A DATA-DRIVEN STRATEGY FOR SEASONAL FLU VACCINE UPTAKE

HIGHLIGHTS

- Overview.
- Business Understanding.
- Data Understanding.
- Data Preparation, Analysis and Visualization.
- Recommendation.
- Limitations.
- Suggestions for Further Analysis.

OVERVIEW

This project analyses survey data to predict seasonal flu vaccine uptake with the aim of identifying key drivers of uptake and provide actionable insights for public health officials.

Business Understanding

- Predict uptake, by using survey data to model whether individuals receive the seasonal flu vaccine.
- Identify key drivers to the uptake.
- Pinpoint demographic , behavioral and attitudinal factors that influence vaccination decisions.
- Generate actionable insights: Provide evidence based recommendations to guide outreach, communication and resource allocation.
- Support public health strategy in effectively handling current and future vaccination efforts.

Data Understanding

- Data Source: 2009 H1N1 Flu Survey conducted in the U.S. Individual responses collected on demographics, health behaviors and attitudes toward vaccination.
- Data Characteristics: Demographics, age,education, insurance coverage,income,health behaviors,doctor visits,presence of chronic conditions,attitudes& beliefs,trust in healthcare providers concerns about vaccine side effects,perceived risk of flu.
- Outcome variable: Whether the respondent received the vaccine(binary: yes/no).

Data Preparation

- Cleaning
- Encoding
- Balancing
- Splitting of the datasets
- Feature Engineering

Analysis

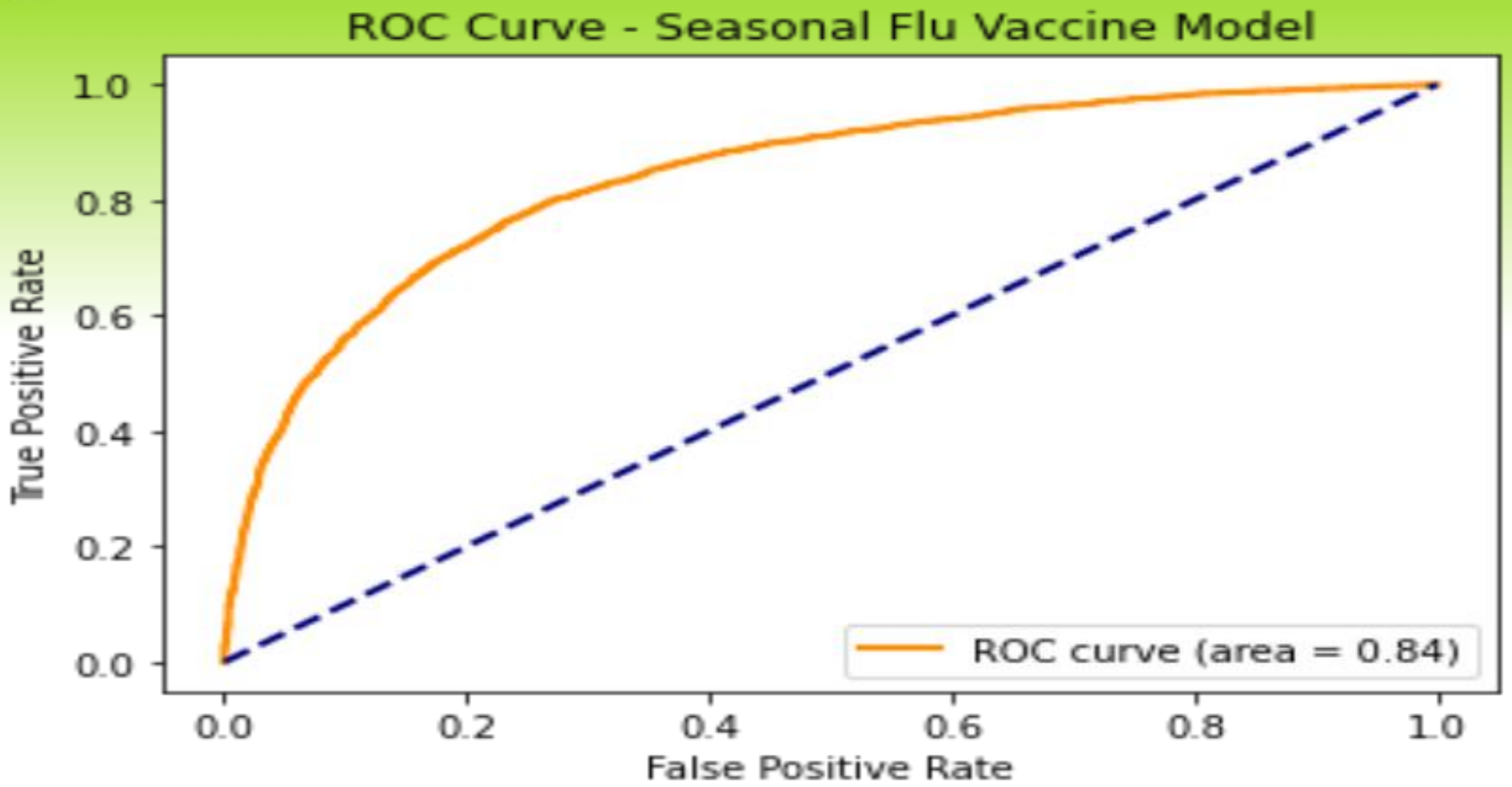
- **Modeling approach**: application of classification model e.g logistic regression to predict vaccine uptake.
- Performance metrics that evaluated accuracy ; ROC AUC, precision and recall.

- **Top Key predictors identified:**
- Demographics :Age, education, insurance coverage.
- Health behaviors: doctor visits, chronic conditions,
- Attitudes: trust in providers, concerns about side effects.

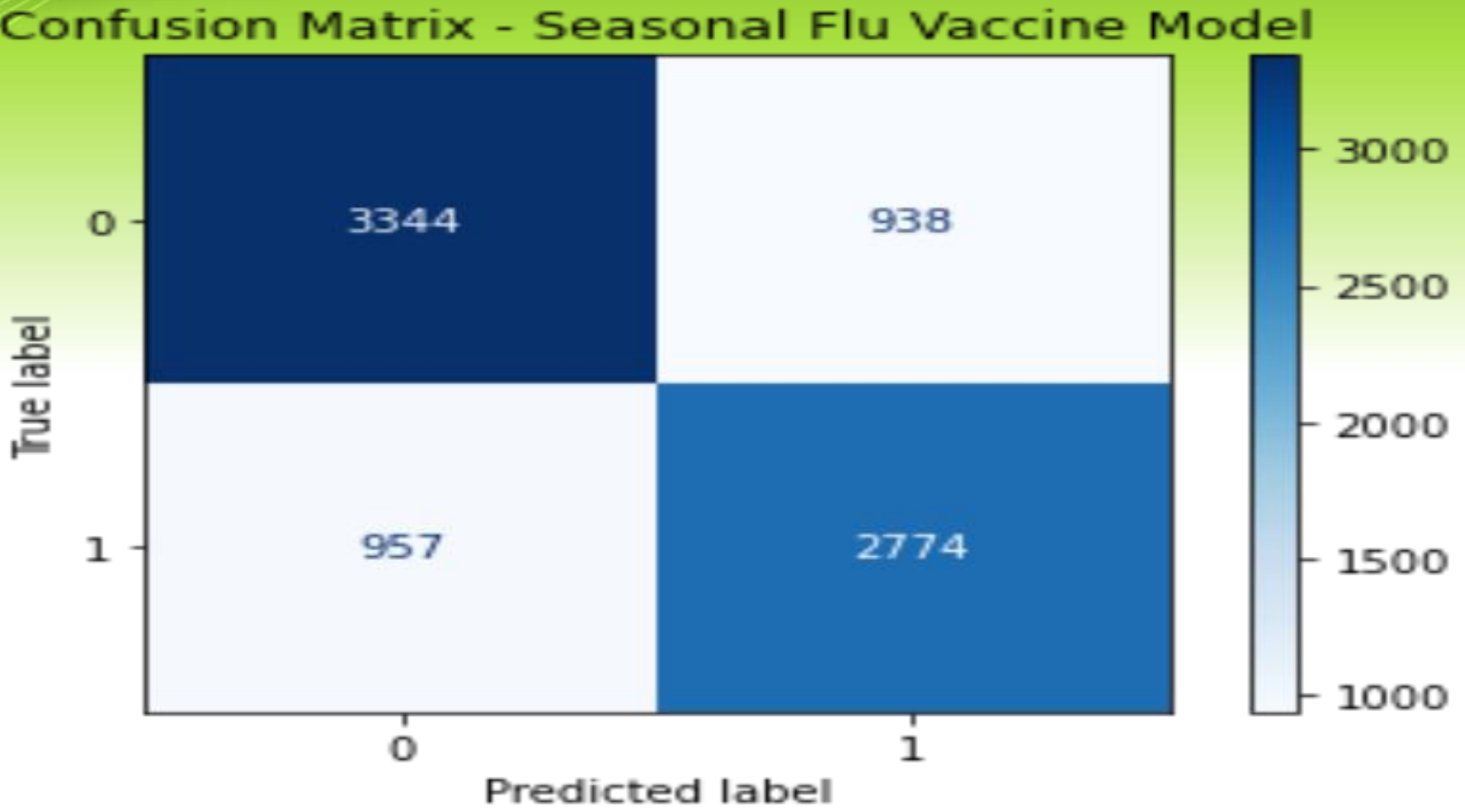
Visualization

- The **ROC curve** and **Confusion matrix** use to show the model performance by demonstrating the predictive accuracy.

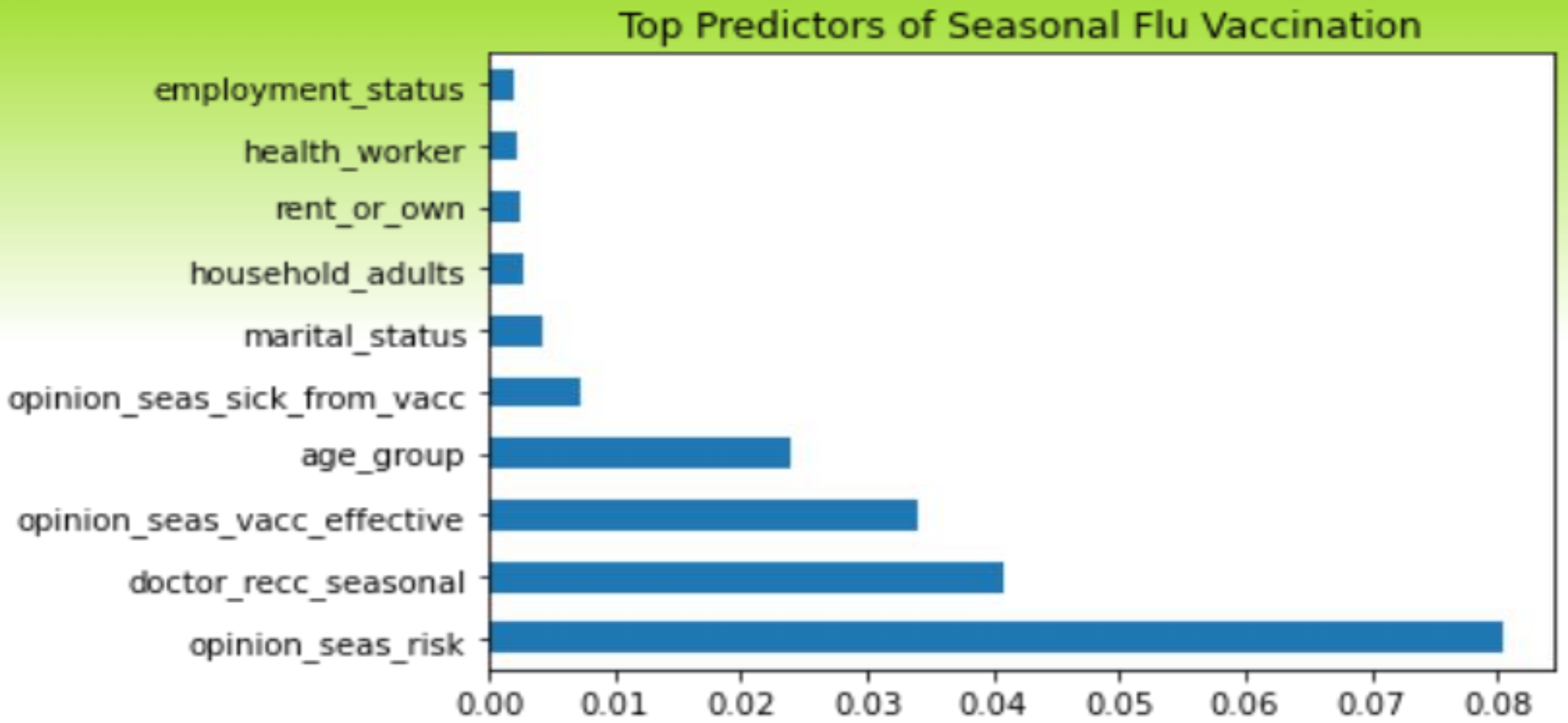
ROC CURVE


ROC Curve - Seasonal Flu Vaccine Model
True Positive Rate
False Positive Rate
0.0
0.2
0.4
0.6
0.8
1.0
ROC curve (area = 0.84)

CONFUSION MATRIX



TOP PREDICTOR FEATURES



Recommendations

- **Use Targeted Outreach** such as focus campaigns on younger adults and those without regular healthcare access.
- **Build Trust** by Strengthening relationships between communities and healthcare providers to improve confidence in vaccination. **Address Safety Concerns** by providing clear, accessible information about vaccine side effects and benefits.
- **Adopt Tailored Communication** through use of community health workers and culturally relevant messaging to reach hesitant populations.
- **Regularly Monitor and Update** by applying similar modelling approaches to current datasets (e.g., COVID 19 vaccination) to ensure relevance.