Flu Shot Learning

By: Jimmy Nguyen

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Introduction

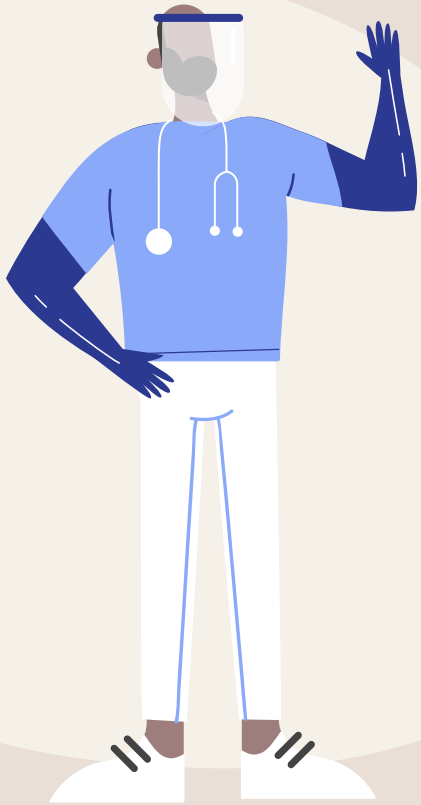
Let’s cover the basics

Influenza “Seasonal” Flu

An infectious disease often known as the flu which occurs predominantly in the winter months of every year.

H1N1 “Swine” Flu

In the beginning of Spring 2009, a new virus emerged and caused a pandemic, otherwise known as the “swine” flu.



02

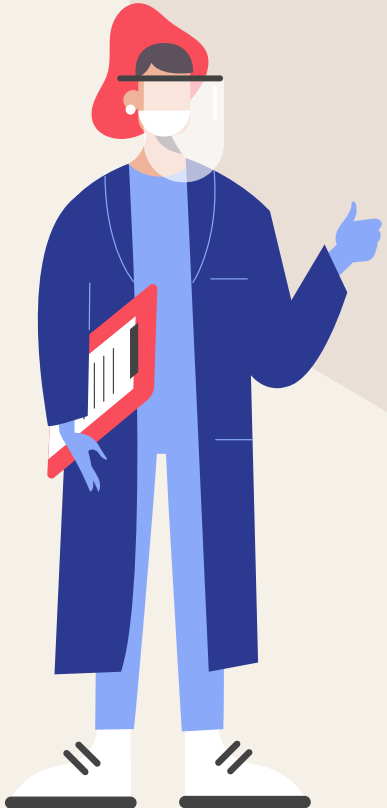
Background

What are the goals
of this project?

Then

The United States conducted the National 2009 survey.

This involved calling respondents by phone and asking them if they took the seasonal flu and H1N1 vaccines.



Now

The data collected and aggregated was courtesy of the United States National Center for Health Statistics.

Future

This project is about leveraging predictive modeling to target high-risk patients who may defer their vaccinations.

Business Goals

More Vaccinations

Fight infectious diseases by giving immunization to everyone

Improve Public Health

Reduce the spread of infection and save lives through “herd immunity”

Patient Trust and Cooperation

Utilize personal vaccination patterns without breaking any data privacy laws

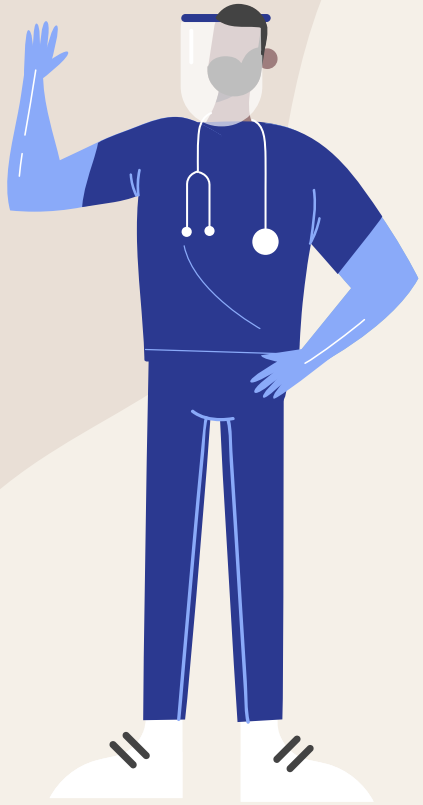
Project Goals

Modeling

Build a predictive model that can identify people that will take or reject vaccinations

Targeting

Reach out to people who may be at high risk without vaccinations.



“Predictive analysis offers tools that could aid the decision making of policymakers, physicians, and environmental health practitioners to improve public health.”

Ranapurwala, S.I., Cavanaugh, J.E., Young, T. *et al.* Public health application of predictive modeling: an example from farm vehicle crashes. *Inj. Epidemiol.* **6,** 31 (2019). https://doi.org/10.1186/s40621-019-0208-9

03 Major Requirements

Constraints, Assumptions, and Considerations

Constraints

Legal

Need to de-identify current data due to identifiable information and ethical concerns

Time

Need to make this project deployable by March 31, 2022

Assumptions

Population

The respondent's age are between 18-65+

Education

The respondent's did not finish high school, graduated high school, or is a college graduate

Considerations

Data Cleaning

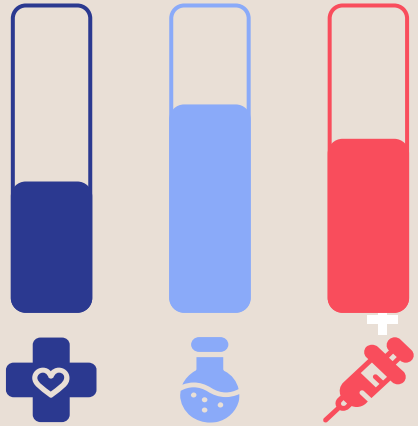
Remove errors or deal with missing values

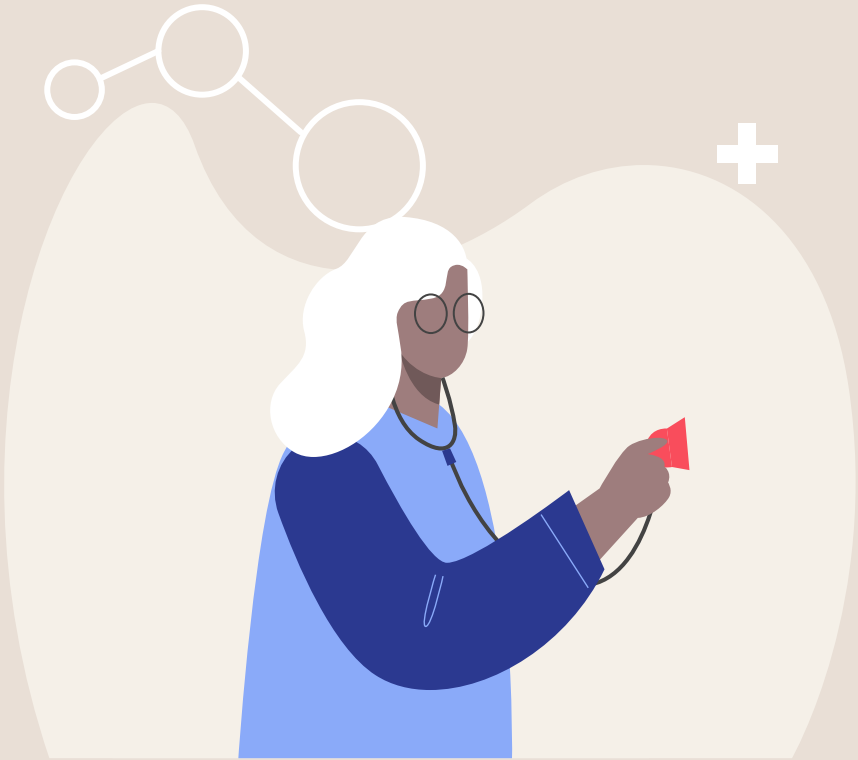
Feature Engineering

Perform de-identification process

Feature Selection

Use selective data to mask identifiable information





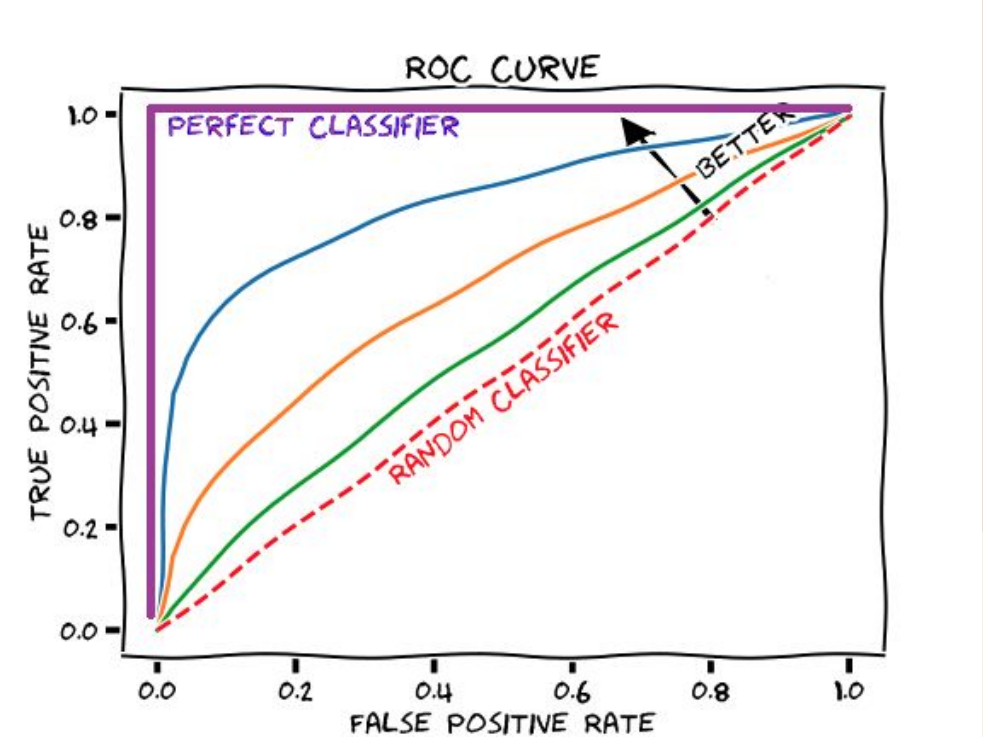
04

Impacts

How do we measure success?

Does it align with our goals?

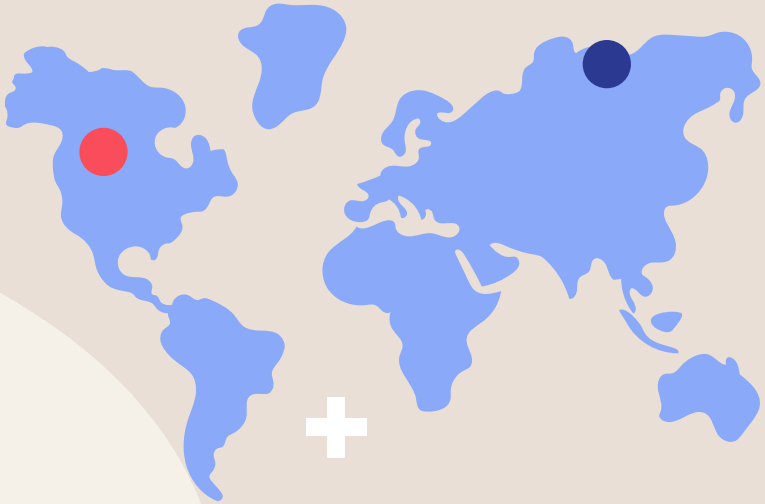
Evaluation KPIs



AUC-ROC Curve

Area under the curve - Receiver Operating Characteristics curve

This project aligns with our business goals



U.S.

Current efforts on historical examples U.S. citizens

Globally

Possible targets globally with your help

05 Stages

What is the current status?

Expected timeline?

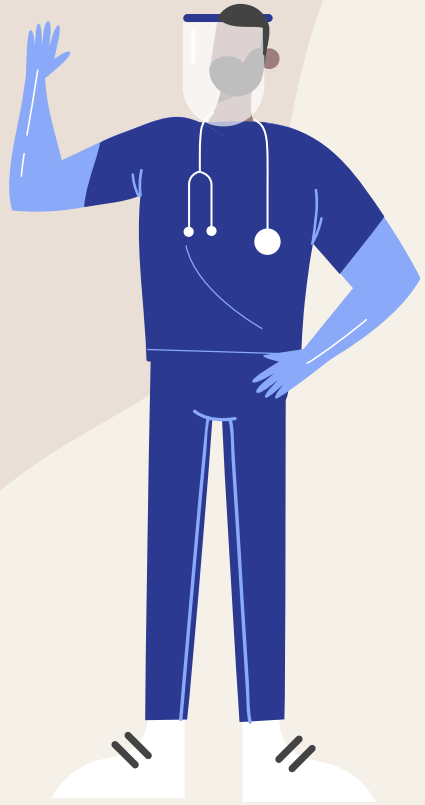
Current Status - Data Exploration

Initial Data Report

Data has 38 columns and 26,707 records

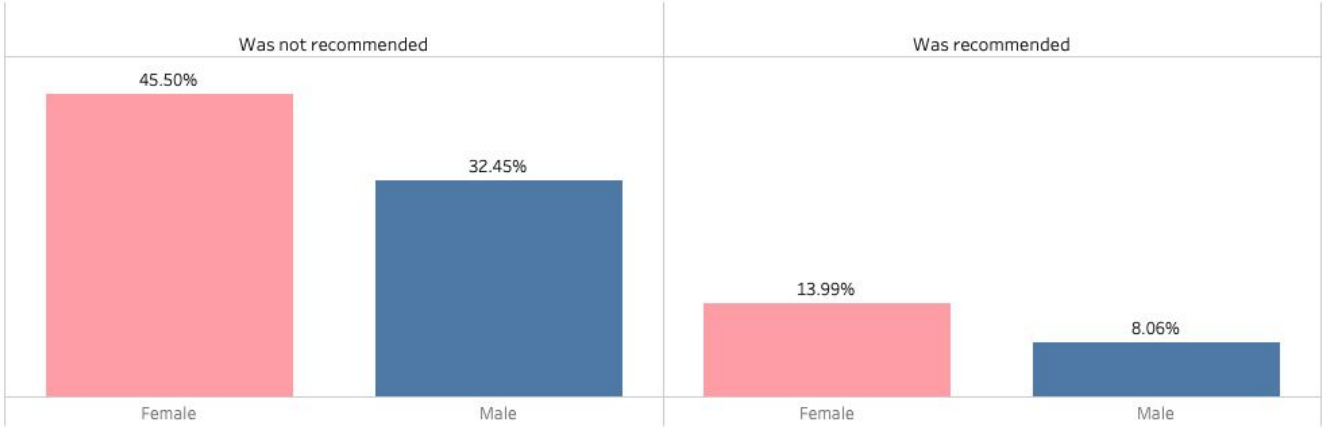
Data is in CSV format with full access and available to download

Three columns that contain over 40% of missing values.



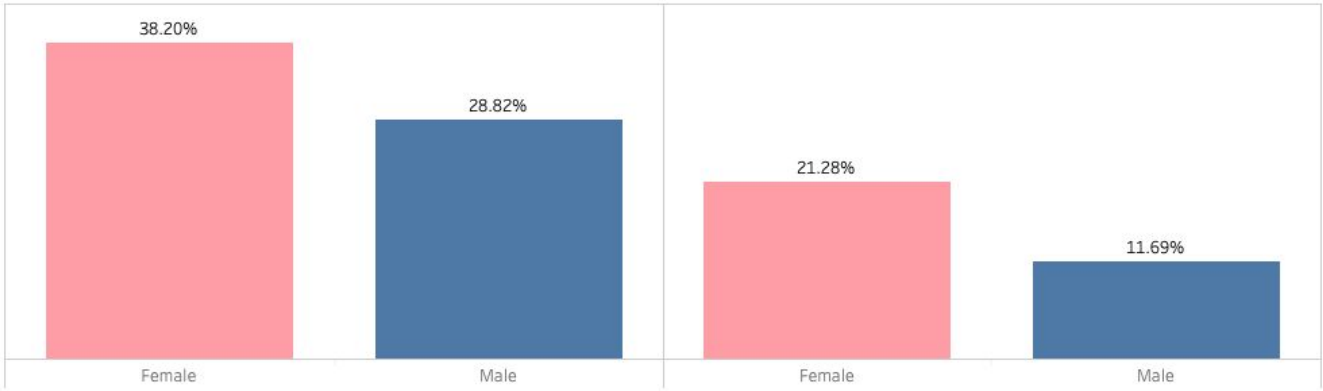
H1N1 Flu Vaccine Recommendations

Females were more often not recommended for a H1N1 flu vaccine than males.



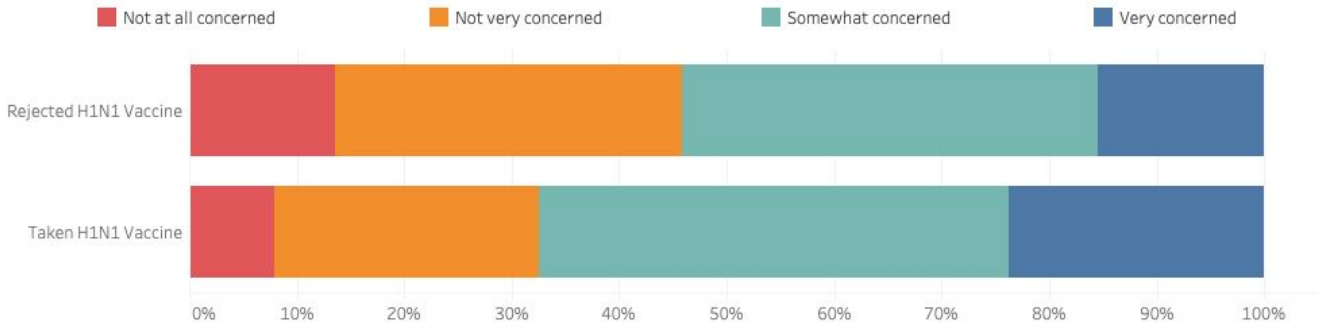
Seasonal Flu Vaccine Recommendations

Females were more often not recommended for a seasonal flu vaccine than males.



Data source: DrivenData.org

H1N1 Concerns Effects on H1N1 Vaccines

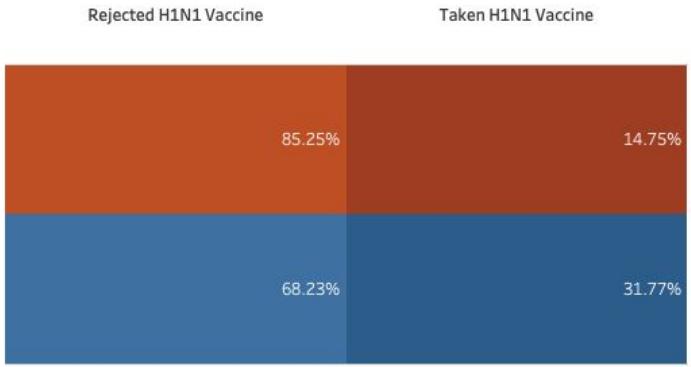


People who are *somewhat concerned* about the H1N1 are more likely to take their H1N1 vaccine

Data Source: DrivenData.org

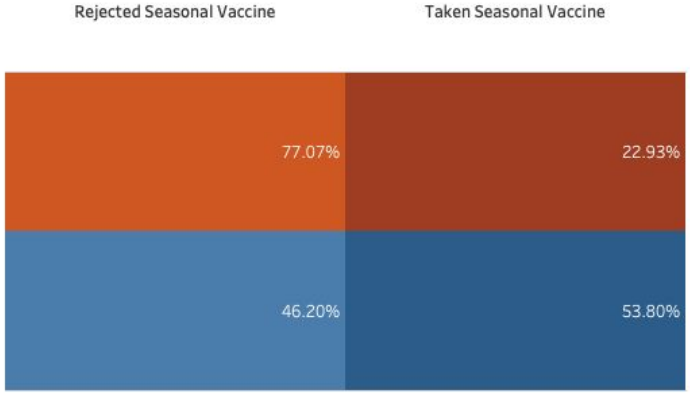
Health Insurance and H1N1 Vaccines

Without health insurance, respondents were more likely to reject H1N1 vaccines



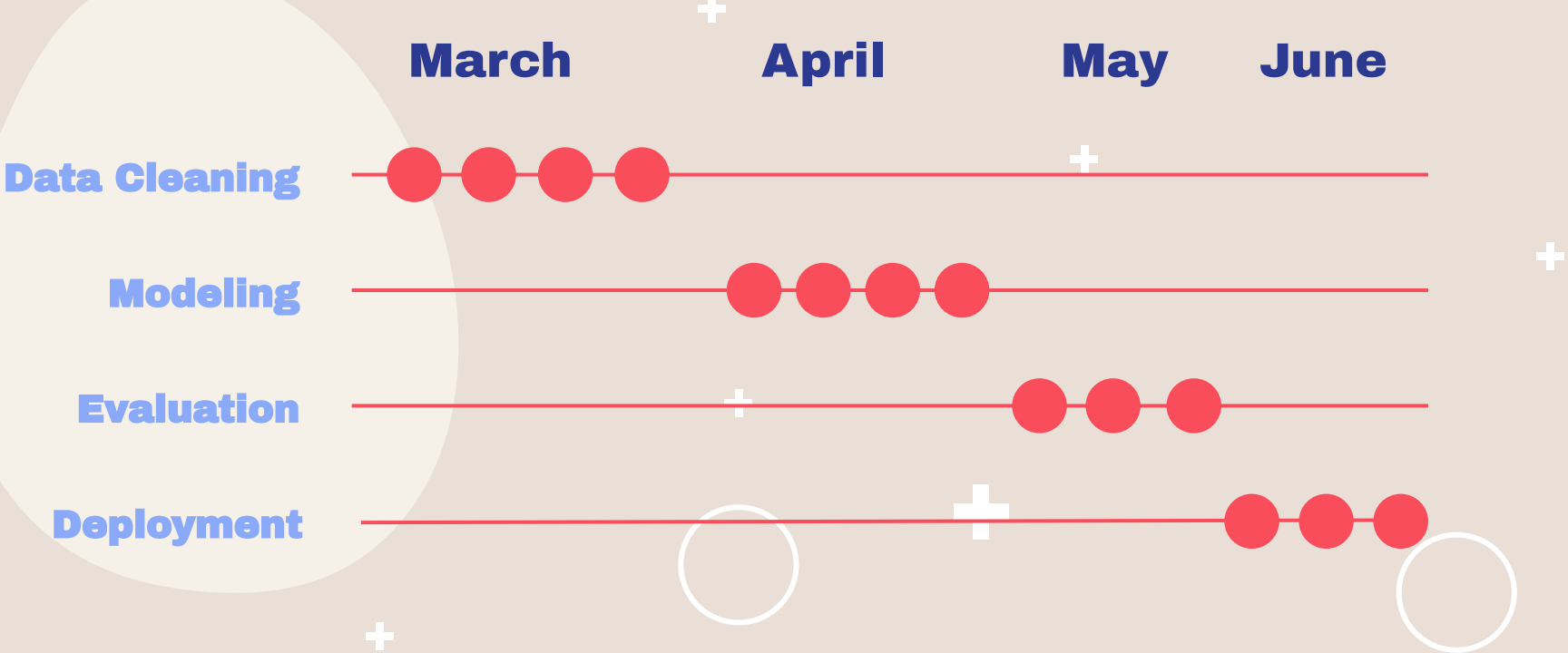
Health Insurance and Seasonal Vaccines

Without health insurance, respondents were also more likely to reject seasonal vaccines



Data source: Drivendata.org

Project Stages



06

Conclusion

Summary

- This was a proposal for modeling vaccination patterns to predict the likelihood of patients who will defer a vaccine
- This project will require a lot of data cleaning and de-identification
- This project will help healthcare leaders push for more vaccinations and ensure public health safety

Next Steps

- We hope to receive your support in this project as we aimed to start the next stage.
- We will continue with data cleaning and explore options for dealing with missing data
- Then we will look into the cardinality of each survey question and perform feature engineering for any class imbalance

Thanks

Do you have any questions?
Follow the project updates

Email: nhannguyen@sandiego.edu
Phone #: (510) 338-2534

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