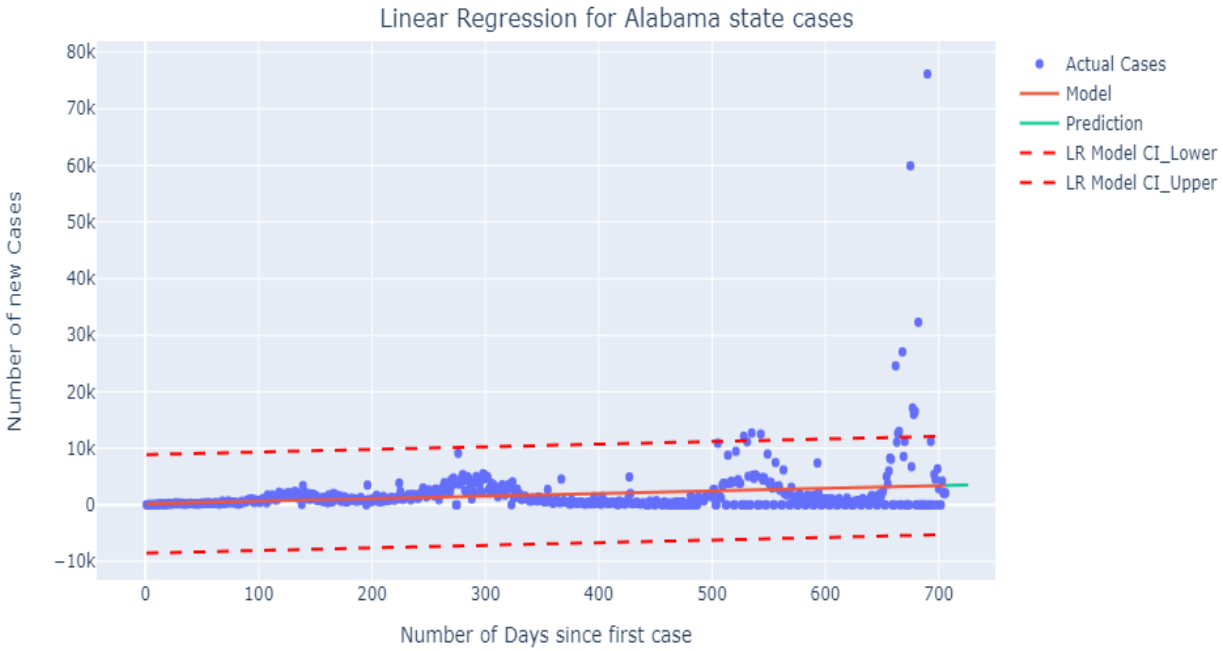
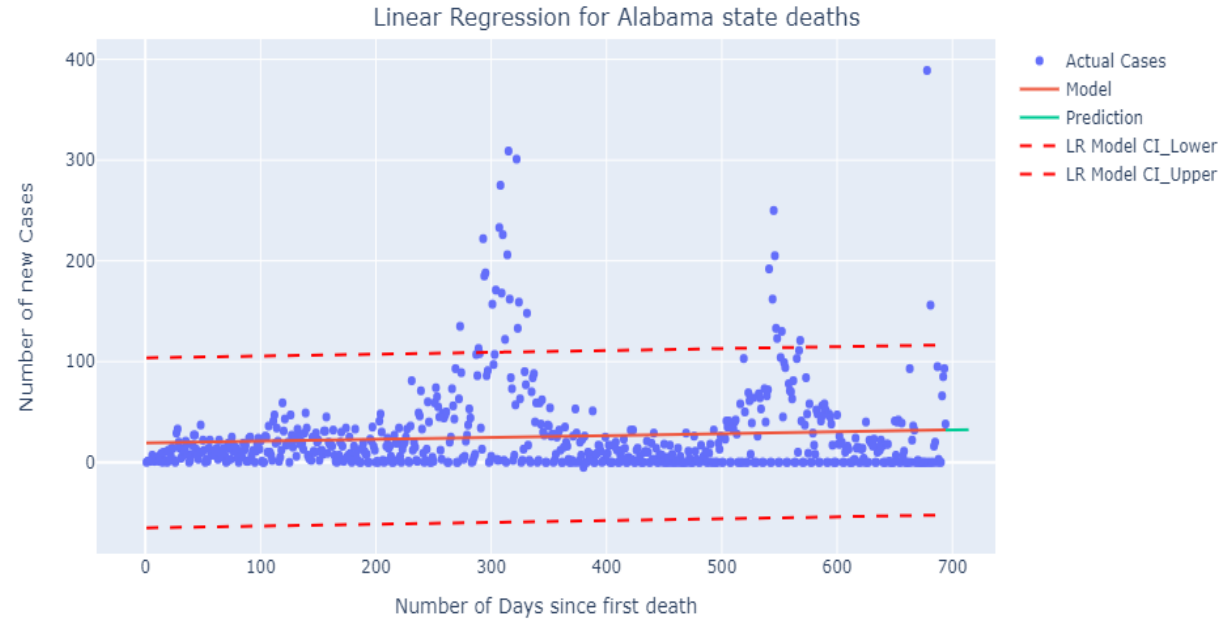
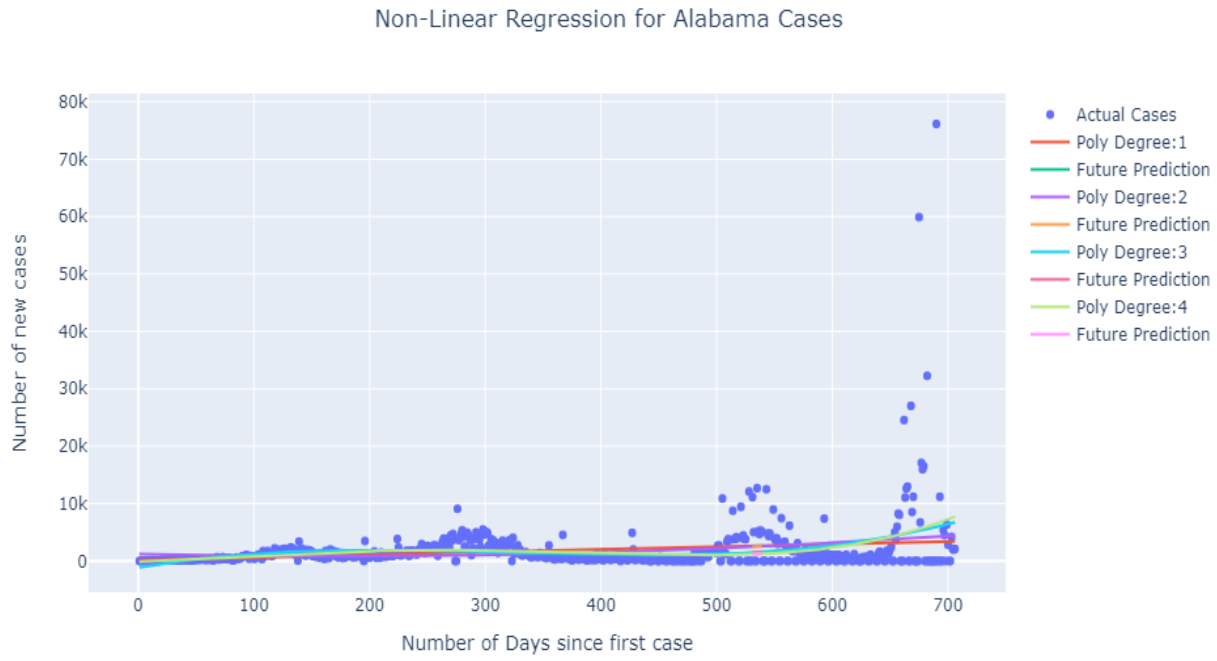
Linear Regression model trends for Alabama State cases:



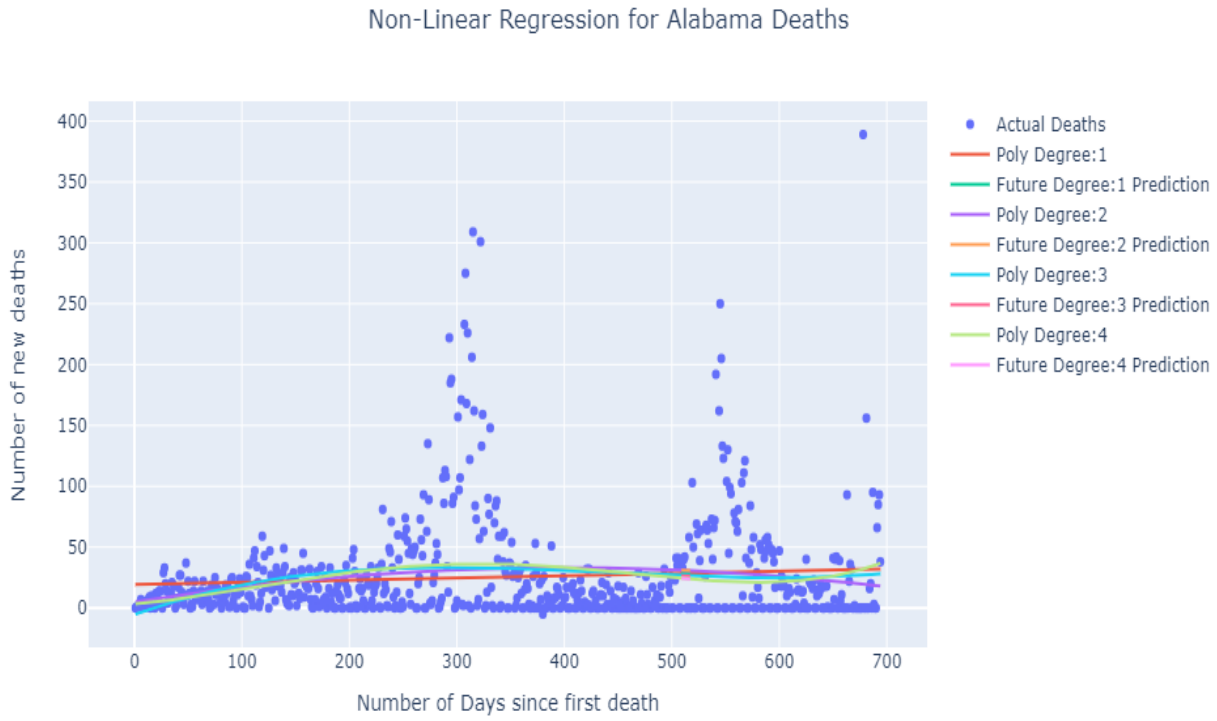
Linear Regression model trends for Alabama State Deaths:



Non-Linear Regression model trends for Alabama State Cases:



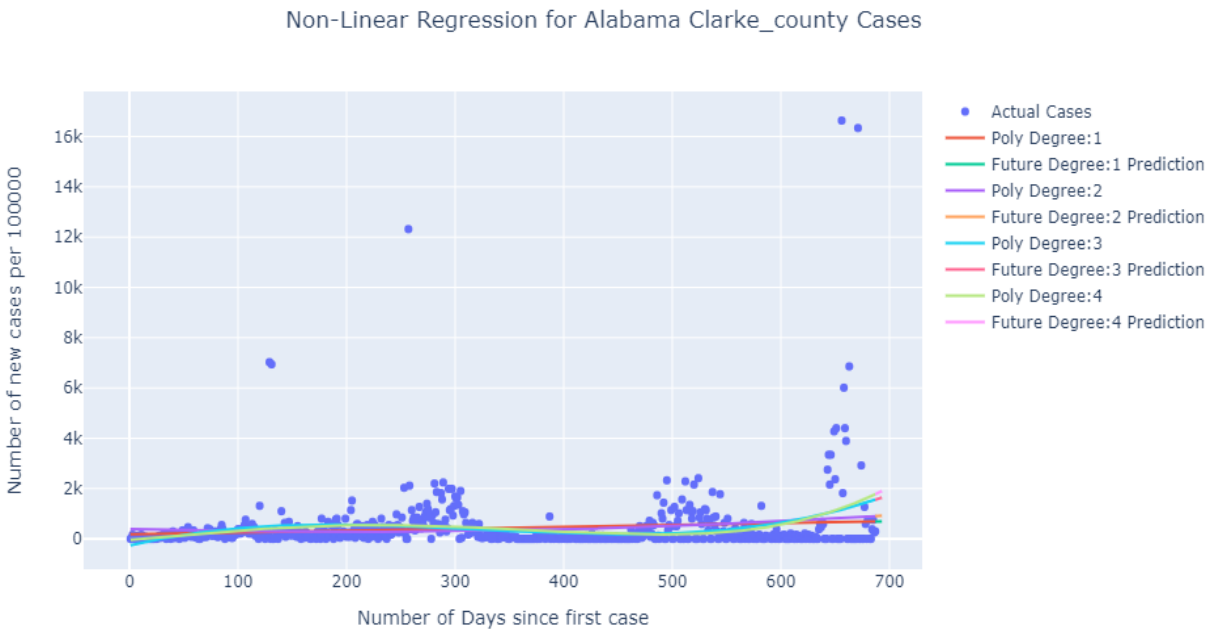
Non-Linear Regression model trends for Alabama State Deaths:

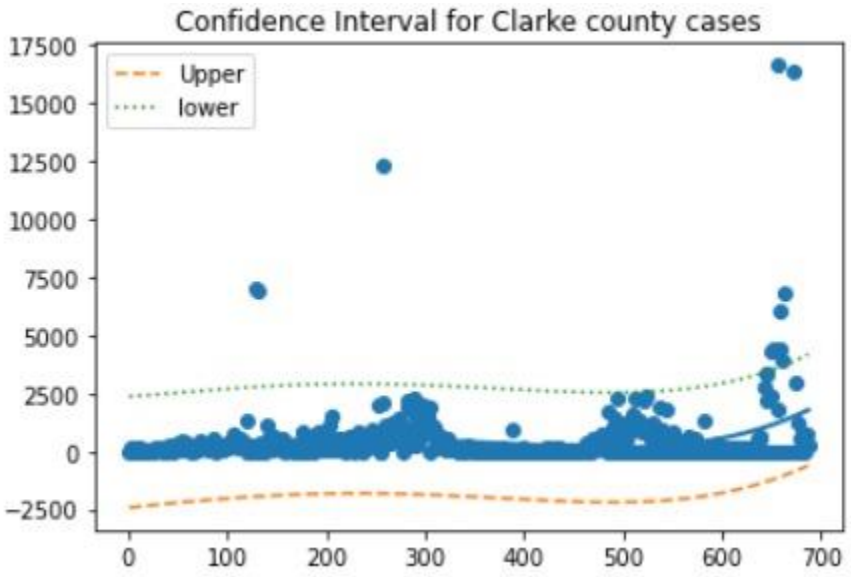


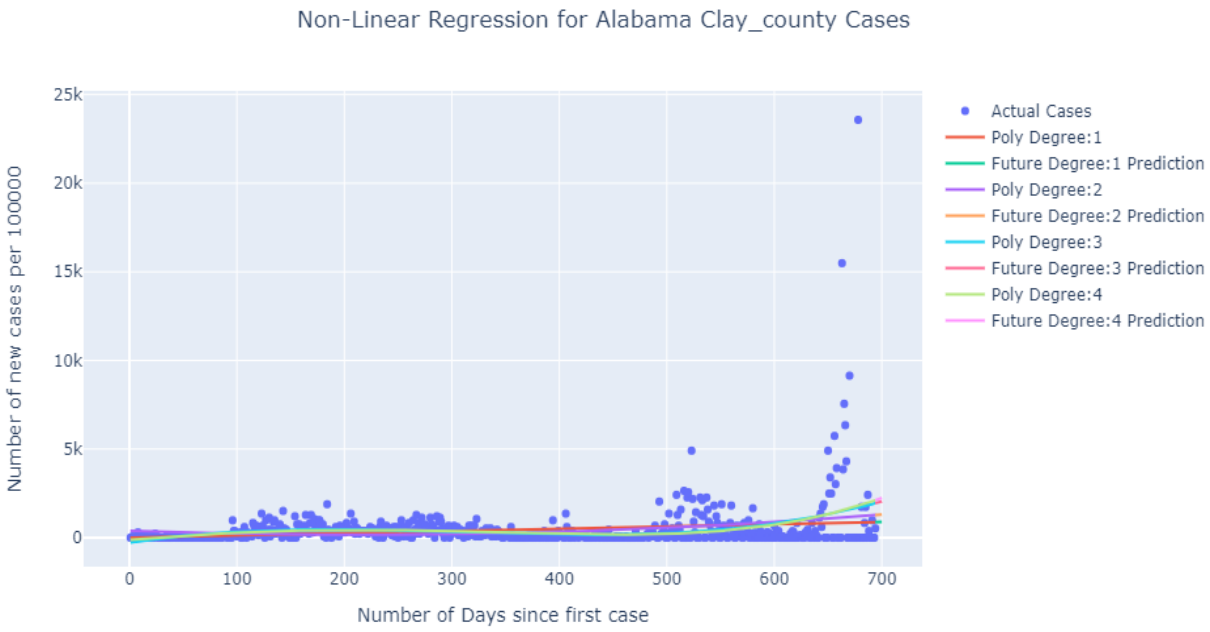
The top 5 most affected counties are:

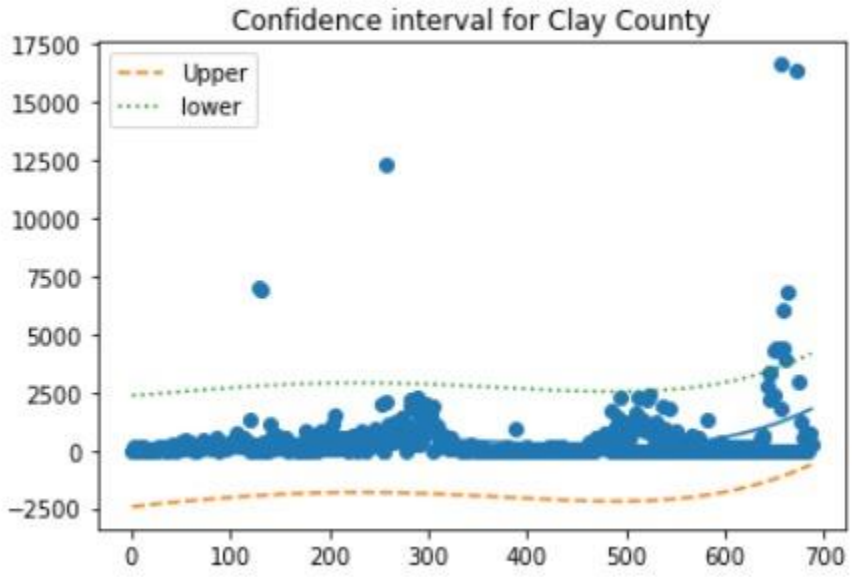
- Hale County
- Winston County
- Franklin County
- Clay County
- Clarke County

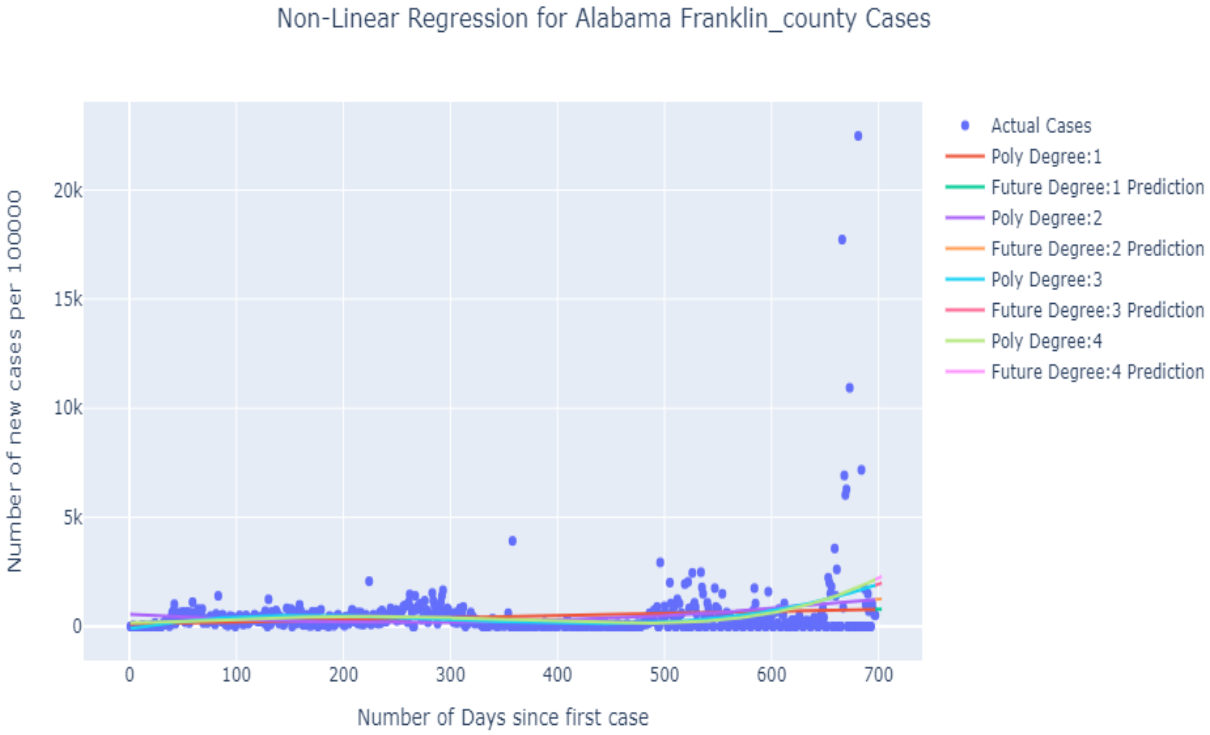
Plotting Non-Linear Regression and Confidence Interval for most affected counties

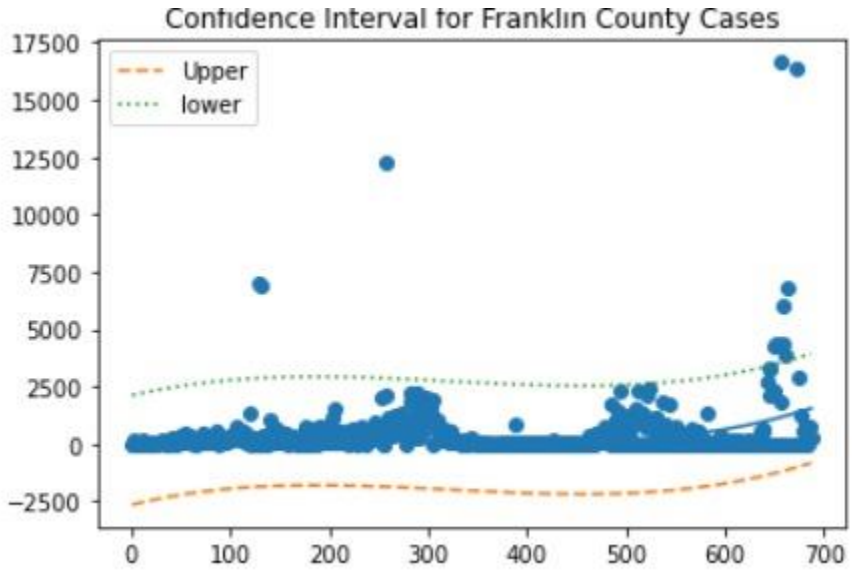


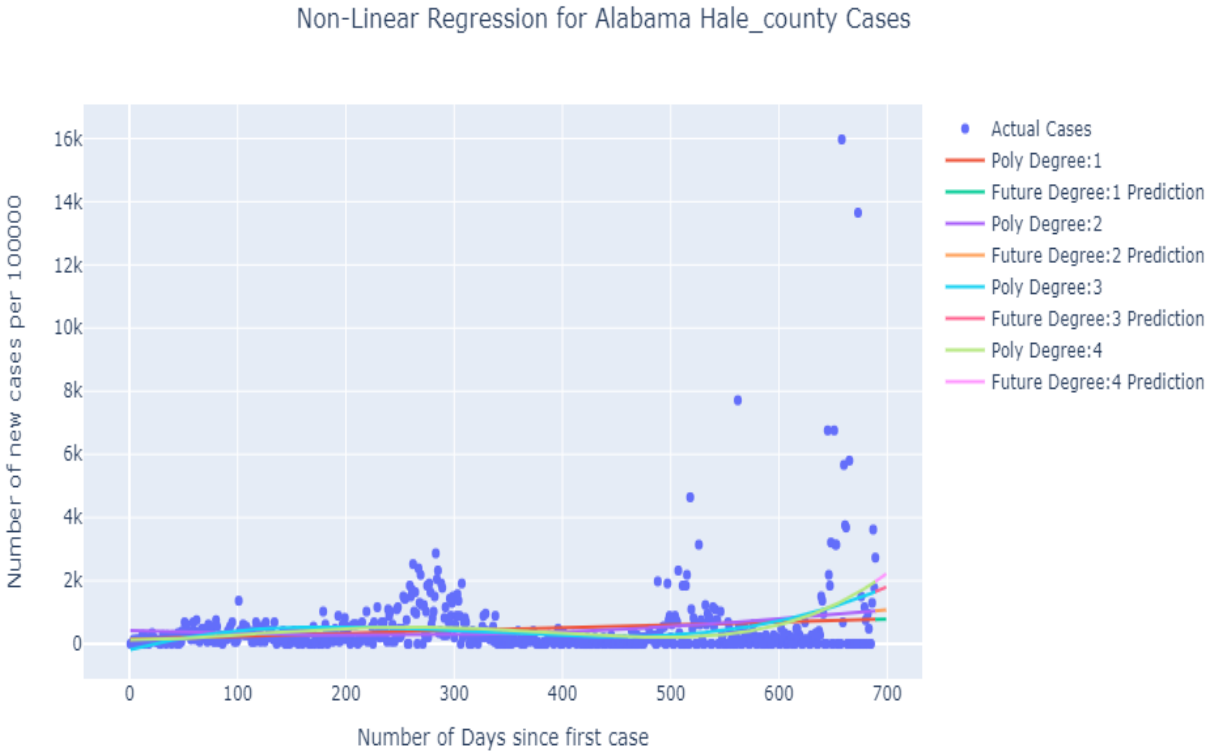


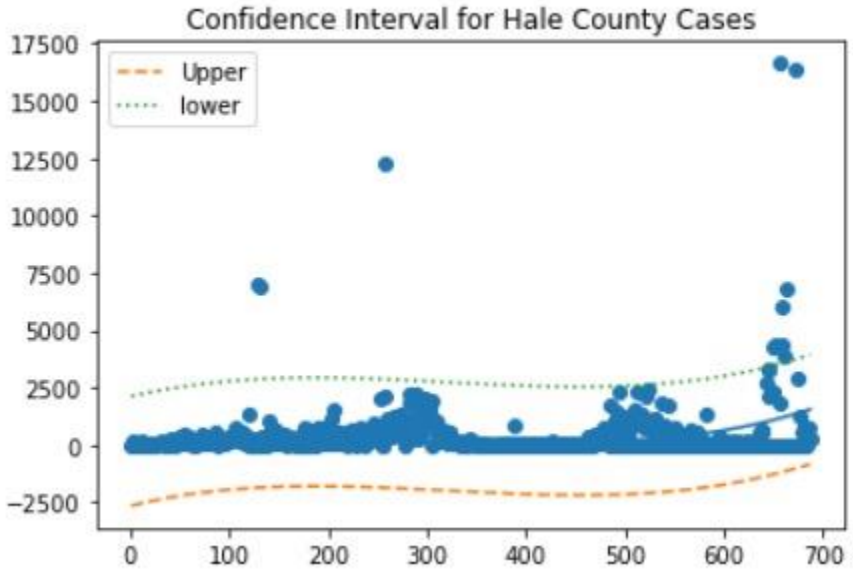

Non-Linear Regression for Alabama Clay_county Cases
Number of new cases per 100000
25k
20k
15k
10k
5k
0
0
100
200
300
400
500
600
700
Number of Days since first case
Actual Cases
Poly Degree:1
Future Degree:1 Prediction
Poly Degree:2
Future Degree:2 Prediction
Poly Degree:3
Future Degree:3 Prediction
Poly Degree:4
Future Degree:4 Prediction

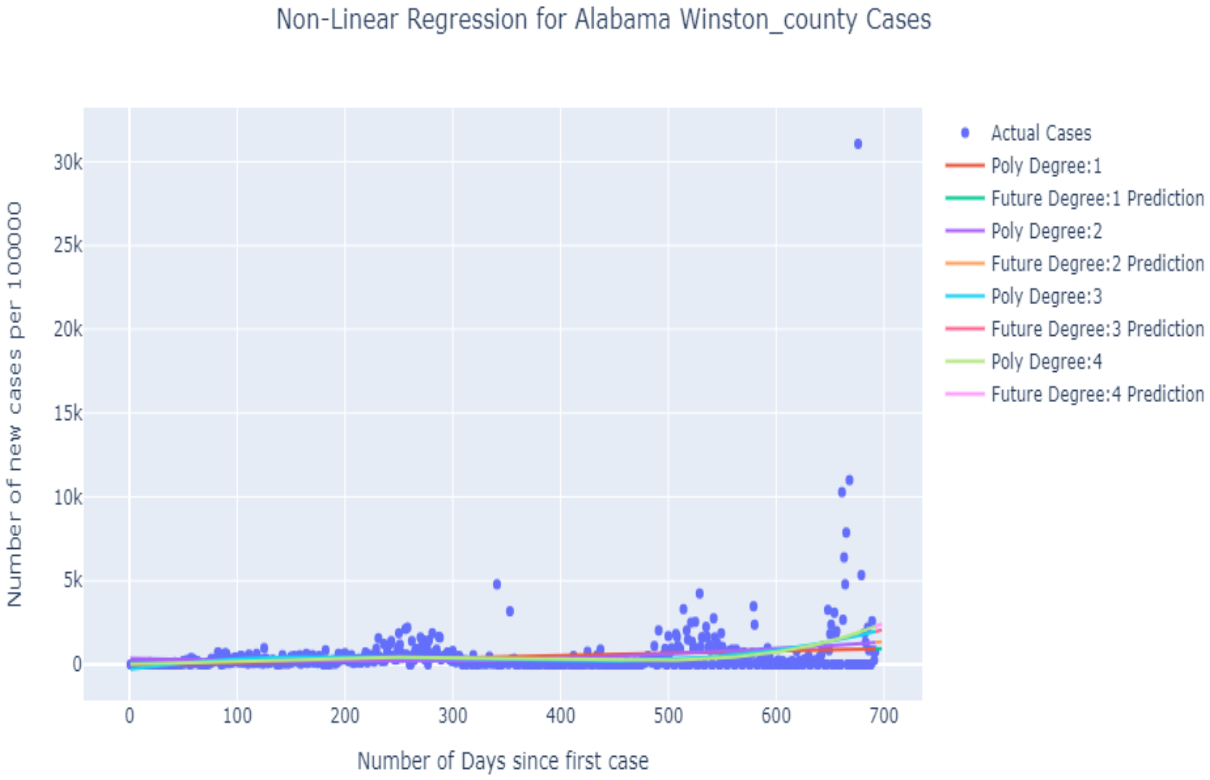

Confidence interval for Clay County
Upper
lower
17500
15000
12500
10000
7500
5000
2500
0
−2500
0
100
200
300
400
500
600
700

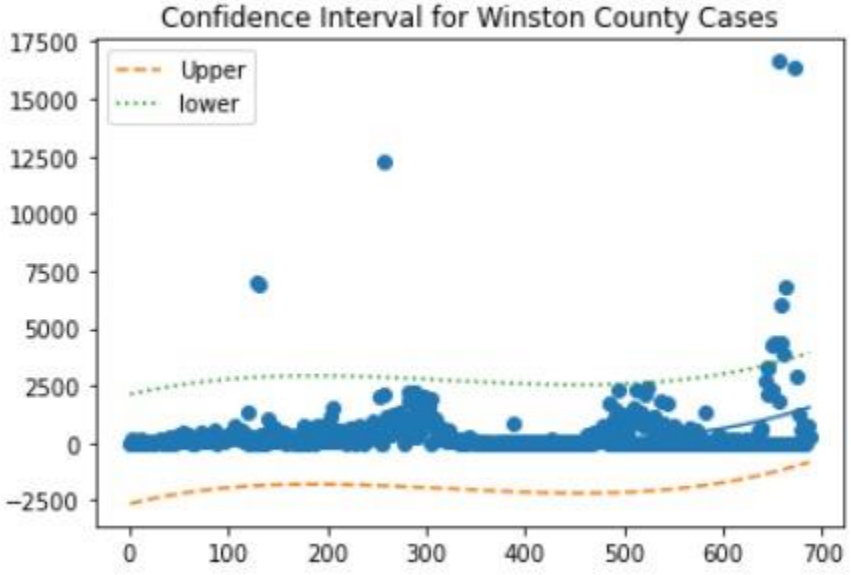

Non-Linear Regression for Alabama Franklin_county Cases
Number of new cases per 100000
20k
15k
10k
5k
0
0
100
200
300
400
500
600
700
Number of Days since first case
Actual Cases
Poly Degree:1
Future Degree:1 Prediction
Poly Degree:2
Future Degree:2 Prediction
Poly Degree:3
Future Degree:3 Prediction
Poly Degree:4
Future Degree:4 Prediction


Confidence Interval for Franklin County Cases
Upper
lower
17500
15000
12500
10000
7500
5000
2500
0
−2500
0
100
200
300
400
500
600
700

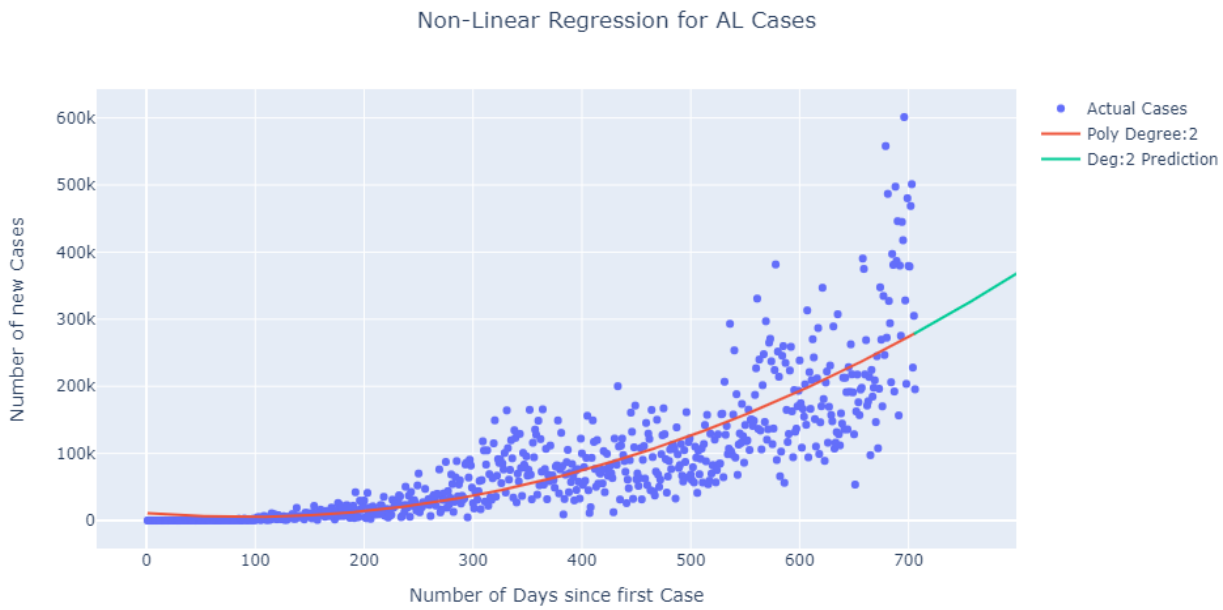

Non-Linear Regression for Alabama Hale_county Cases
Number of new cases per 100000
16k
14k
12k
10k
8k
6k
4k
2k
0
0
100
200
300
400
500
600
700
Number of Days since first case
Actual Cases
Poly Degree:1
Future Degree:1 Prediction
Poly Degree:2
Future Degree:2 Prediction
Poly Degree:3
Future Degree:3 Prediction
Poly Degree:4
Future Degree:4 Prediction

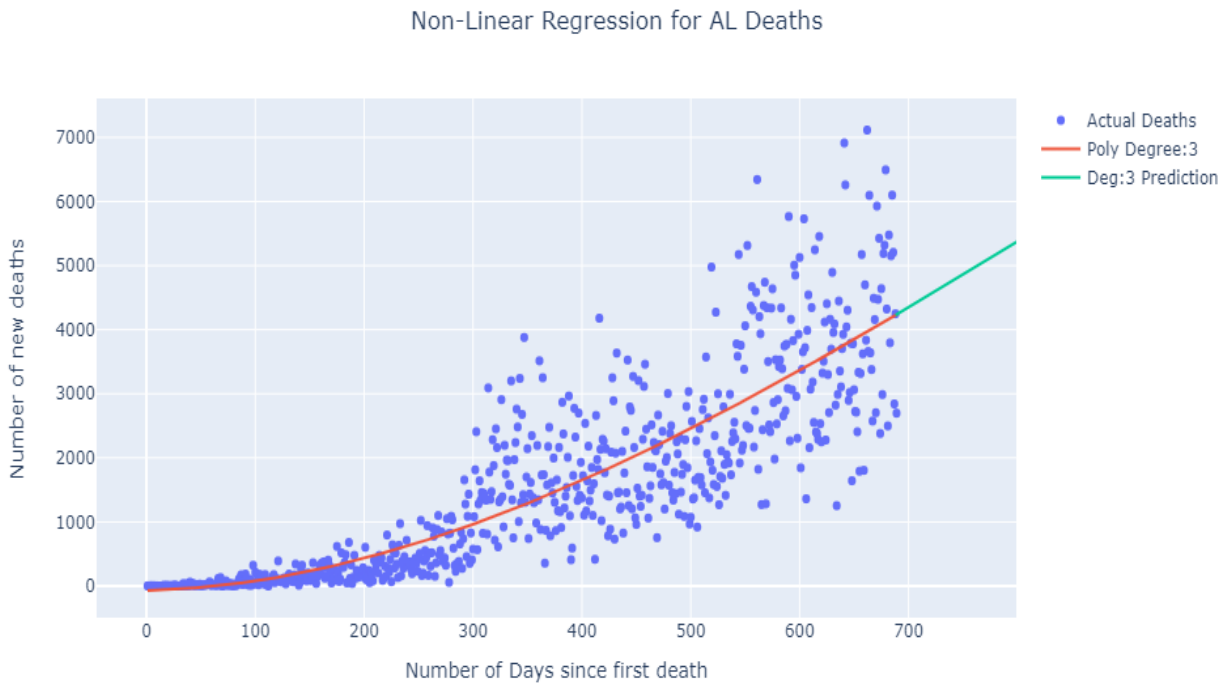

Confidence Interval for Hale County Cases
Upper
lower
17500
15000
12500
10000
7500
5000
2500
0
−2500
0
100
200
300
400
500
600
700


Non-Linear Regression for Alabama Winston_county Cases
Number of new cases per 100000
30k
25k
20k
15k
10k
5k
0
0
100
200
300
400
500
600
700
Number of Days since first case
Actual Cases
Poly Degree:1
Future Degree:1 Prediction
Poly Degree:2
Future Degree:2 Prediction
Poly Degree:3
Future Degree:3 Prediction
Poly Degree:4
Future Degree:4 Prediction


Confidence Interval for Winston County Cases
Upper
lower
17500
15000
12500
10000
7500
5000
2500
0
−2500
0
100
200
300
400
500
600
700

Prediction forecast for Alabama State Cases and Deaths:





Hypothesis Testing:

Hypothesis to determine if states with highest population has highest cases

```
In [56]: stats.ttest_ind(a=analysis_data_grp['Cases'], b= analysis_data_grp['population'],equal_var=False)
Out[56]: Ttest_indResult(statistic=-2.414315103729526, pvalue=0.0194206789447396)
```

In this case, the p-value is lower than our significance level α (equal to 1-conf.level or 0.05) so, we should reject the null hypothesis.

Hypothesis to determine if states with highest number cases has highest number of deaths

```
In [57]: stats.ttest_ind(a=analysis_data_grp['Cases'], b= analysis_data_grp['Death'],equal_var=False)
Out[57]: Ttest_indResult(statistic=2.523712673776677, pvalue=0.014833637985892425)
```

In this case, the p-value is lower than our significance level α (equal to 1-conf.level or 0.05) so, we should reject the null hypothesis.

Hypothesis to determine if state with population has highest number hospital beds available

```
In [58]: stats.ttest_ind(a=analysis_data_grp['population'], b= analysis_data_grp['total_beds_7_day_avg'],equal_var=False)
Out[58]: Ttest_indResult(statistic=2.621352588969838, pvalue=0.011572682224243175)
```

In this case, the p-value is lower than our significance level α (equal to 1-conf.level or 0.05) so, we should reject the null hypothesis.

Hypothesis to determine if state with highest number of hospital beds have used higher icu beds

```
In [59]: stats.ttest_ind(a=analysis_data_grp['total_beds_7_day_avg'], b= analysis_data_grp['icu_beds_used_7_day_avg'],equal_var=False)
Out[59]: Ttest_indResult(statistic=6.129933733366105, pvalue=1.2831375945873215e-07)
```

In this case, the p-value is greater than our significance level α (equal to 1-conf.level or 0.05) so, we would fail to reject the null hypothesis.