

Project Stage -3

1. Observation for California State

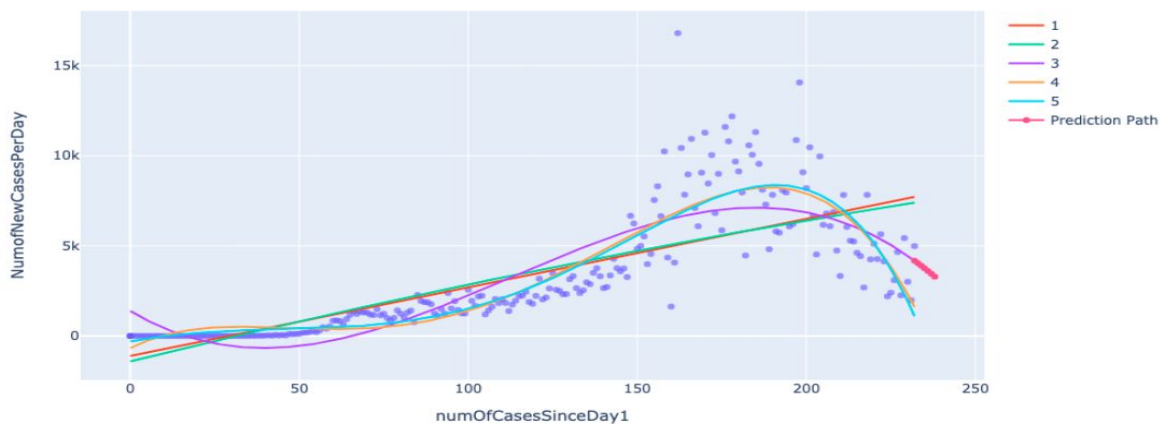
For New cases : Polynomial Regression with degree 3 is the best fit among other degrees based on the curve. RMSE : 1793.6 , R2 : 0.72

For New deaths : Polynomial Regression with degree 5 is the best fit among other degrees. RMSE : 37.9 , R2 : 0.55

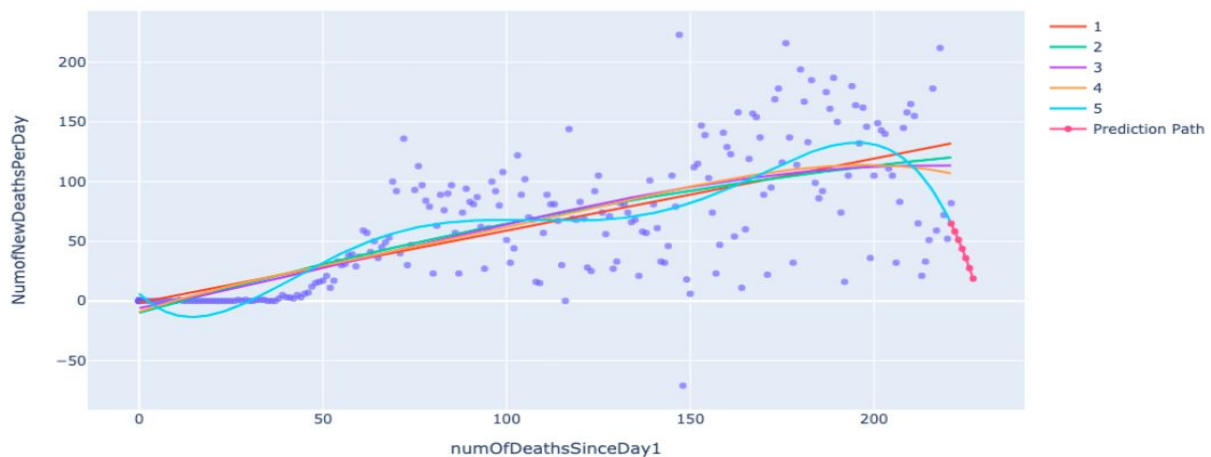
Trendline - The number of new cases and deaths is gradually decreasing

Predictions - The number of new cases and deaths is gradually decreasing for next week also

Prediction Path future cases for 1 week CA

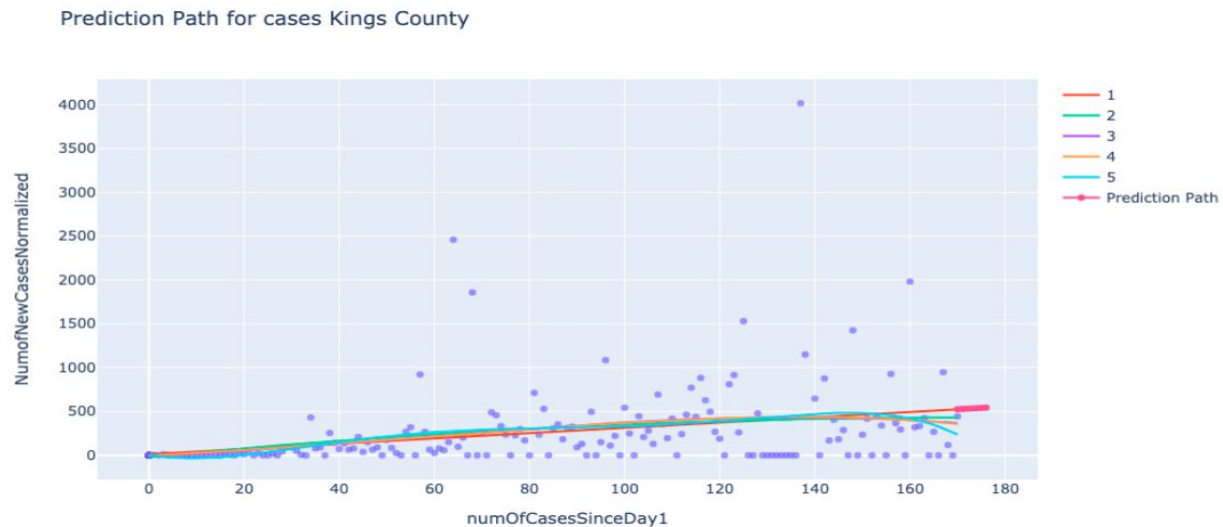


Prediction Path of future deaths for 1 week CA

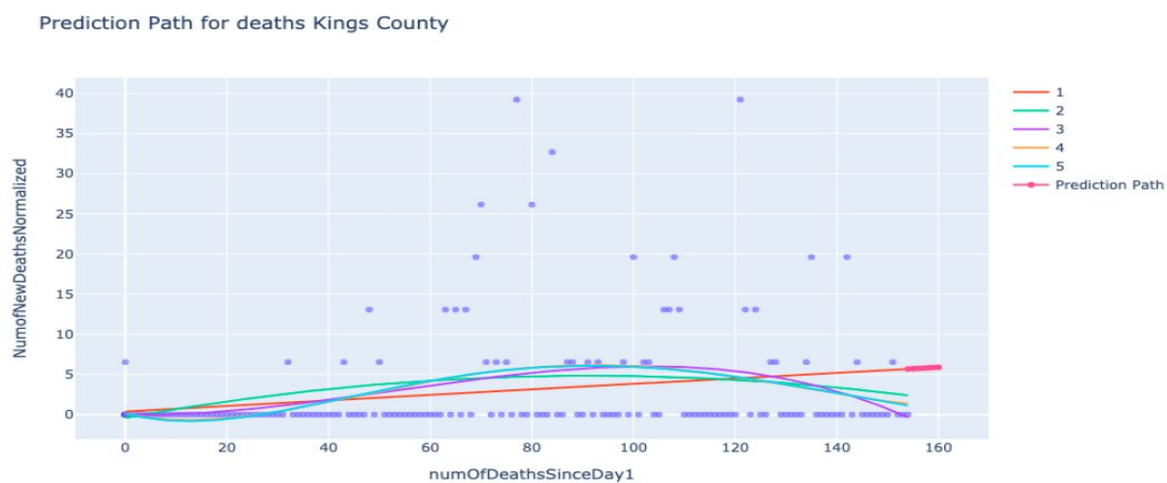


Chooosen 5 counties - **imperial, kings, kern, tulare, merced** with high cases from Stage-2.

Among all 5 states, the number of cases for **Kings county** is increasing gradually for the future week. And Polynomial Regression with degree 1 is the best fit among other degrees based on the curve. RMSE : 394.4 , R2 : 0.12



Among all 5 states, the number of deaths for **Kings county** is increasing gradually for the future week. And Polynomial Regression with degree 1 is the best fit among other degrees based on the curve. RMSE : 5.88 , R2 : 0.06

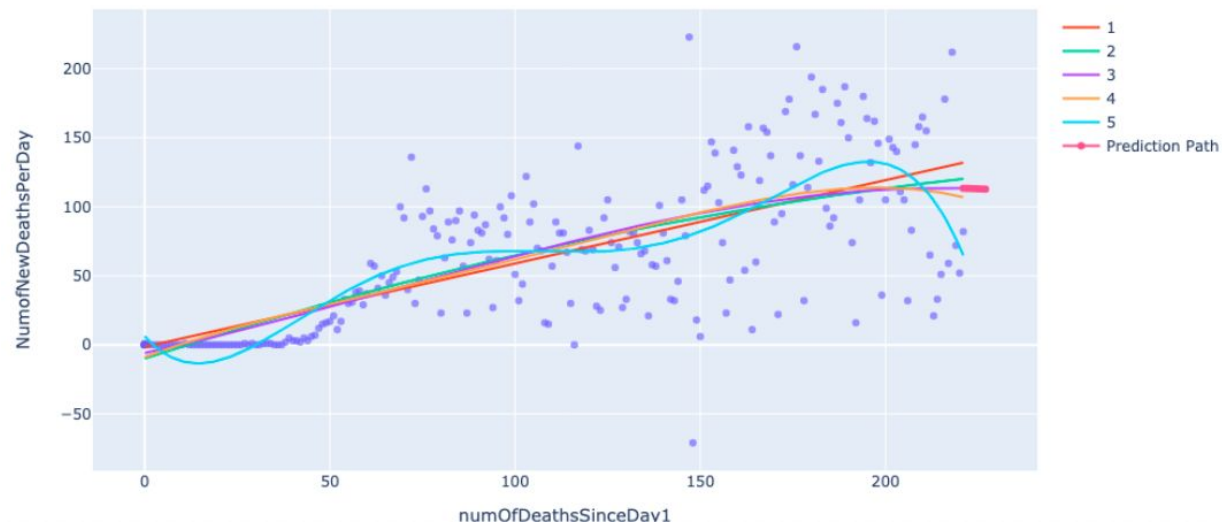


For all other counties, the number of cases and deaths are decreasing.

3. Chooosed 5 states - "CA", "NC","NY","TX","FL"

- California Total ICU Beds - 8652 ,
Predicted deaths - [113.37783921, 113.30799552, 113.22750813,
113.13630775,
113.0343251 , 112.92149089, 112.79773582]

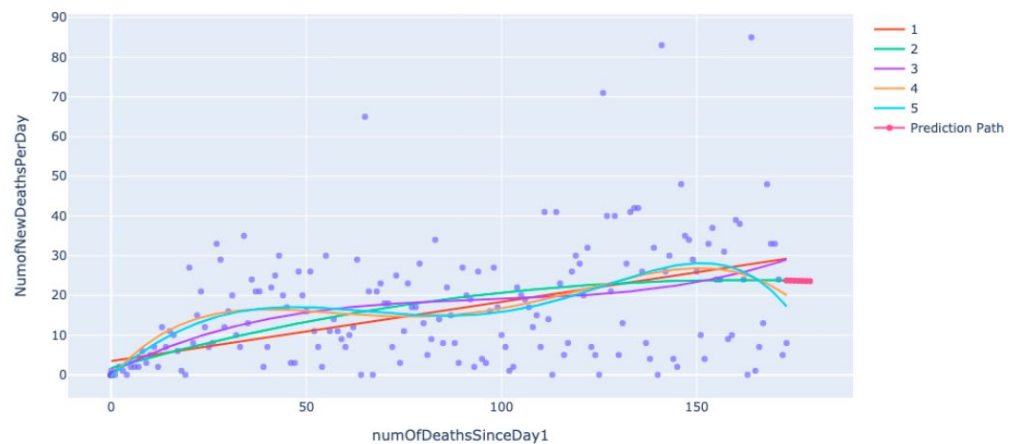
Prediction Path CA



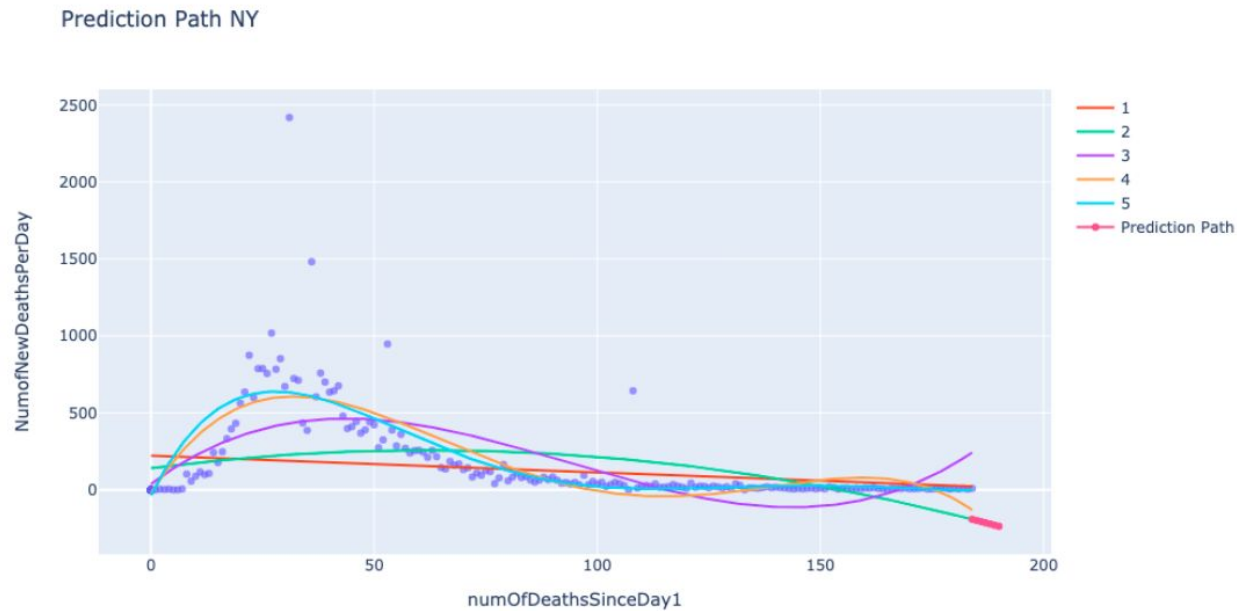
- NC Total ICU Beds - 6231

Predicted deaths - [23.7527702 , 23.73109093, 23.70769756, 23.68259009,
23.6557685 , 23.62723282, 23.59698302]

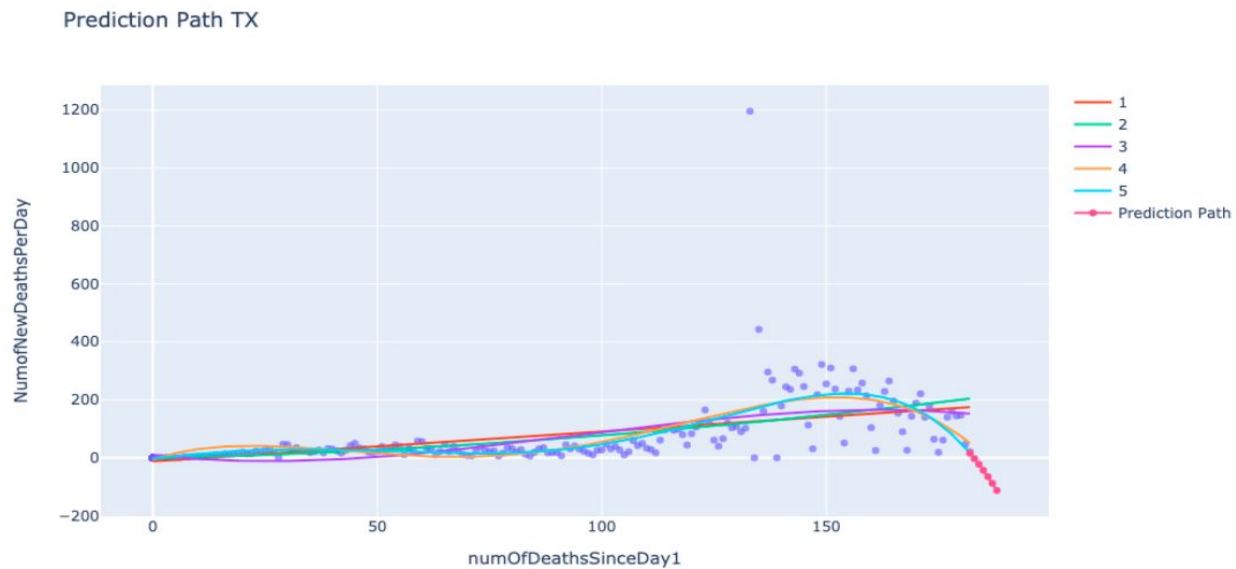
Prediction Path NC



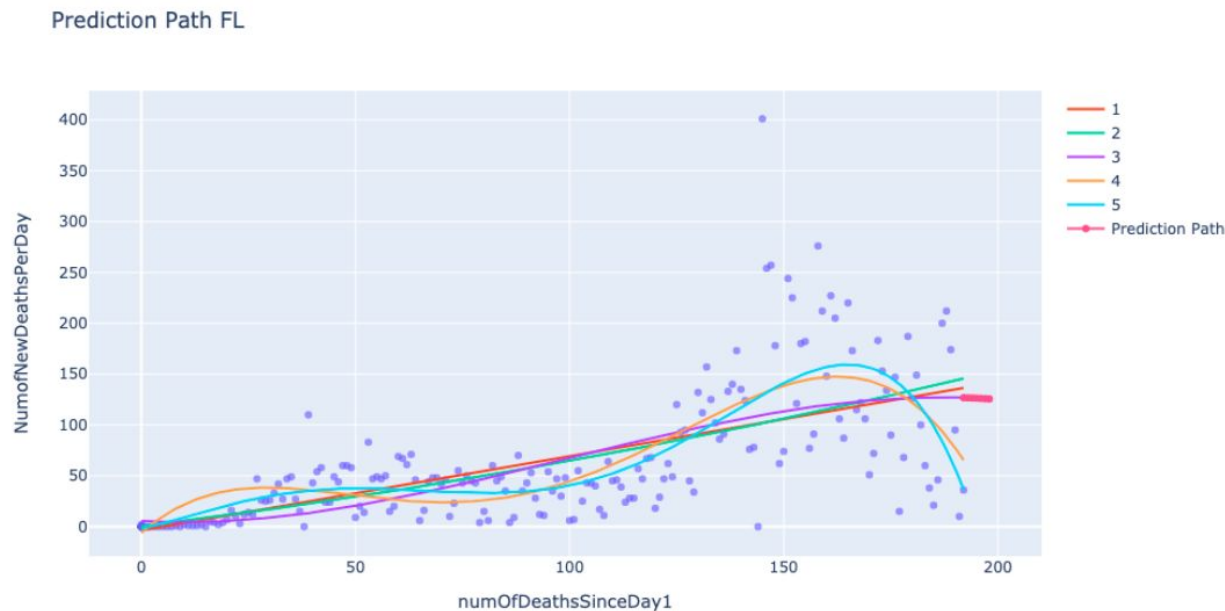
- NY Total ICU Beds - 2648
 Predicted deaths - [-191.99393722, -199.40040161, -206.86740214, -214.3949388, -221.98301159, -229.63162051, -237.34076555]



- TX Total ICU Beds - 4230
 Predicted deaths - [16.01950252, -2.64048853, -22.36997331, -43.20226142, -65.17125494, -88.3114532, -112.65795756]



- FL Total ICU Beds - 8719
Predicted deaths - [126.79274728, 126.65191719, 126.48587768, 126.29436272, 126.07710624, 125.8338422 , 125.56430455]



No state crossed Total number of ICU beds. For all states the number of deaths is decreasing.

- On predicting for one week data in advance based on following models -
 - Decision Tree Regressor RMSE - 1774.6
 - Random Forest Regressor RMSE - 1648.2
 - ARIMA RMSE - 1522.8

Among all 3 models the ARIMA has less RMS error.

5. Selected 5 features for Hospital Beds enrichment data -
"NUM_LICENSED_BEDS","NUM_STAFFED_BEDS","NUM_ICU_BEDS","AVG_VENTILATOR_USAGE","BED_UTILIZATION"

For new cases :

Decision Tree - RMSE : 8616.18

Feature Importance -

```
Feature: 1, Score: 0.00102
Feature: 2, Score: 0.03062
Feature: 3, Score: 0.00355
Feature: 4, Score: 0.86082
Feature: 5, Score: 0.10399
```

Random Forest Regressor - RMSE : 4449.96

Feature Importance -

```
Feature: 1, Score: 0.15589
Feature: 2, Score: 0.15631
Feature: 3, Score: 0.15812
Feature: 4, Score: 0.19929
Feature: 5, Score: 0.33039
```

RMSE for Random Forest is less compared to decision tree. On observing feature importance from both models we can say Feature 4 (AVG_VENTILATOR_USAGE) and Feature 5 (BED_UTILIZATION) has high importance for cases

For new deaths :

Decision Tree - RMSE : 103.62

Feature Importance -

```
Feature: 1, Score: 0.00083
Feature: 2, Score: 0.00187
Feature: 3, Score: 0.01151
Feature: 4, Score: 0.91650
Feature: 5, Score: 0.06929
```

Random Forest Regressor - RMSE : 85

Feature Importance -

```
Feature: 1, Score: 0.17352
Feature: 2, Score: 0.16144
Feature: 3, Score: 0.14382
Feature: 4, Score: 0.21242
Feature: 5, Score: 0.30880
```

RMSE for Random Forest is less compared to decision tree. On observing feature importance from both models we can say Feature 4 (AVG_VENTILATOR_USAGE) and Feature 5 (BED_UTILIZATION) has high importance for deaths as well