Flu Shot

Who is likely to get one?

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Overview

- Vaccines are a firstline defense against disease outbreaks.
- However, due to various factors, the uptake of vaccines is inconsistent.
- Such factors are usually a complex interplay of individual beliefs, risk perceptions, trust in healthcare systems and social influences.
- The advent of social media has increased misinformation and contributed to worsening vaccine hesitancy, challenging global health efforts

Business Understanding

- The COVID-19 pandemic highlighted the critical need to understand barriers to vaccination, as timely uptake became a matter of life and death.
- Historical data on flu vaccine perceptions can offer valuable insights into potential challenges for new vaccine introductions.
- Anticipating these challenges enables the development of proactive strategies to improve vaccine acceptance and distribution.
- Predictive modeling helps identify individuals less likely to get vaccinated, allowing for targeted communication and resource allocation.
- Such models are essential for designing cost-effective vaccine delivery strategies, especially in low-resource settings.

Business Problem

1. Who is likely to get vaccinated and why?
2. What behaviours are associated with poor vaccine uptake ?
3. Reccomendations for overcoming these barriers to uptake during introduction of a new vaccine?

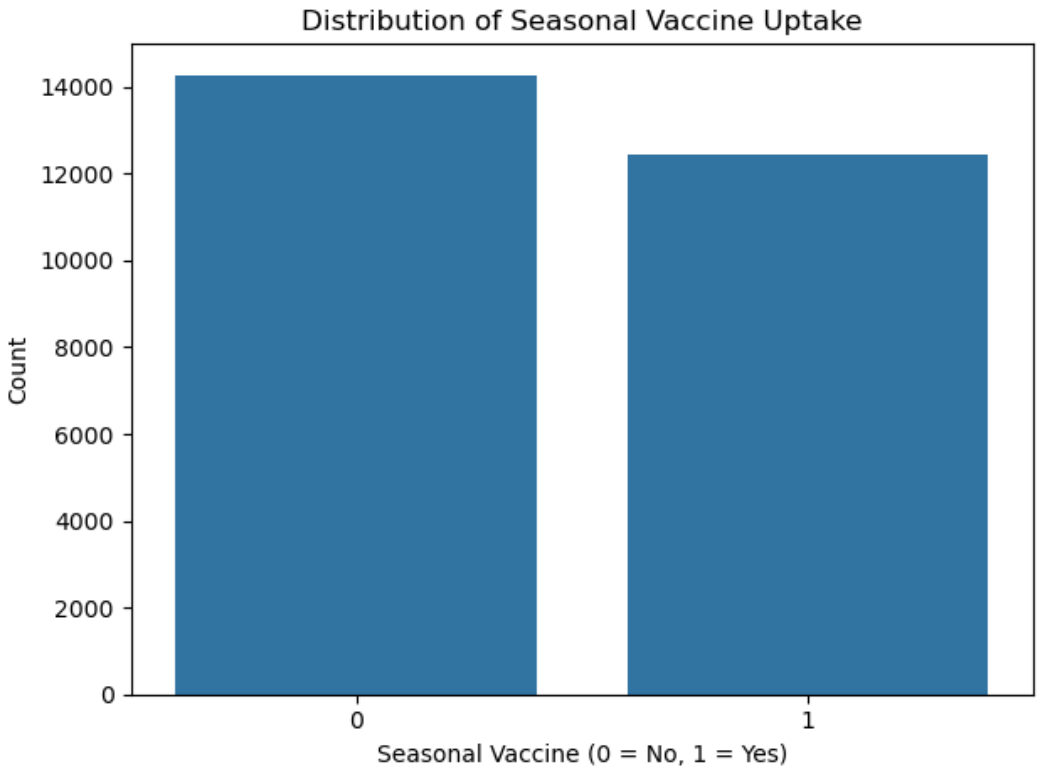
Data Understanding

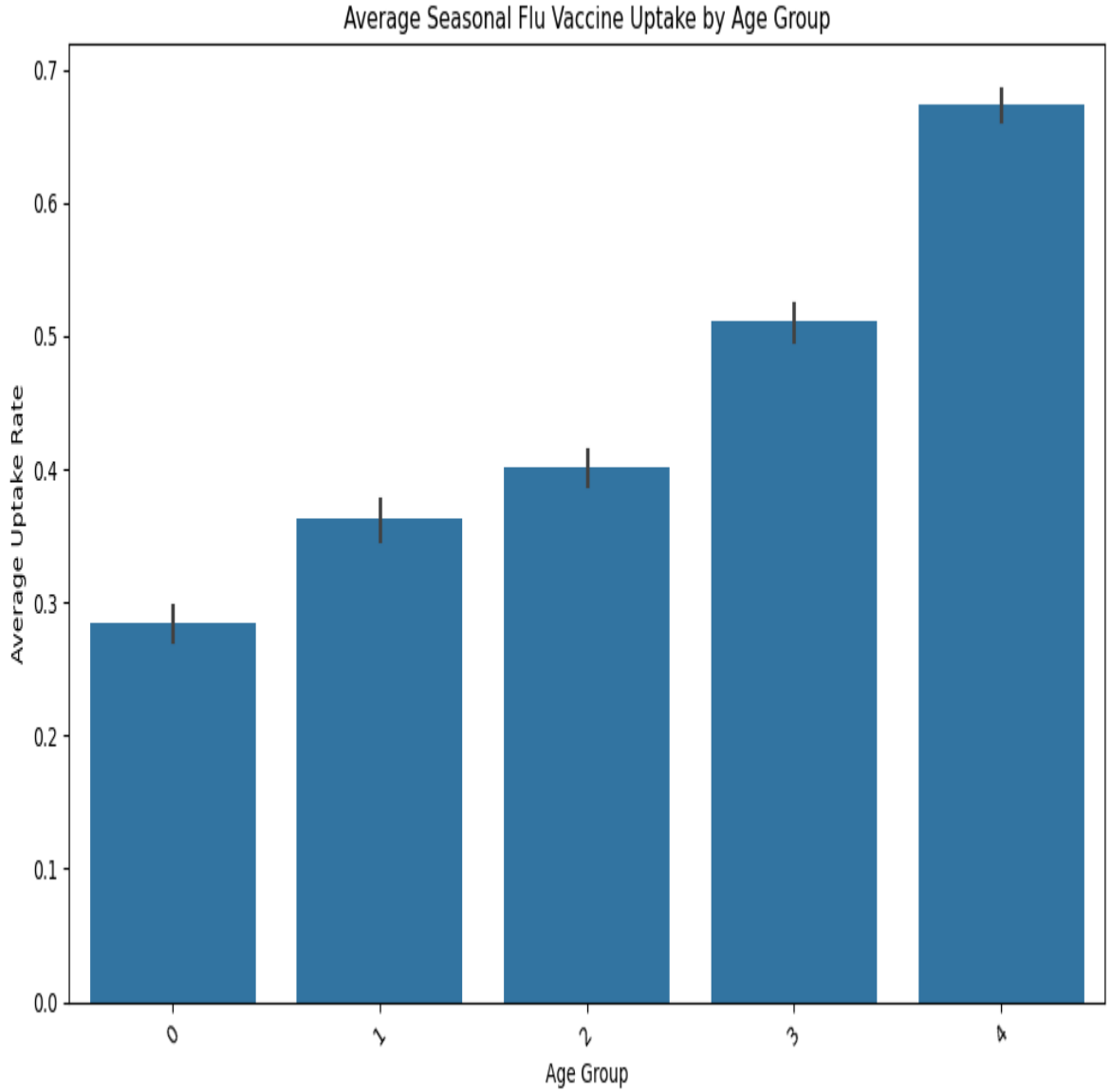
- The data was sourced from Kaggle and preprocessed ahead of modelling
- Data description:
  - Shape: the data had 26,707 rows and 38 colums
    - 23 colums of float data type.
    - 3 columns are integer datatype.
    - 12 colums are object datatype.

- Data preparation
  - Data cleaning handled by dropping columns and handling missing values
  - Categorical variables were transformed to numerical values for easier analysis

Data Analysis

Bar graph of vaccine uptake fairly balance distribution between those vaccinated and not

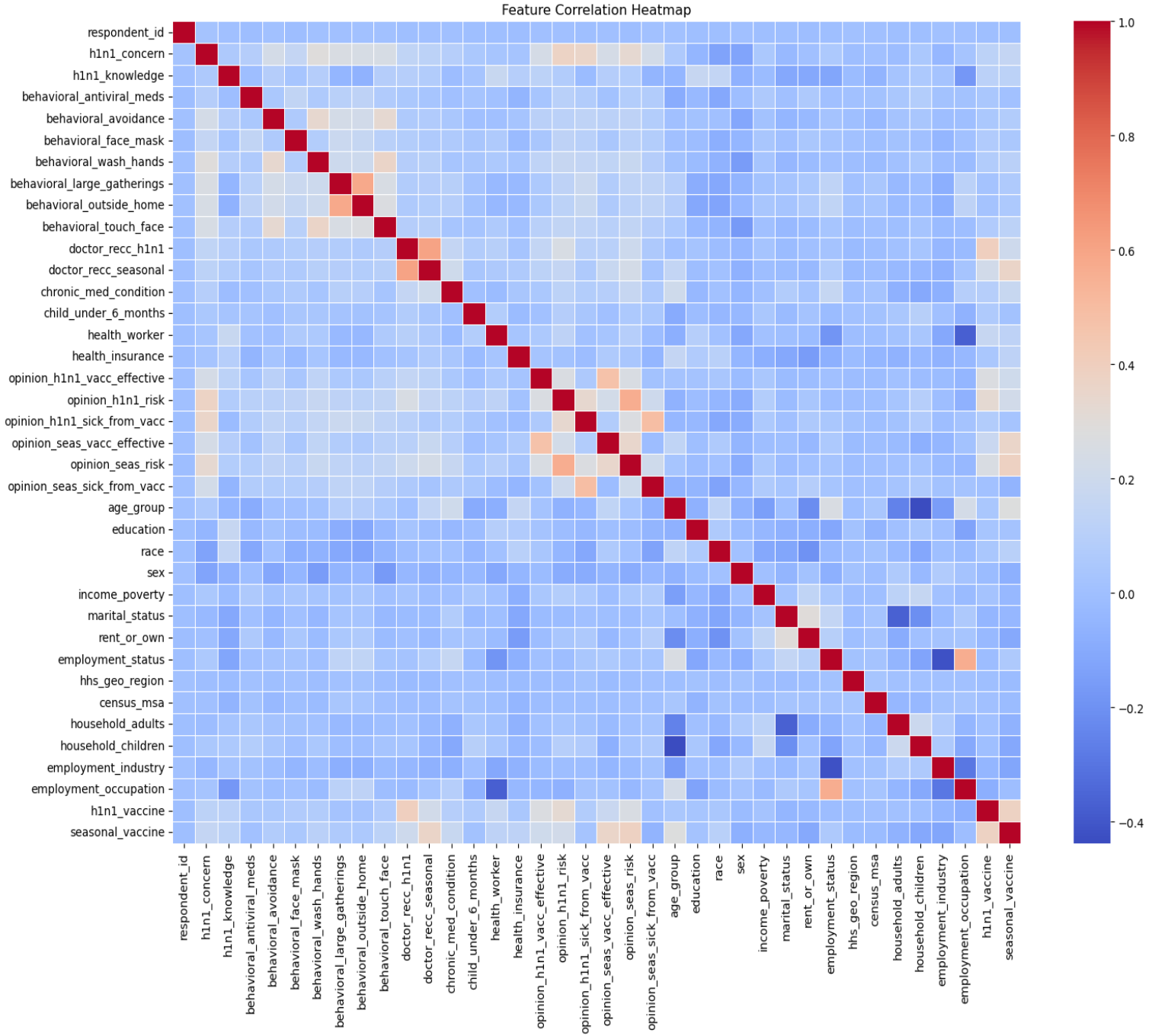




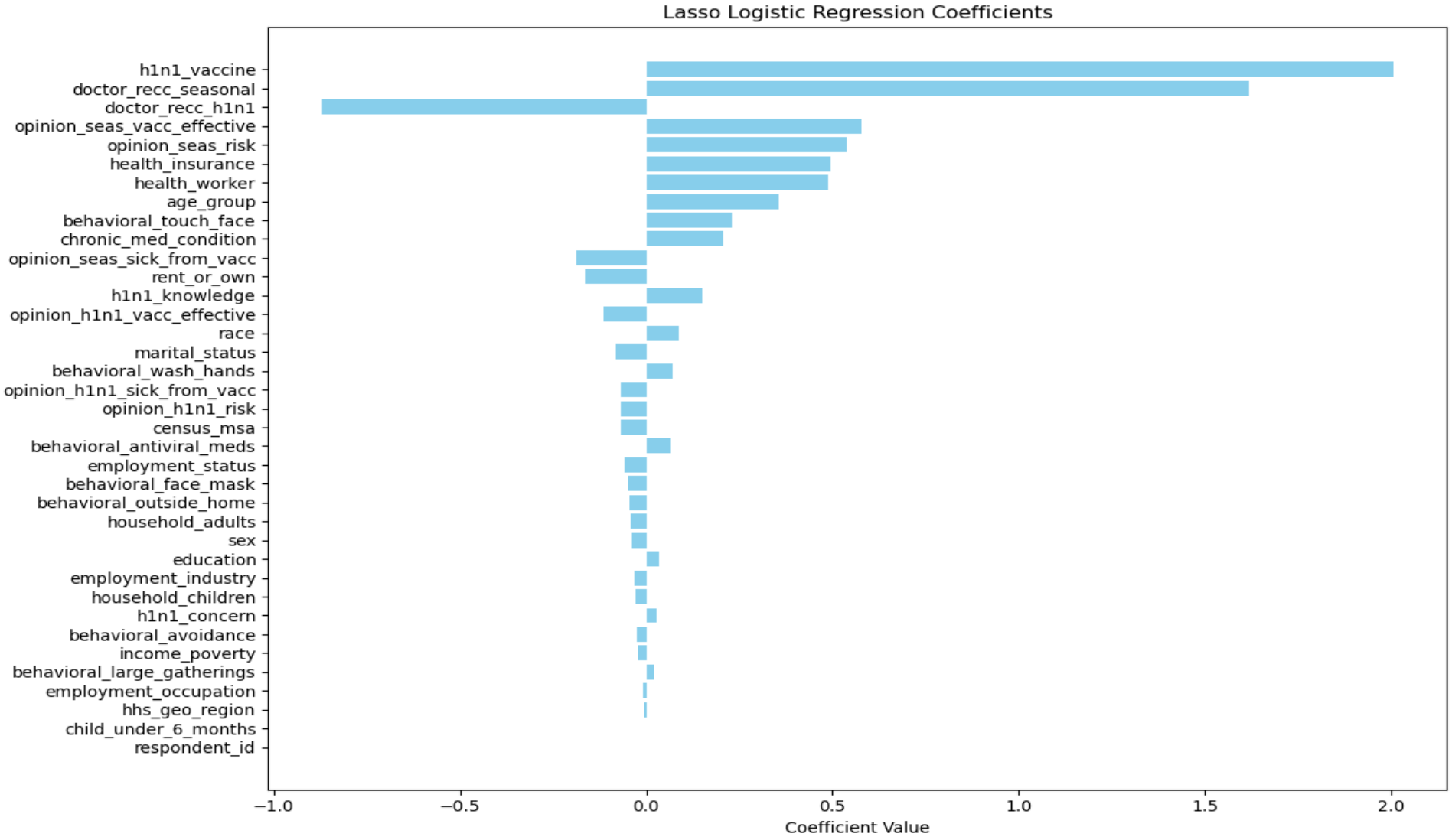
Uptake of seasonal vaccine increase with age group

Data Analysis

The heatmap suggested some strong correlation between features which could be worth exploring in the model.

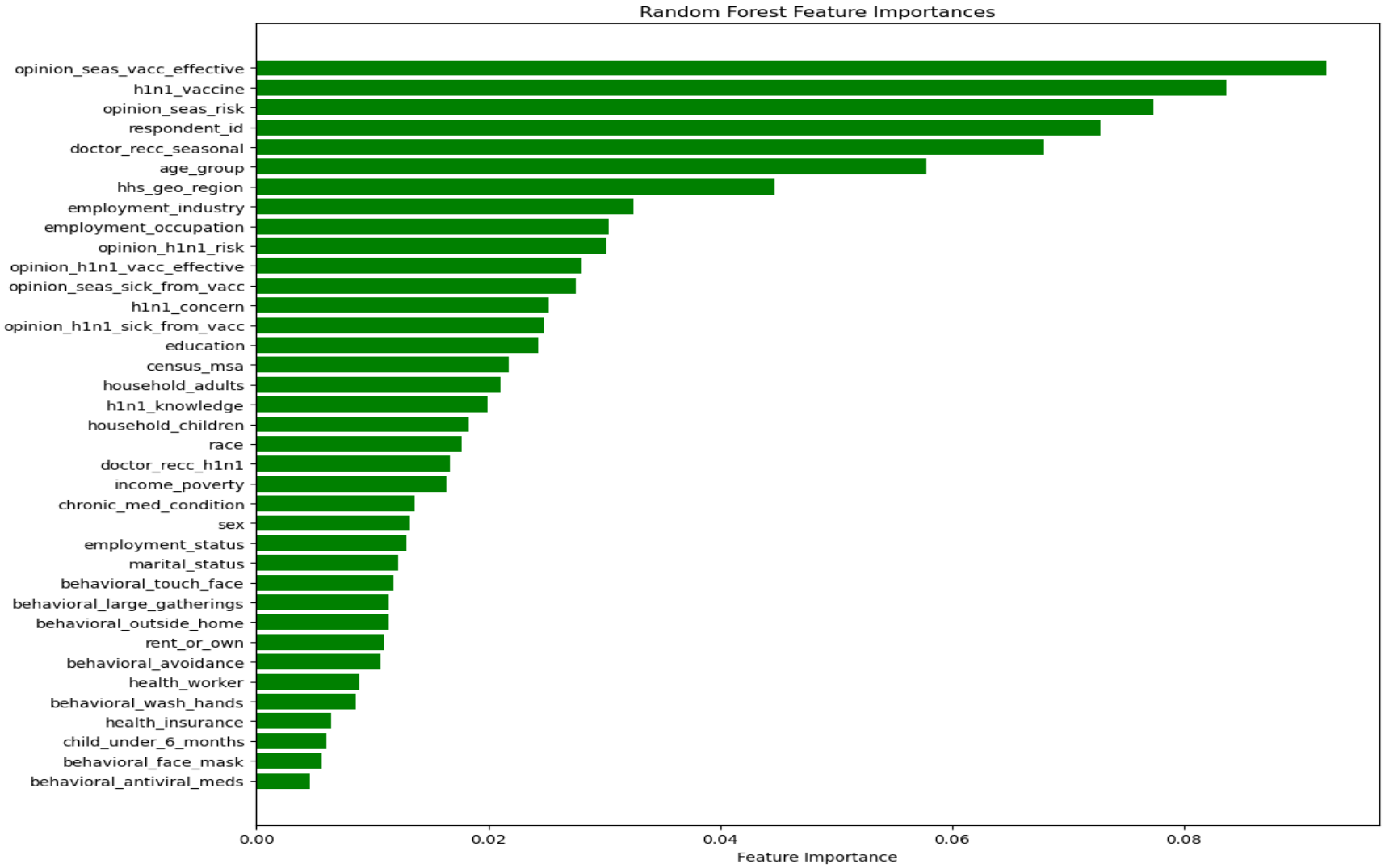


Modelling



Features with positive coefficients increase the likelihood of vaccination while features with negative coefficients decrease it.

Modelling



- Features at the top have the **greatest influence** on predicting seasonal flu vaccine uptake.
- This helps identify which variables are most valuable for decision-making or further analysis.

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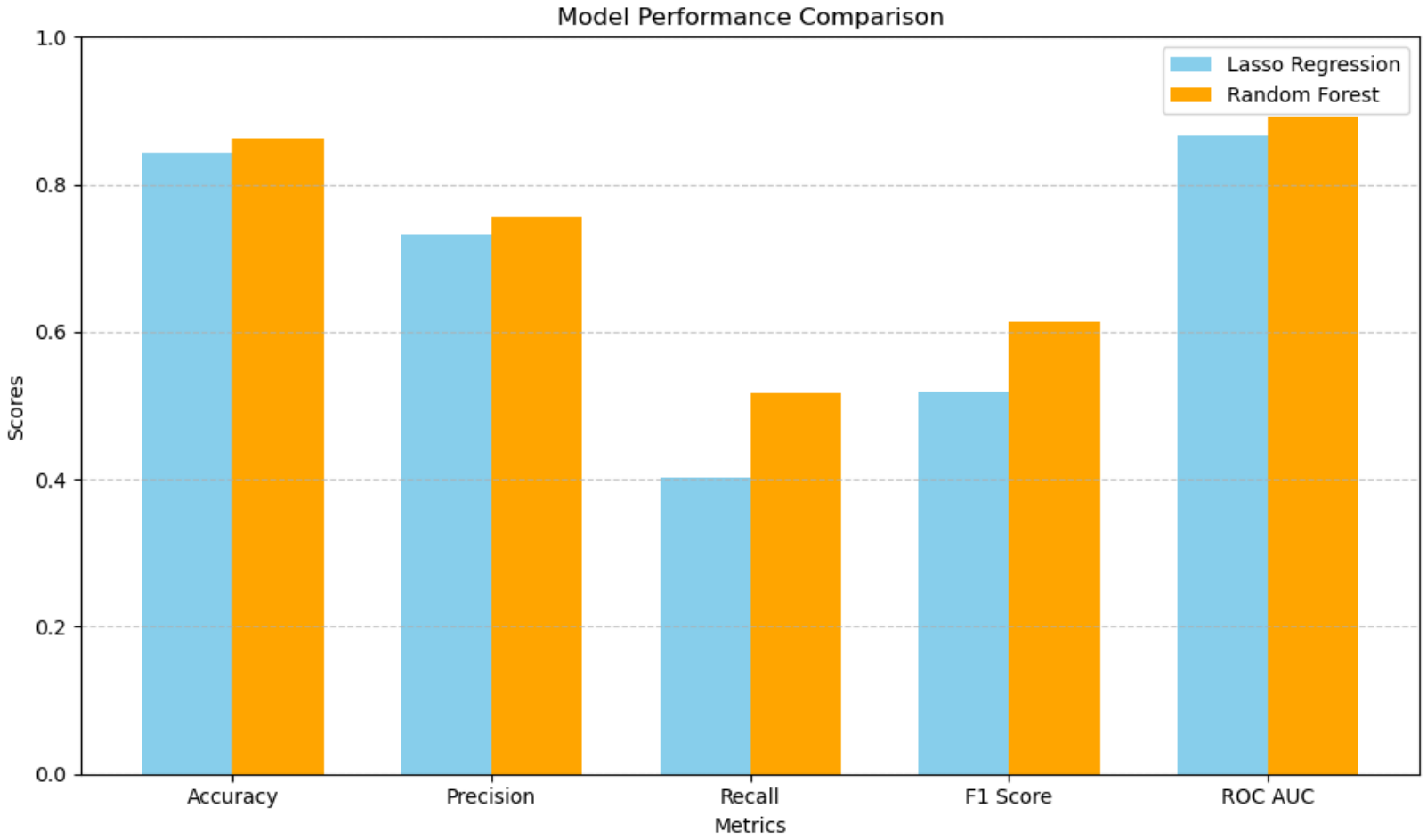
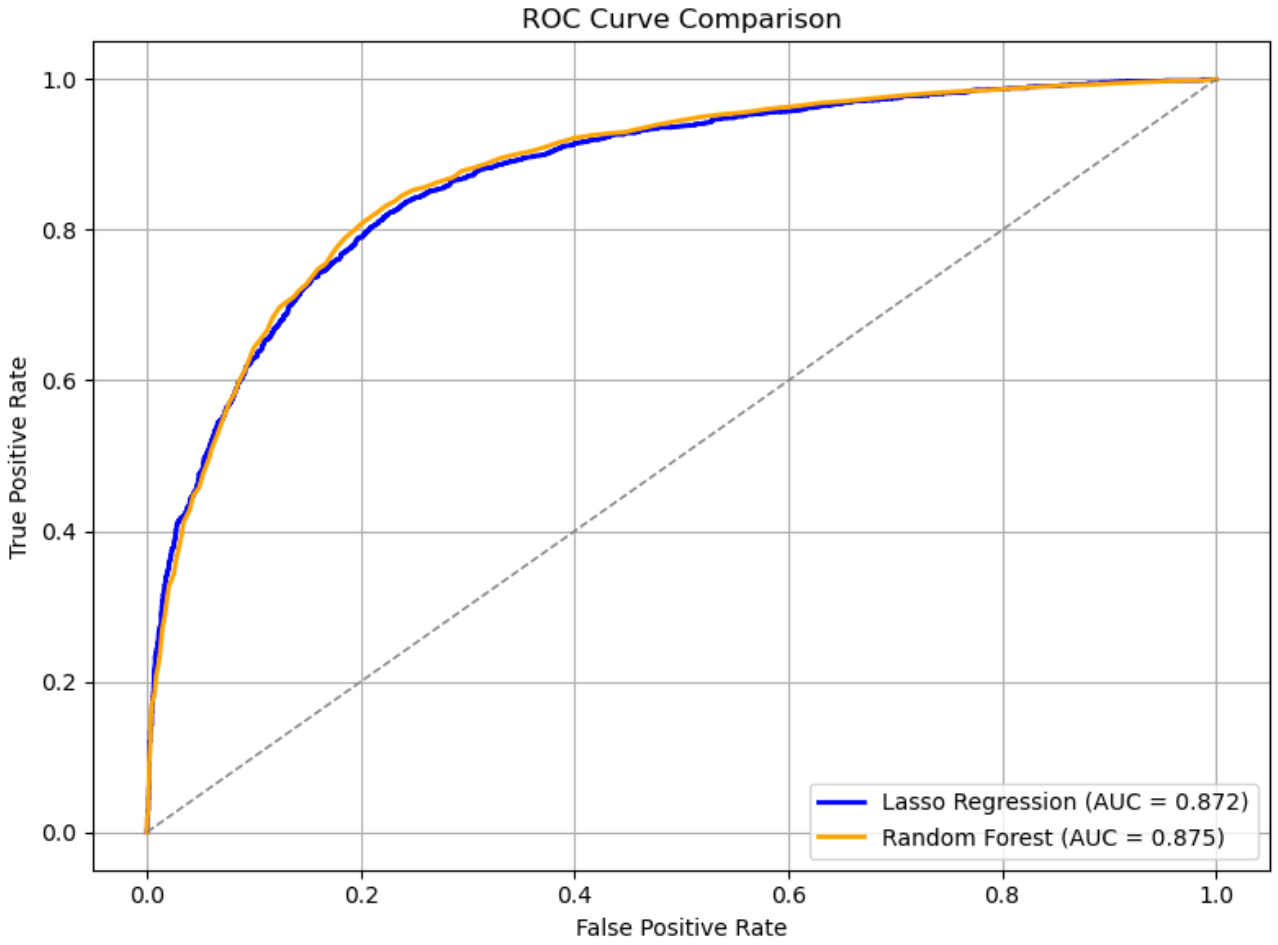
Evaluation



- Random Forest outperforms Lasso Regression across all metrics, especially in recall and F1 score, which are crucial for identifying positive cases.

Evaluation



The Random Forest curve stays closer to the top-left corner, reflecting a better balance between sensitivity and specificity. Lasso Regression, while slightly less effective, still demonstrates strong predictive power.

Recommendations

1. Leverage Healthcare Providers for Advocacy

Since a doctor's recommendation is one of the strongest predictors of vaccine uptake, empower healthcare workers with training and resources to proactively discuss vaccine benefits with patients.

2. Target Misconceptions About Vaccine Effectiveness and Safety

Public health campaigns should focus on correcting misinformation, especially around the effectiveness of the seasonal flu vaccine and fears of getting sick from it. Use clear, evidence-based messaging tailored to different age and risk groups.

3. Prioritize Outreach in Low-Uptake Regions and Occupations

Geographic region and employment type significantly influence vaccine behavior. Design localized interventions and workplace vaccination programs to reach populations with lower uptake rates.

Next Step

- Design strategies based on the feedback from the models
- Deploy the Random forest model
- Refine the model as new data is available
- Further analysis of communication strategies and outreach efforts is necessary to find out which methods are the most effective.

- Thank You

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