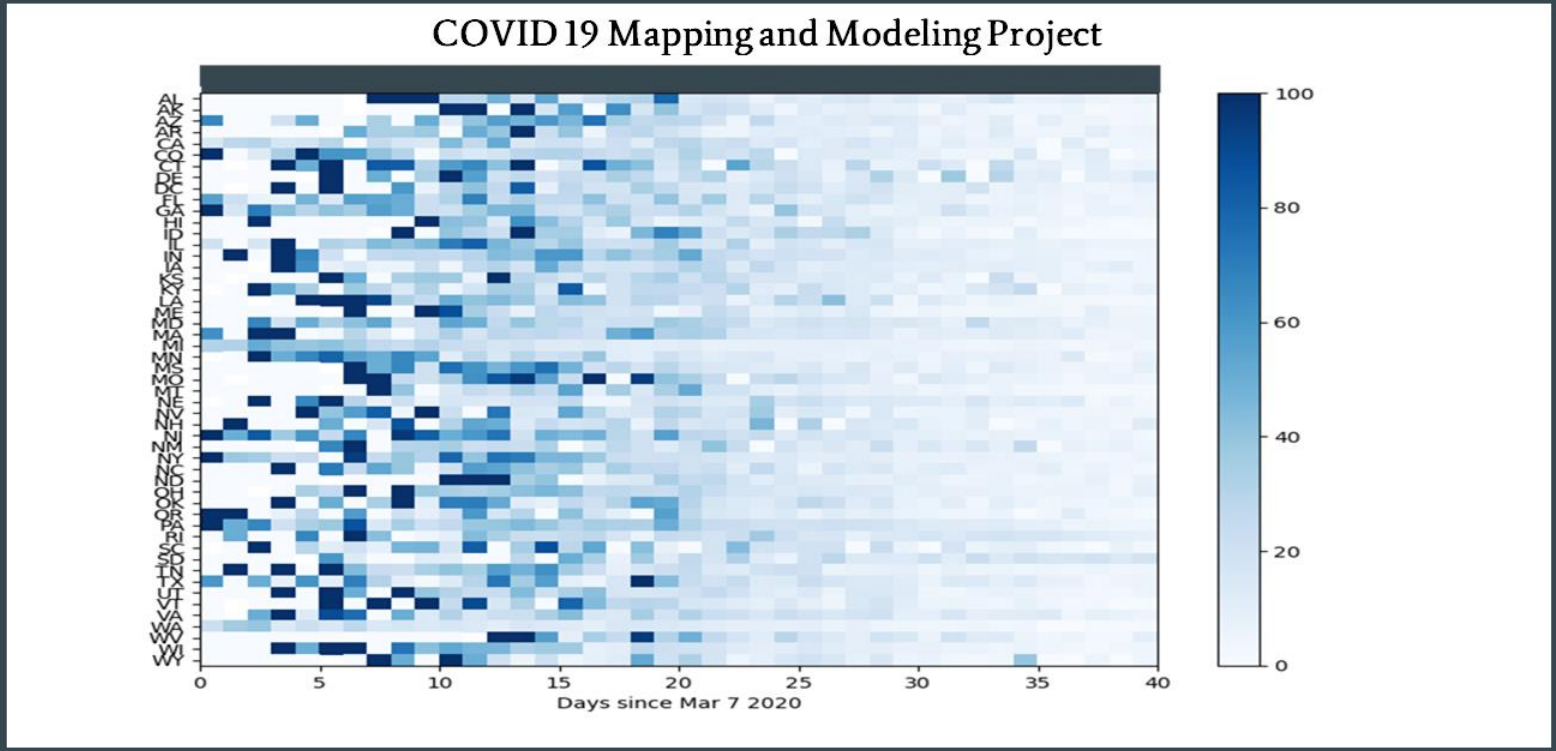
DALY-TALLY



HACK FOR HOPE

DENDROSITE

Objective

To create a predictive pandemic model to risk stratify populations and generate actionable dashboards by guiding resource allocation and planning.

We leveraged the following data:

- Updated COVID19 County-level Cases and Deaths
- Population Demographics (Size, Age Stratification, Ethnic Makeup, Density)
- Disease Burden (Disease Adjusted Life Year Scores, Medicare Data)

Understanding the Problem

Trends

We investigated population trends reported in the news regarding COVID 19 with regards to:

- Age
- Race
- Comorbidities
- Infection Rates
- Death Rates
- Geographical Characteristics

Modeling

We applied various statistical and machine learning approaches to publicly available data:

- Multivariate Regressions
- Correlations
- Random Forest
- Lasso Regressions
- Neural Nets
- Function Modeling

Utility

We deliberated on the possible use cases for these efforts:

- Disease Knowledge
- Risk Stratification
- Planning
- Resource Allocation
- Actionable Dashboards
- Pandemic Tracking

Regression Analysis

JAMES MACION
Healthcare Data Analytics
Solutions Architect
UCLA Alumni

James was the project manager who initiated this effort and coordinated the building of the team. He gathered and created many of the data sets used in the analysis. His regressions displayed the statistically strong effects of public disease burden data from Medicare and Disease Adjusted Life Year Scores on COVID 19 cases, deaths and hospitalizations.

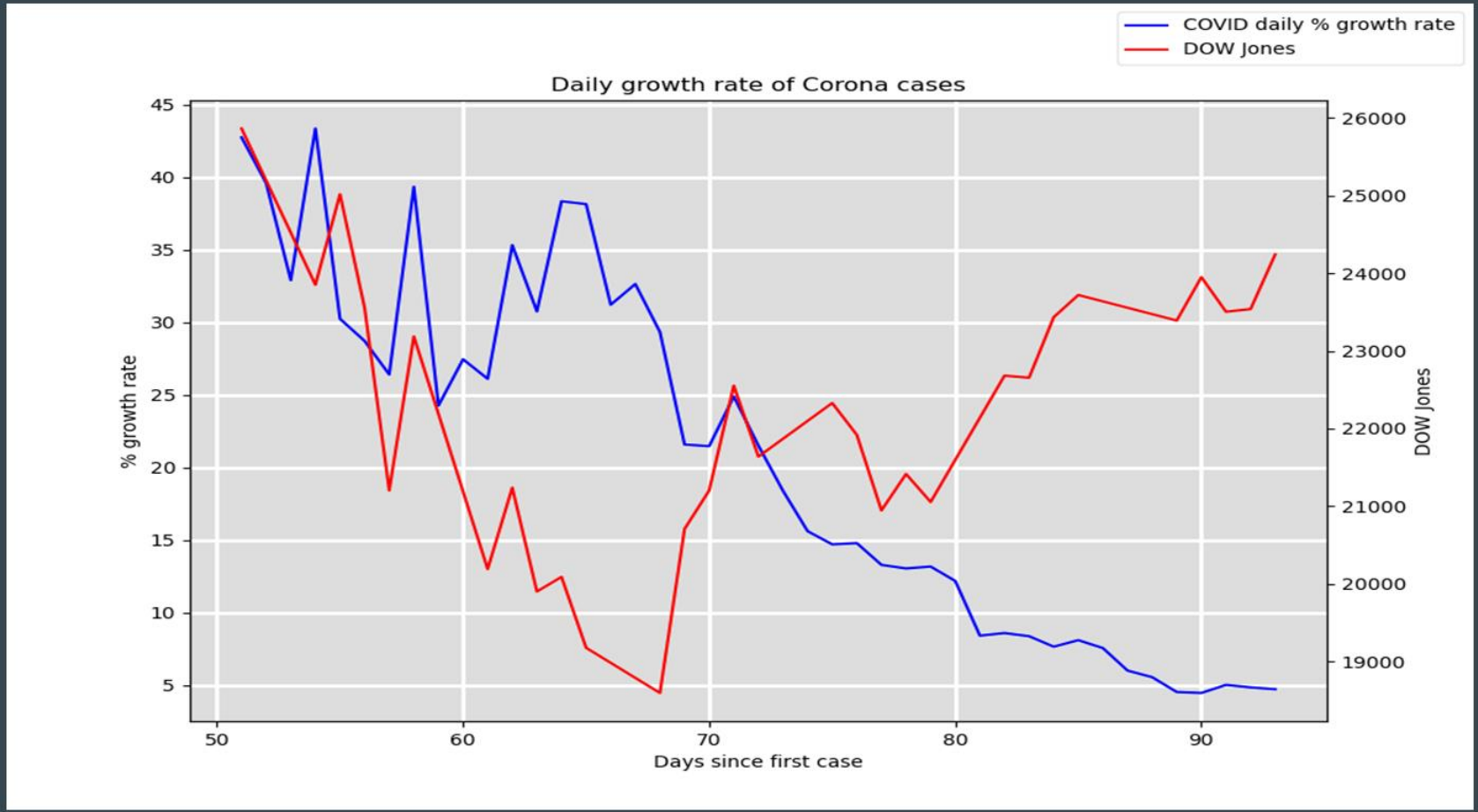
SUMMARY OUTPUT								
CASES X MEDICARE DATA X ALEX FUNCTION								
Regression Statistics								
Multiple R	0.974893404							
R Square	0.95041715							
Adjusted R Square	0.938021437							
Standard Error	8097.261051							
Observations	51							
ANOVA								
	df	*SS*	*MS*	*F*	*Significance F*			
Regression	10	50271176398	5027117640	76.67305477	7.06287E-23			
Residual	40	2622625461	65565636.52					
Total	50	52893801859						
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1020.944351	1909.153557	0.534762826	0.595774222	-2837.59892	4879.487622	-2837.59892	4879.487622
Sum of NUM_Non-Hispanic_White_BEN	-0.006871018	0.002370835	-2.898142668	0.006064651	-0.011662654	-0.002079382	-0.011662654	-0.002079382
Sum of NUM_Minorities	-0.014052666	0.003945885	-3.561346835	0.00097051	-0.022027597	-0.006077734	-0.022027597	-0.006077734
Sum of NUM_BEN_Asthma	0.067586622	0.018321549	3.6889142	0.000669919	0.03055739	0.104615854	0.03055739	0.104615854
Sum of NUM_BEN_Chronic_Kidney_Disease	-0.029070264	0.007076205	-4.108171452	0.000191696	-0.043371808	-0.01476872	-0.043371808	-0.01476872
Sum of NUM_BEN_Chronic_Obstructive_Pulmonary_Disease	-0.030666407	0.007723709	-3.970424933	0.000290655	-0.046276605	-0.015056209	-0.046276605	-0.015056209
Sum of NUM_BEN_Diabetes	0.039144116	0.0095684	4.090977984	0.000201969	0.019805657	0.058482574	0.019805657	0.058482574
Sum of NUM_BEN_Ischemic_Heart_Disease	0.014892641	0.004342828	3.429249401	0.001416608	0.006115458	0.023669824	0.006115458	0.023669824
Sum of POPULATION_COUNTY2	0.003296973	0.001130476	2.916446809	0.005779495	0.001012196	0.00558175	0.001012196	0.00558175
a (10^-3)	7.9851E-05	1.01885E-05	7.8373802	1.31502E-09	5.92593E-05	0.000100443	5.92593E-05	0.000100443
b	2.62638E-05	1.04193E-05	2.520688212	0.015802923	5.20562E-06	4.7322E-05	5.20562E-06	4.7322E-05

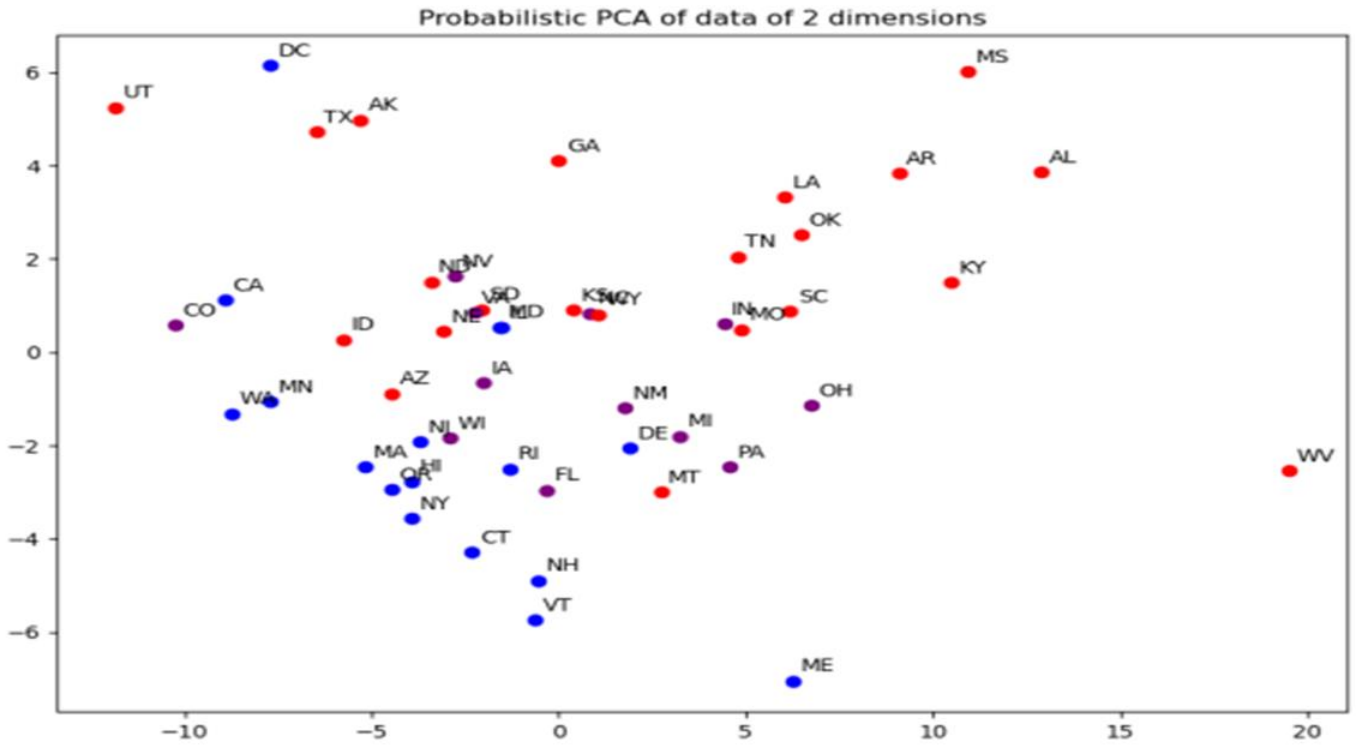
Algorithm Coding

TING FUNG LAM
Chemistry PhD
Computer Science MS
USC Student

Ting ("Wilton") Lam coded many of the algorithms on this project. He ran PCA analysis, sigmoid modeling, SIR modeling, financial comparisons/analysis, and ran a neural network on our data.

Repository: https://github.com/lamwilton/COVID-19


COVID daily % growth rate
DOW Jones
Daily growth rate of Corona cases
% growth rate
DOW Jones
Days since first case
45
40
35
30
25
20
15
10
5
26000
25000
24000
23000
22000
21000
20000
19000
50
60
70
80
90

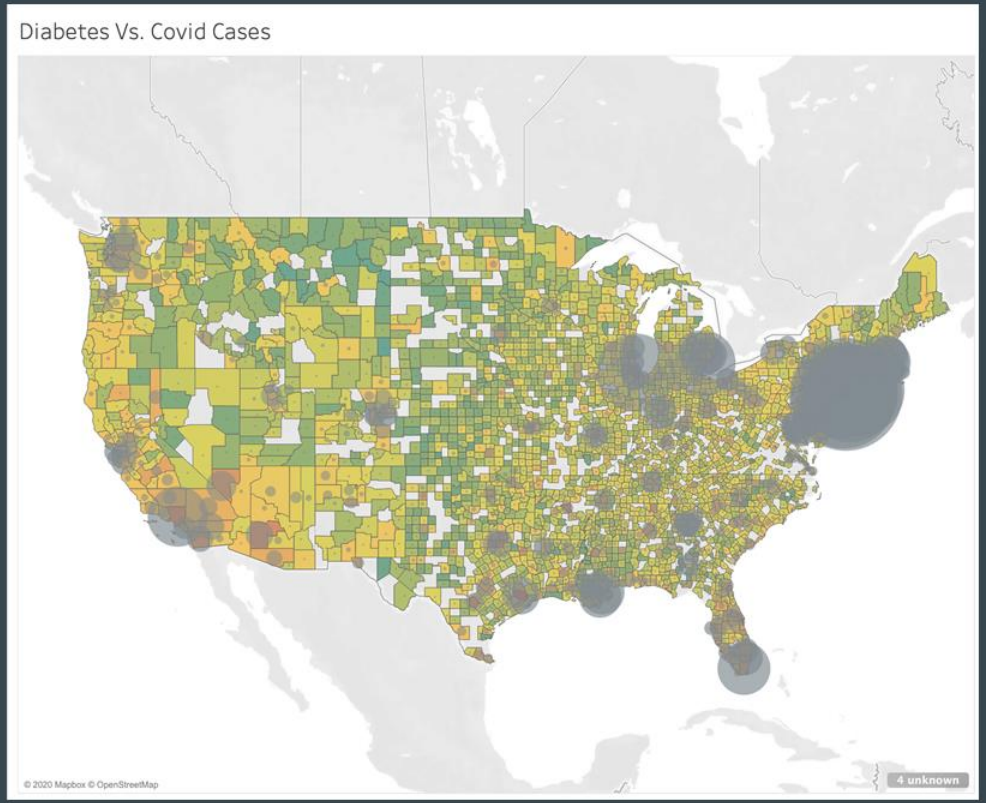

Probabilistic PCA of data of 2 dimensions
DC
MS
UT
AK
TX
GA
AR
AL
LA
OK
TN
KY
CA
CO
ID
SC
IN
MO
AZ
IA
MN
NM
OH
WI
DE
MI
MA
RI
PA
WV
FL
MT
NY
CT
NH
VT
ME
6
4
2
0
−2
−4
−6
−10
−5
0
5
10
15
20

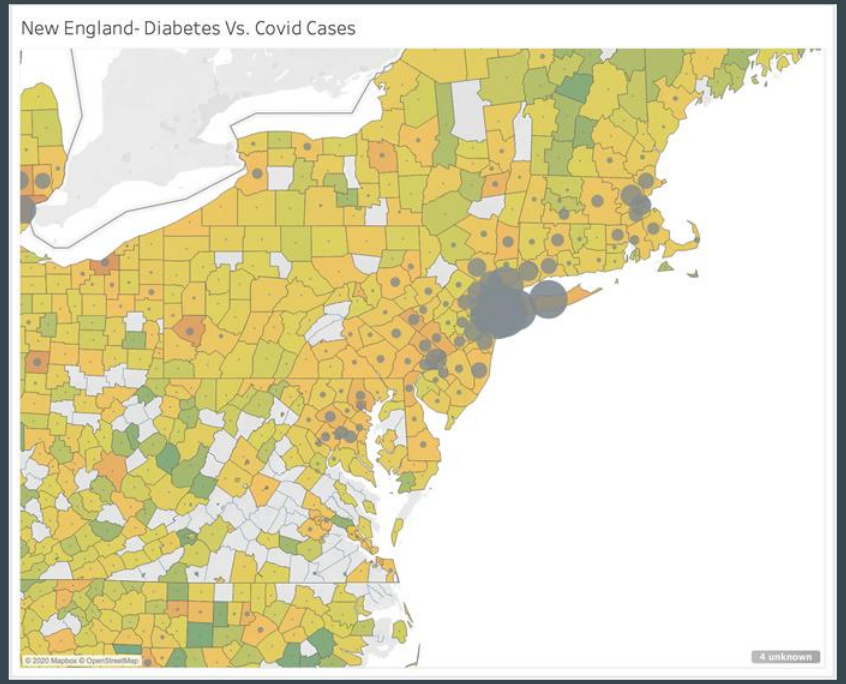
GIS Mapping

MAE MORTON-DUTTON
Geography, BA
Mount Holyoke College

Mae used GIS to map the data that we processed and periodically gave us a visual representation of the effects that we encountered along the way.

Diabetes vs. Covid Cases





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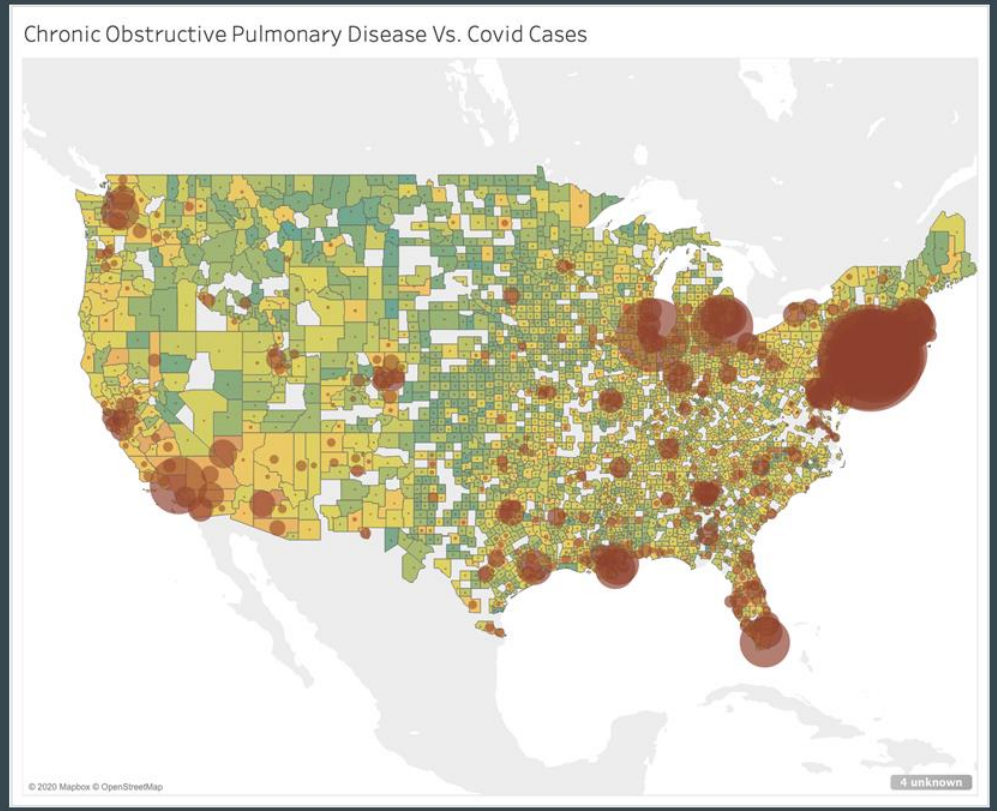
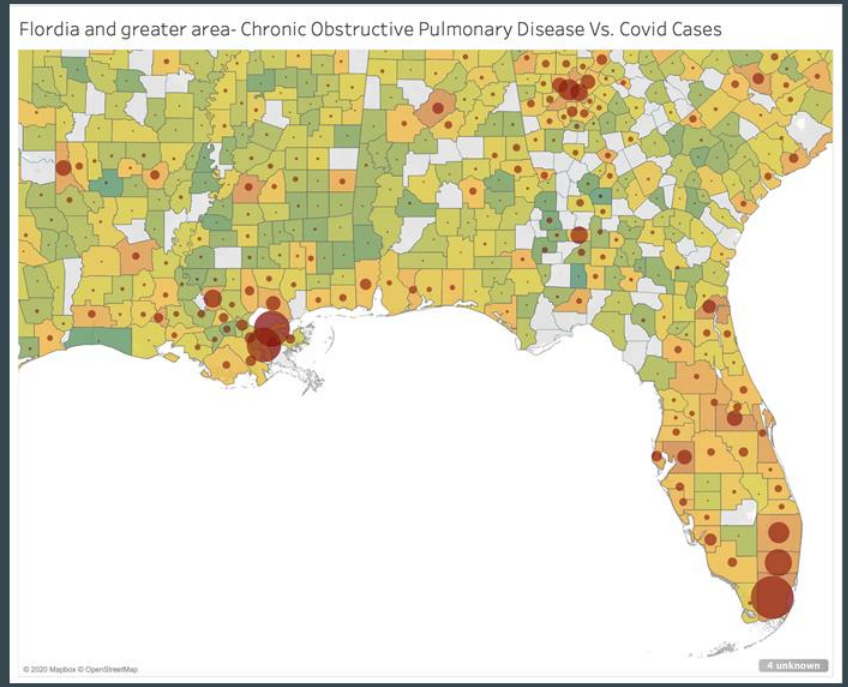
Chronic Obstructive Pulmonary Disease vs. Covid Cases

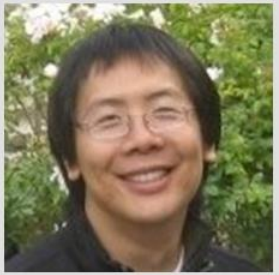




DENDROSITE

Statistical Methods

STEPHEN KWOK
Mathematics PhD
Biostatistics MS
UCLA Alumni



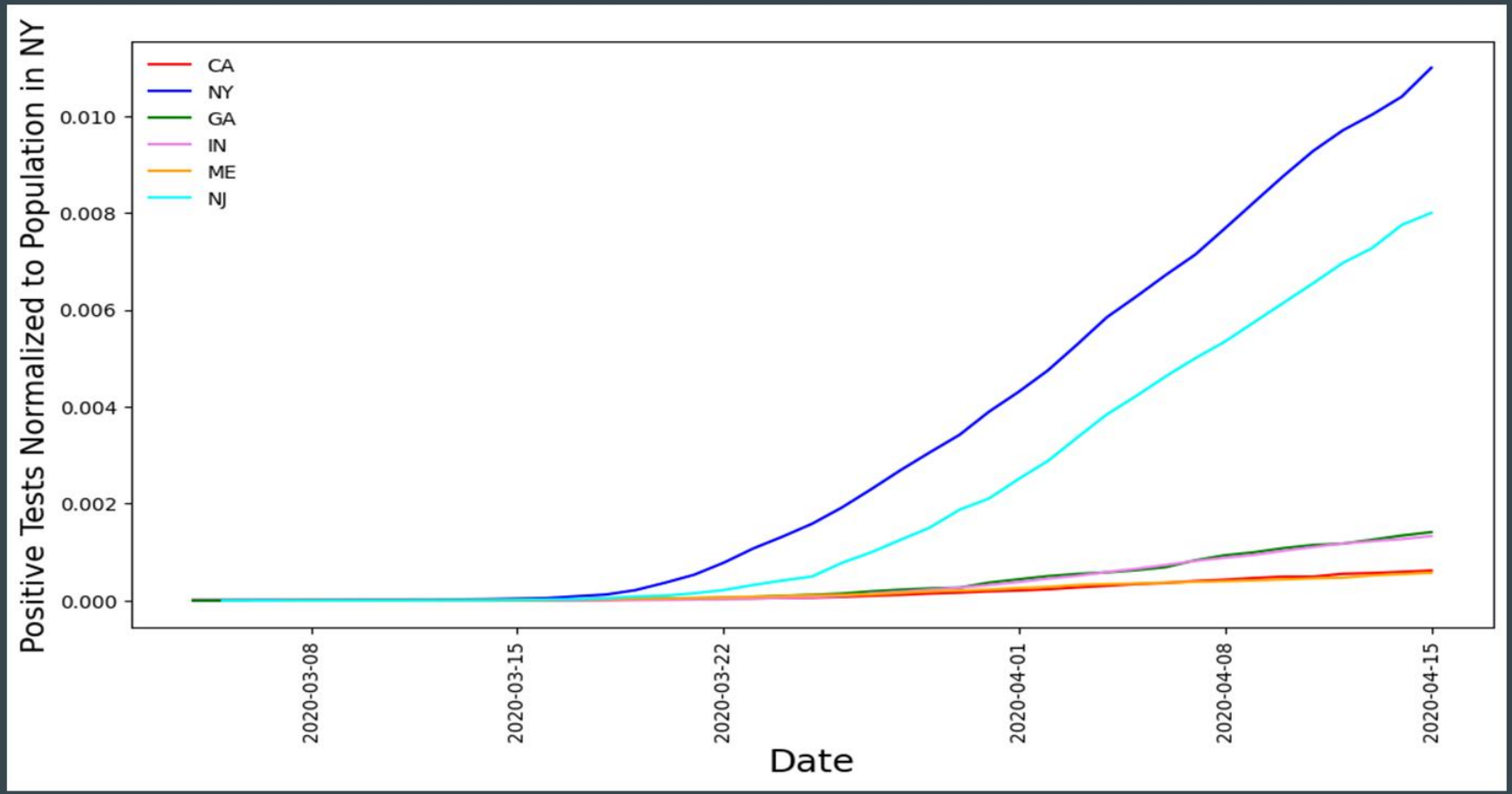
Stephen advised the group on statistical methods. He evaluated the multiple parallel approaches and advised the group on direction. He also contributed Lasso Regressions to better identify key variables.

Function Modeling

ALEX GERWER
Healthcare Strategist
Product Manager
Data Scientist
UCLA Alumni

Alex focused on function modeling. He ran parallel coding efforts and discovered a consistent functional form that best fit the normalized positive cases and deaths. This function strengthened the models that we used in analysis.

$$y = A*\exp(B/x)$$


Positive Tests Normalized to Population in NY
CA
NY
GA
IN
ME
NJ
0.010
0.008
0.006
0.004
0.002
0.000
2020-03-08
2020-03-15
2020-03-22
2020-04-01
2020-04-08
2020-04-15
Date

Data Integration

MICHAEL CHANG
Health Informatics MS
Computer Science BS
USF Alumni

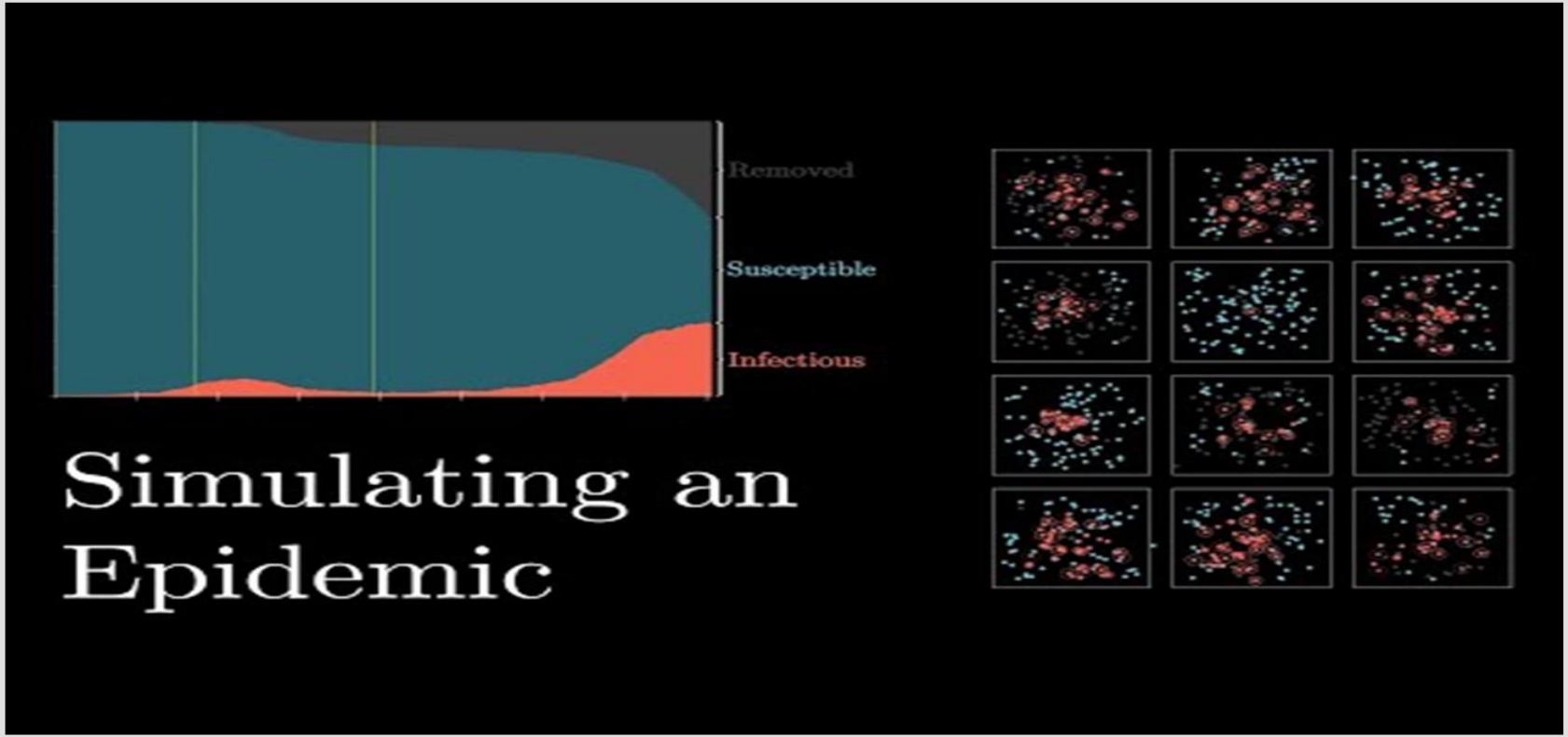
Michael assisted with data integration and scrubbing. He searched for related public data sets that may be impactful to the project. He also ran random forest algorithms on our data sets.

Future Project Plan

- To create a modular platform for pandemic tracking, planning and resource allocation by leveraging our data and models.
- We plan on creating county level compartmentalized simulations that use our data approach to create visualizations of population interactions, population risk composition, and pandemic growth metrics.

Inspiration

Source: https://www.3blue1brown.com, Youtube Channel



Ask

We are calling out to organizations and investors to collaborate with our team and continue the creation of this platform. This will hopefully lead to the following:

- More Resources
- Organizational Partnerships
- Access to de-identified healthcare, IOT or GPS data to strengthen our models.

Advisors

Amytis Towfighi, MD
Chief of Neurology, Associate Medical Director of Neurological Services, and Director of Research, LAC+USC Medical Center Director, Neurological Services, Los Angeles County Department of Health Services, James and Dorothy Williams Stroke Scholar, Associate Professor of Neurology (Clinical Scholar), USC Keck School of Medicine, Co-Director of Research and Director of Implementation Science, SC Clinical and Translational Science Institute

Shaunna Clark, PhD
Associate Professor- Advanced Quantitative Methods
Texas A&M- College of Medicine