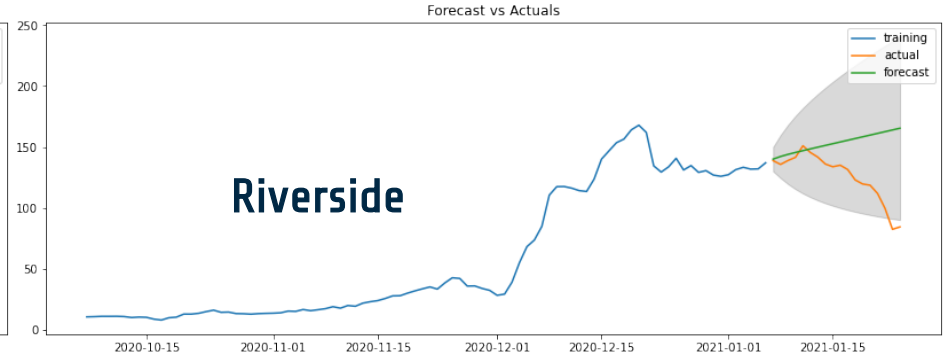
- Visit this link to follow along: https://covid.jesseptao.com

Modeling –ARIMA

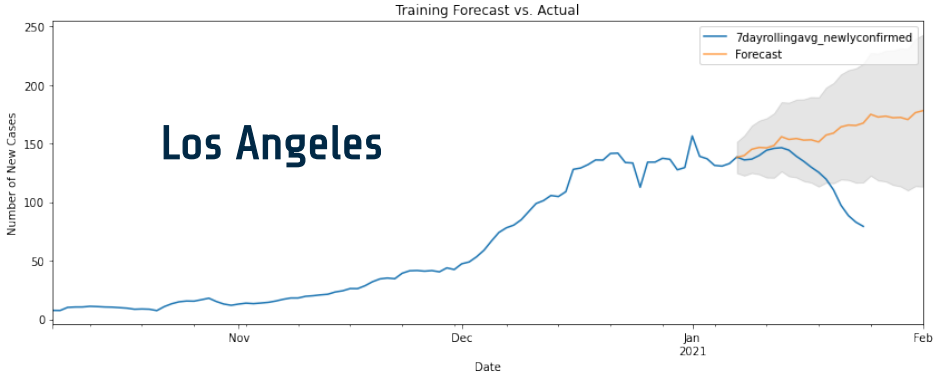


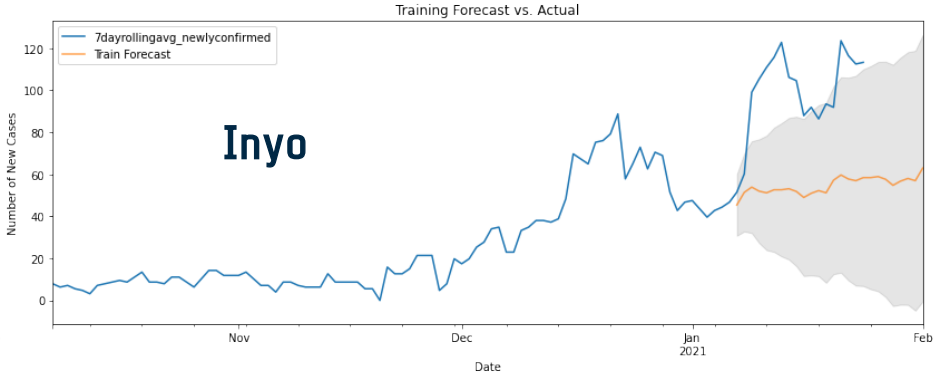


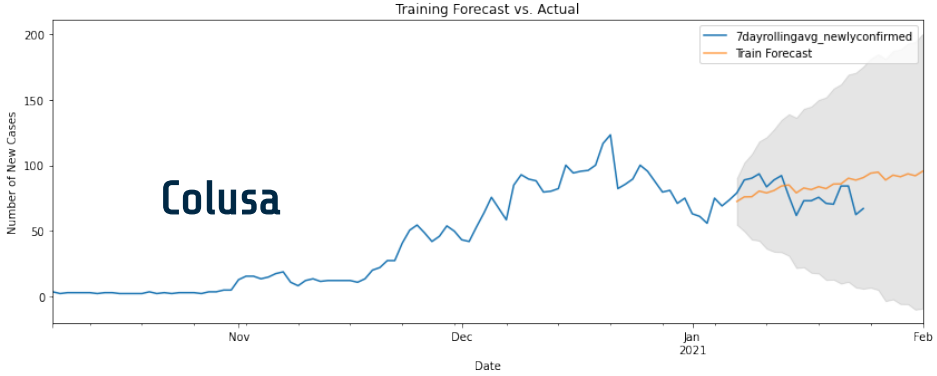


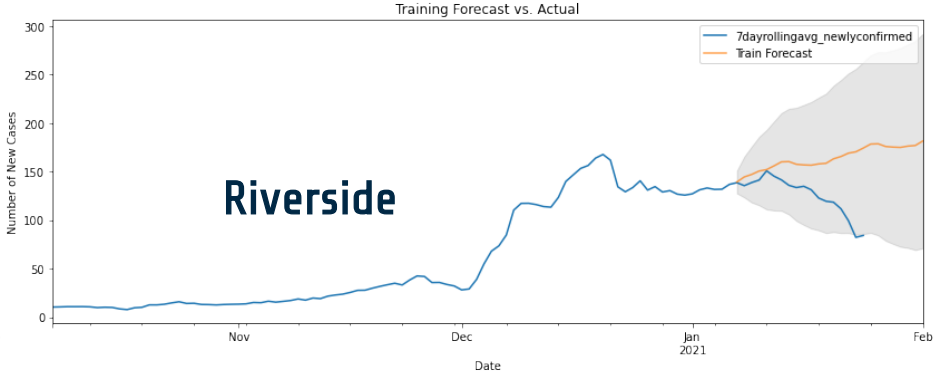


Modeling –SARIMAX

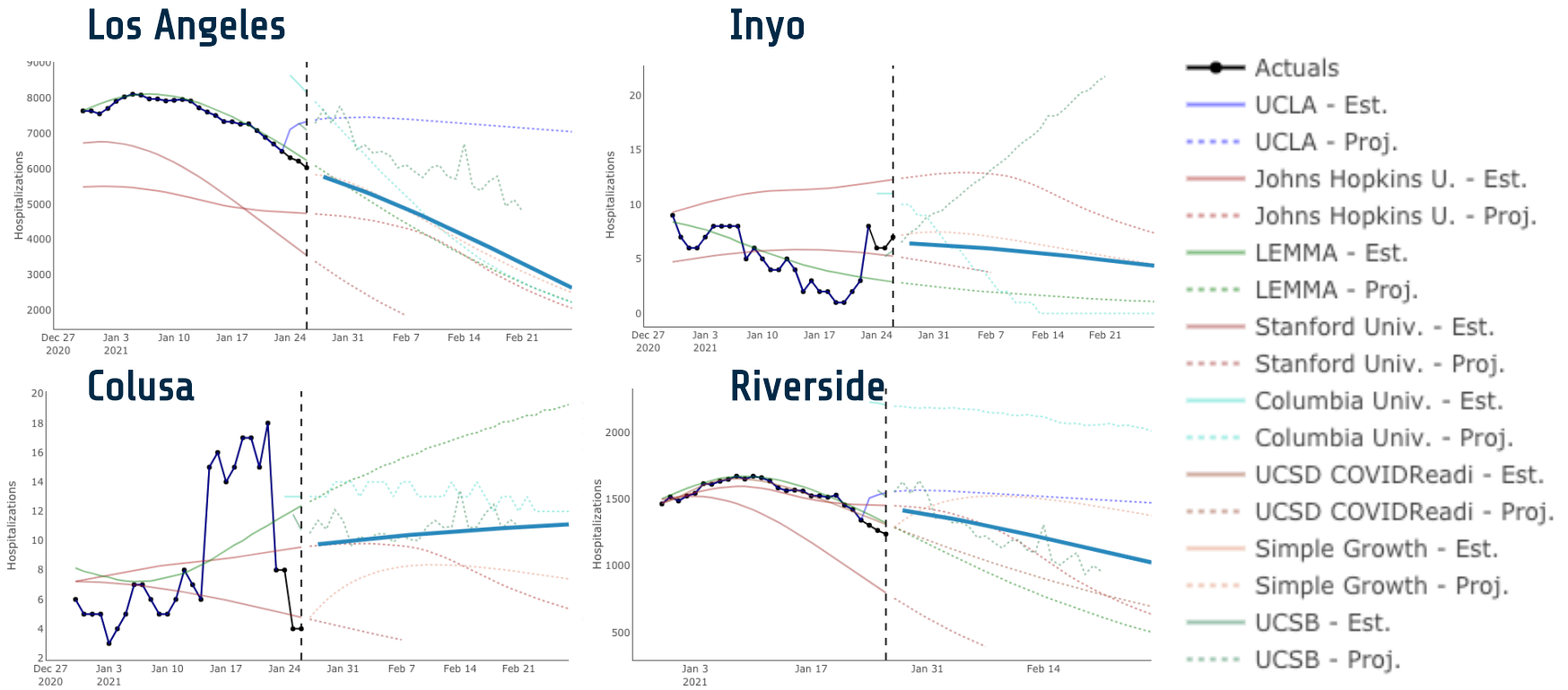








How does our model compare to existing models?



CA's Vaccine Distribution Plan

Phase 1A (in progress)

- ~ 3 million
- healthcare workers
- long-term care residents

Phase 1B

- Tier 1 (we are here)
- Age 65+ yrs old
- Essential workers
- (education, childcare, emergency services, food, agriculture)

- Tier 2
- Essential workers
- (transportation, residential, and sheltering facilities, services, critical manufacturing)

Phase 1C

- Age 50-64 yrs old
- Age 16-49 yrs old with underlying health conditions

Federal Vaccine Allocation Plan

2.8 million/week
(1.4 million people)

Total doses allocated (Jan 28th 2021) = 48 million
Total doses ordered (July 31st 2021) = 600 million

Total doses received (Jan 28th 2021) = 5.5 million
Total doses expected (July 31st 2021) = 69 million

Conclusion

- forecasting is extremely difficult
- currently, none of the existing models perform well
- many unexpected factors can change the trends (govt policies, supply issues, distribution within the county, etc)

- mathematical models over ethics?
- can we justify “optimizing” for the state?
- should race/gender/age/wealth be used to decide who gets the vaccine first?