Clustering Analysis of COVID-19 Responses by County to inform Future Pandemic Prevention

The Eastcoast Eagles: Andrew Faris, Jyothi Karra, Morteza Maleki, Ruchi Patel, Betsy Thorne, Tony Bakshi

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Context

COVID-19 has impacted people, hospitals, communities, families, and much more.

Given the available data, there is an opportunity to leverage modern machine learning to identify improvement opportunities for each county in the USA.

78.4M US Cases*

935K US Deaths**

*https://www.nytimes.com/interactive/2020/us/coronavirus-us-cases.html
**https://ourworldindata.org/coronavirus-data

Objectives of the study

- Identify "high-performing" groups of counties
- Execute summary statistics about why the groups might be “high-performing”, and analyze “lower-performing” groups of counties to suggest improvement opportunities
- Use data-driven insights to instill new practices into how to manage COVID-19

How is COVID control / analysis done today?

- Conservative / broad sweeping mandates to prevent transmission
- Big emphasis on cases, deaths, and vaccine doses
- Descriptive and diagnostic analytics, instead of predictive and prescriptive analytics

Our approach

- Ingest large spectrum of data (COVID statistics, demographic, behavioral data) at county level
- Feature engineer and normalize data
- K-Means clustering algorithm
- Visualization of K-Means clusters utilizing Principal Component Analysis (top two principal components)
- Analyze clusters using summary statistics
- Identify recommendations for each cluster to help with COVID control

What is innovative and new?

- K-Means utilizing a broad integrated data set at county level (i.e., more granular)
- Focus on predictive / prescriptive actions for counties to take

Who cares? What difference will this make?

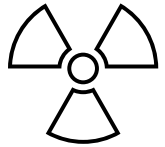
Who Cares?

- Public officials and policymakers
- Everyday US citizens
- Pandemic researchers / scientists

What difference will this make?

- Potentially can save future lives
- Reduce strain on hospital / health care systems
- Mitigate negative economic impact

Risks and payoffs



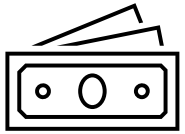
Risks

- Misuse of demographic data / bias
- Unreasonable recommendations

Payoffs

- Data-driven approach to improve human lives
- Reduce economic impact on society
- Reduce strain on healthcare system

Costs and effort estimates



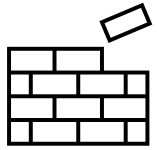
Cost

- Computing power
- Time (est. $20,000)

Effort Estimates

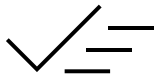
- Duration: 8 weeks
- Hours: 6 resources at 20 hours per week

Monitoring progress and success



Midterm check

- Data is available and can be integrated
- Logical groupings / clusters established
- KPIs: # of reasonable clusters, # of available features



Final check

- Reasonable summary statistics by cluster
- Reasonable / actionable recommendations by cluster to be transcended to each county
- KPIs: # of recommendations by cluster, # of next steps for study

Effort Estimates*/Next Steps

Name	Task(s)	Start Date	Target date
Andrew Faris	Model Dev, Report Writing, Poster Building	1/25/2022	4/23/2022
Jyothi Karra	Data Engineering, Report Writing, Poster Building	1/25/2022	4/23/2022
Morteza Maleki	Data Engineering, Report Writing, Poster Building	1/25/2022	4/23/2022
Ruchi Patel	Model Dev, Report Writing, Poster Building	1/25/2022	4/23/2022
Betsy Thorne	Visualization, Report Writing, Poster Building	1/25/2022	4/23/2022
Tony Bakshi	Model Dev, Report Writing, Poster Building	1/25/2022	4/23/2022

*All team members have contributed a similar amount of effort.

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