

# Understanding Vaccine Acceptance



Ryan Johnson

# Problem

- New Vaccines Have Lower Adoption Rates
- Higher Vaccine Rates Contain Outbreaks Quicker
- Lower Loss of Life and Economic Impact
- COVID-19



# Stakeholders

- Governments
- Medical Professionals
- Business Leaders
- In Short Everyone!





# Factors

- Behavior
  - Hand Washing
  - Gathering Attendance
  - Face Mask Use
- Opinions
  - Severity of Virus
  - Effectiveness of Vaccine
- Demographics
  - Age
  - Income
  - Household Makeup





# Data

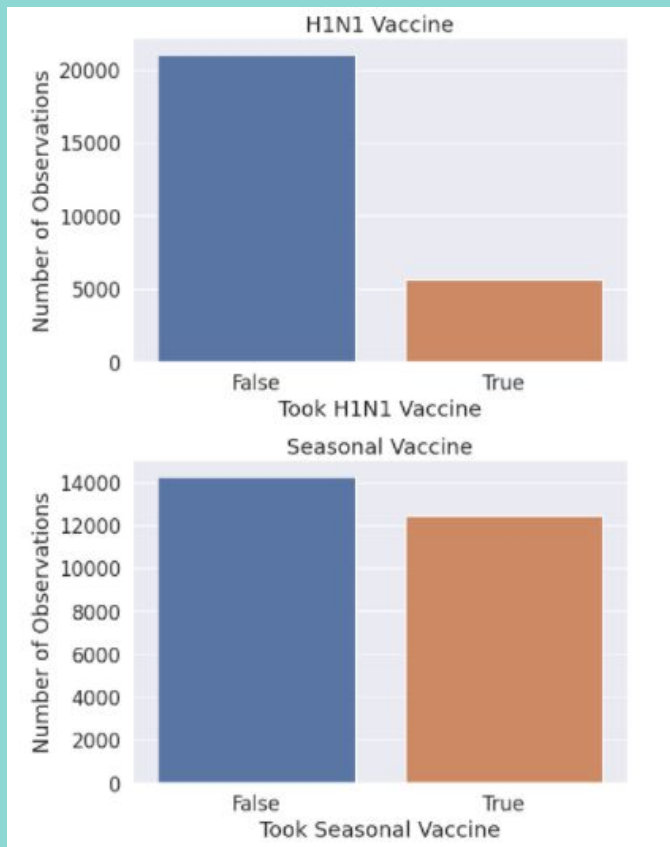
- National 2009 H1N1 Flu Survey
- 26707 Observations
- 37 Features
- Seasonal Flu & H1N1 Vaccine Target Labels
- Data Wrangling
  - Eliminated Arbitrary Region, Industry & Occupation Values
  - Assigned Categorical Value to Invalid Entries





# Initial Analysis

- Imbalanced Data for H1N1

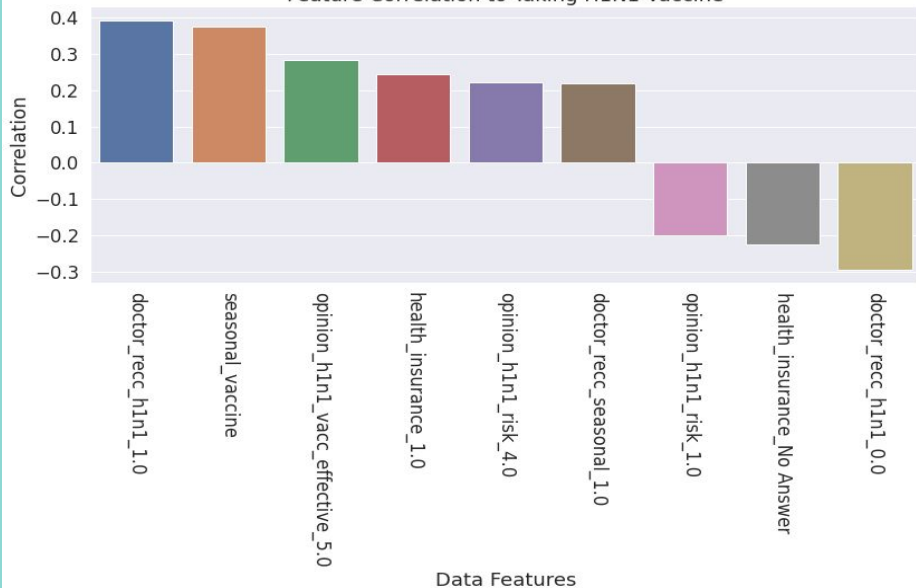




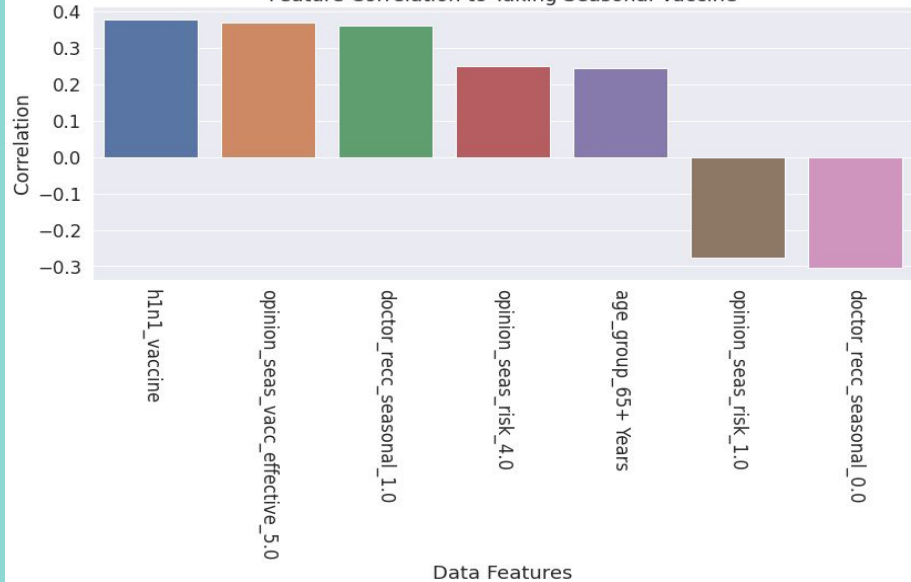
# Initial Analysis Continued

- Feature Correlation
  - Positive & Negative

Feature Correlation to Taking H1N1 Vaccine

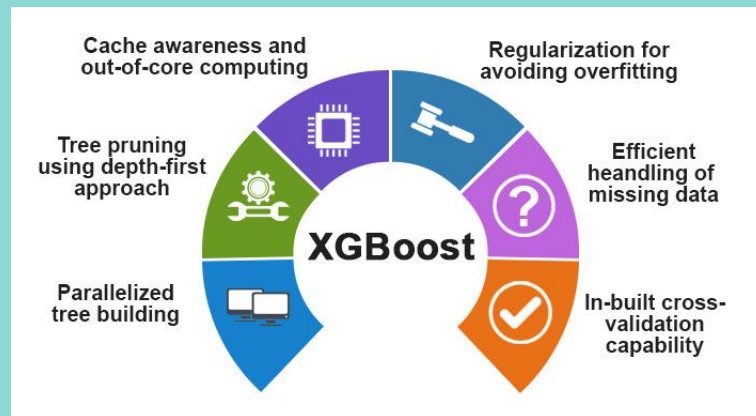


Feature Correlation to Taking Seasonal Vaccine



# Modeling Analysis

- Imbalanced Data
  - SMOTE
  - Classification Algorithm
- Grid Search

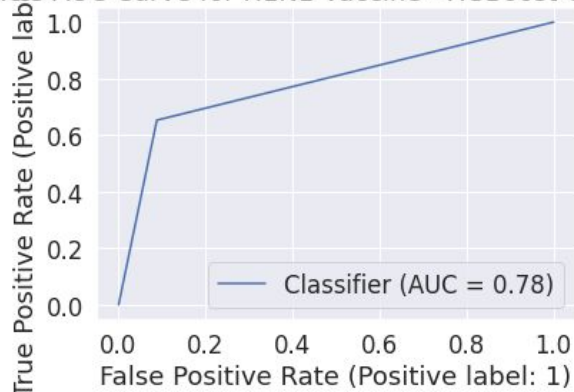




# Modeling Analysis Continued

- Random Forest
- Naive Bayes
- XGBoost

ROC-AUC Curve for H1N1 Vaccine - XGBoost Classifier



H1N1 Vaccine - XGBoost Classifier					
	precision	recall	f1-score	support	
0	0.91	0.91	0.91	4204	
1	0.66	0.67	0.66	1138	
accuracy			0.86	5342	
macro avg	0.79	0.79	0.79	5342	
weighted avg	0.86	0.86	0.86	5342	
Seasonal Vaccine - XGBoost Classifier					
	precision	recall	f1-score	support	
0	0.81	0.84	0.82	2873	
1	0.80	0.77	0.78	2469	
accuracy			0.80	5342	
macro avg	0.80	0.80	0.80	5342	
weighted avg	0.80	0.80	0.80	5342	

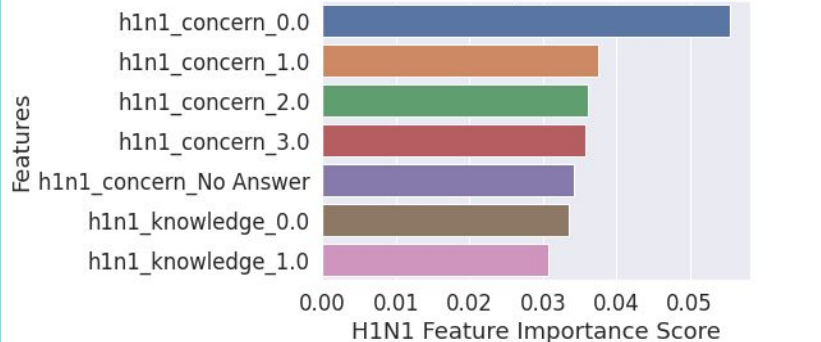
ROC-AUC Curve for Seasonal Vaccine - XGBoost Classifier



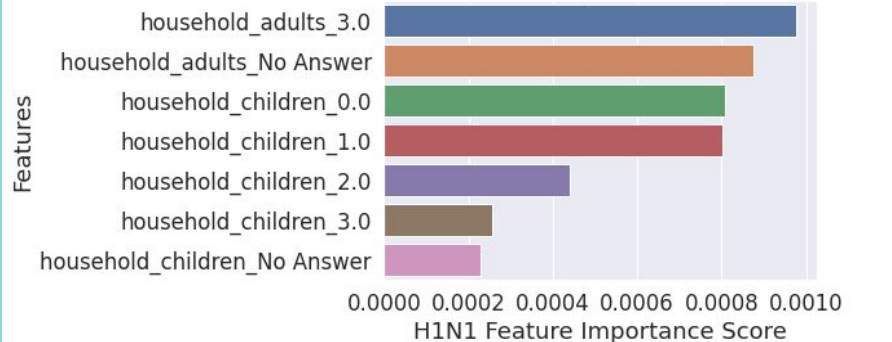


# Modeling Analysis Continued

H1N1 Vaccine Most Important Features: XGBoost



H1N1 Vaccine Least Important Features: XGBoost



# Findings

- Trust
- Knowledge
- Fear
- Physician Engagement

