Predicting Seasonal Flu Vaccine Uptake:

Leveraging Demographic Data to Optimize Vaccine Supply Distribution

Introduction

Presentation and analysis brought to you by:

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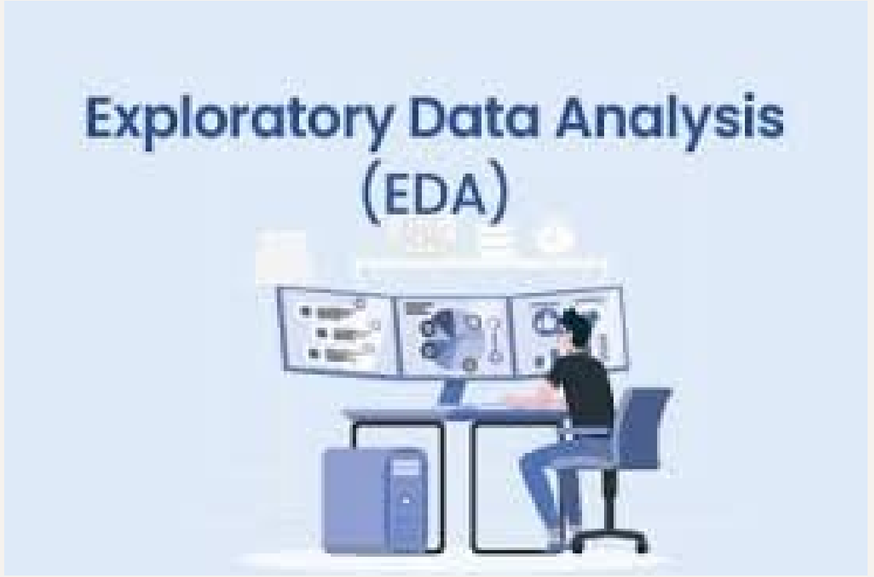
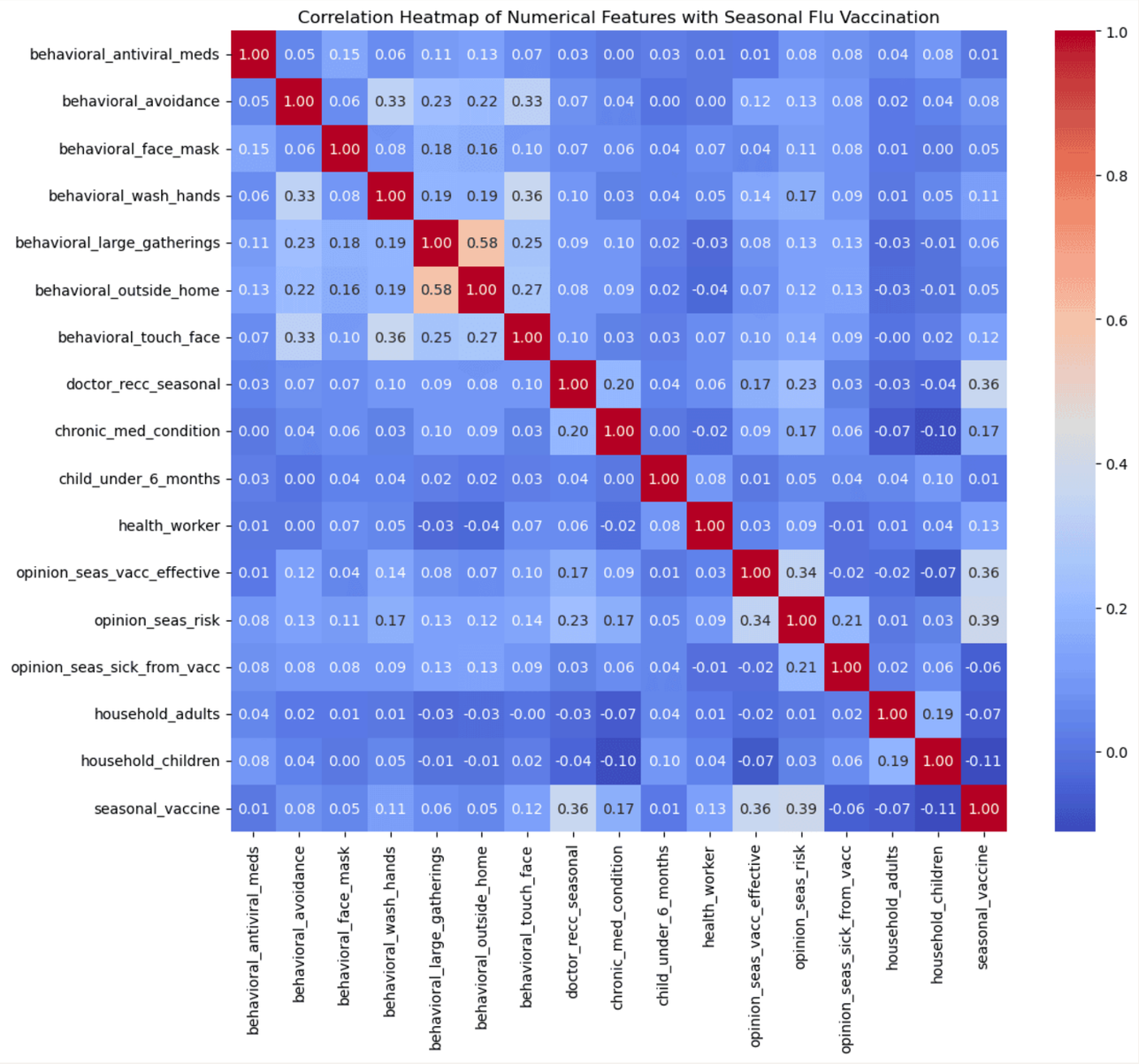
Business Model Objective

- Accurately forecast seasonal flu vaccine demand.
- Identify key demographic factors influencing vaccine uptake.
- Aim for effective vaccine supply allocation to meet health needs.
- Minimize shortages and surpluses, optimizing resources.

Data Understanding and EDA Findings



- Dataset comprised of demographics, health behaviors, and vaccine opinions from over 26,000 entries and 38 columnsKey findings
- Age, income levels, and health attitudes correlate with vaccine uptake.
- Clean data set. Dropped insignificant columns and encoding categorical data were of focus.


Correlation Heatmap of Numerical Features with Seasonal Flu Vaccination
behavioral_antiviral_meds 1.00 0.05 0.15 0.06 0.11 0.13 0.07 0.03 0.00 0.03 0.01 0.01 0.08 0.08 0.04 0.08 0.01
behavioral_avoidance 0.05 1.00 0.06 0.33 0.23 0.22 0.33 0.07 0.04 0.00 0.00 0.12 0.13 0.08 0.02 0.04 0.08
behavioral_face_mask 0.15 0.06 1.00 0.08 0.18 0.16 0.10 0.07 0.06 0.04 0.07 0.04 0.11 0.08 0.01 0.00 0.05
behavioral_wash_hands 0.06 0.33 0.08 1.00 0.19 0.19 0.36 0.10 0.03 0.04 0.05 0.14 0.17 0.09 0.01 0.05 0.11
behavioral_large_gatherings 0.11 0.23 0.18 0.19 1.00 0.58 0.25 0.09 0.10 0.02 -0.03 0.08 0.13 0.13 -0.03 -0.01 0.06
behavioral_outside_home 0.13 0.22 0.16 0.19 0.58 1.00 0.27 0.08 0.09 0.02 -0.04 0.07 0.12 0.13 -0.03 -0.01 0.05
behavioral_touch_face 0.07 0.33 0.10 0.36 0.25 0.27 1.00 0.10 0.03 0.03 0.07 0.10 0.14 0.09 -0.00 0.02 0.12
doctor_recc_seasonal 0.03 0.07 0.07 0.10 0.09 0.08 0.10 1.00 0.20 0.04 0.06 0.17 0.23 0.03 -0.03 -0.04 0.36
chronic_med_condition 0.00 0.04 0.06 0.03 0.10 0.09 0.03 0.20 1.00 0.00 -0.02 0.09 0.17 0.06 -0.07 -0.10 0.17
child_under_6_months 0.03 0.00 0.04 0.04 0.02 0.02 0.03 0.04 0.00 1.00 0.08 0.01 0.05 0.04 0.04 0.10 0.01
health_worker 0.01 0.00 0.07 0.05 -0.03 -0.04 0.07 0.06 -0.02 0.08 1.00 0.03 0.09 -0.01 0.01 0.04 0.13
opinion_seas_vacc_effective 0.01 0.12 0.04 0.14 0.08 0.07 0.10 0.17 0.09 0.01 0.03 1.00 0.34 -0.02 -0.02 -0.07 0.36
opinion_seas_risk 0.08 0.13 0.11 0.17 0.13 0.12 0.14 0.23 0.17 0.05 0.09 0.34 1.00 0.21 0.01 0.03 0.39
opinion_seas_sick_from_vacc 0.08 0.08 0.08 0.09 0.13 0.13 0.09 0.03 0.06 0.04 -0.01 -0.02 0.21 1.00 0.02 0.06 -0.06
household_adults 0.04 0.02 0.01 0.01 -0.03 -0.03 -0.00 -0.03 -0.07 0.04 0.01 -0.02 0.01 0.02 1.00 0.19 -0.07
household_children 0.08 0.04 0.00 0.05 -0.01 -0.01 0.02 -0.04 -0.10 0.10 0.04 -0.07 0.03 0.06 0.19 1.00 -0.11
seasonal_vaccine 0.01 0.08 0.05 0.11 0.06 0.05 0.12 0.36 0.17 0.01 0.13 0.36 0.39 -0.06 -0.07 -0.11 1.00
behavioral_antiviral_meds
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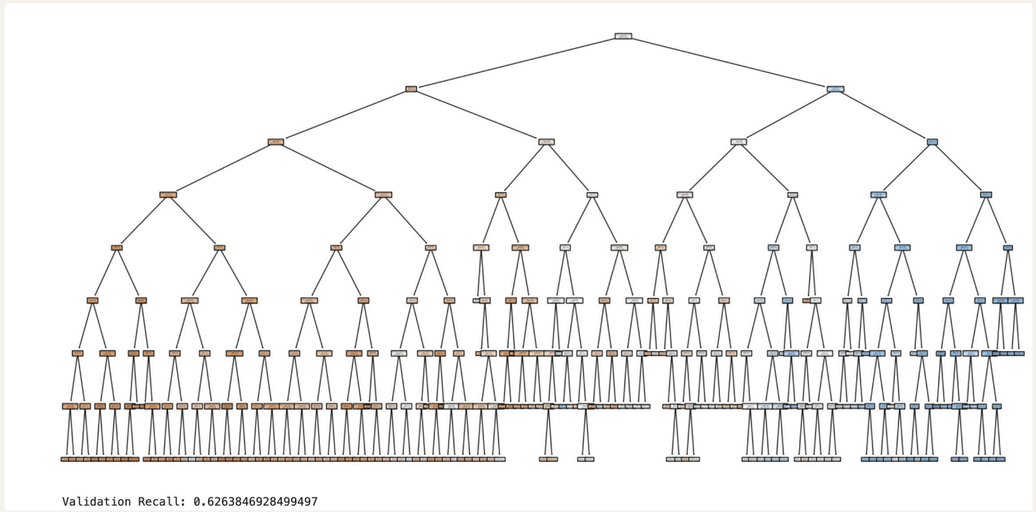
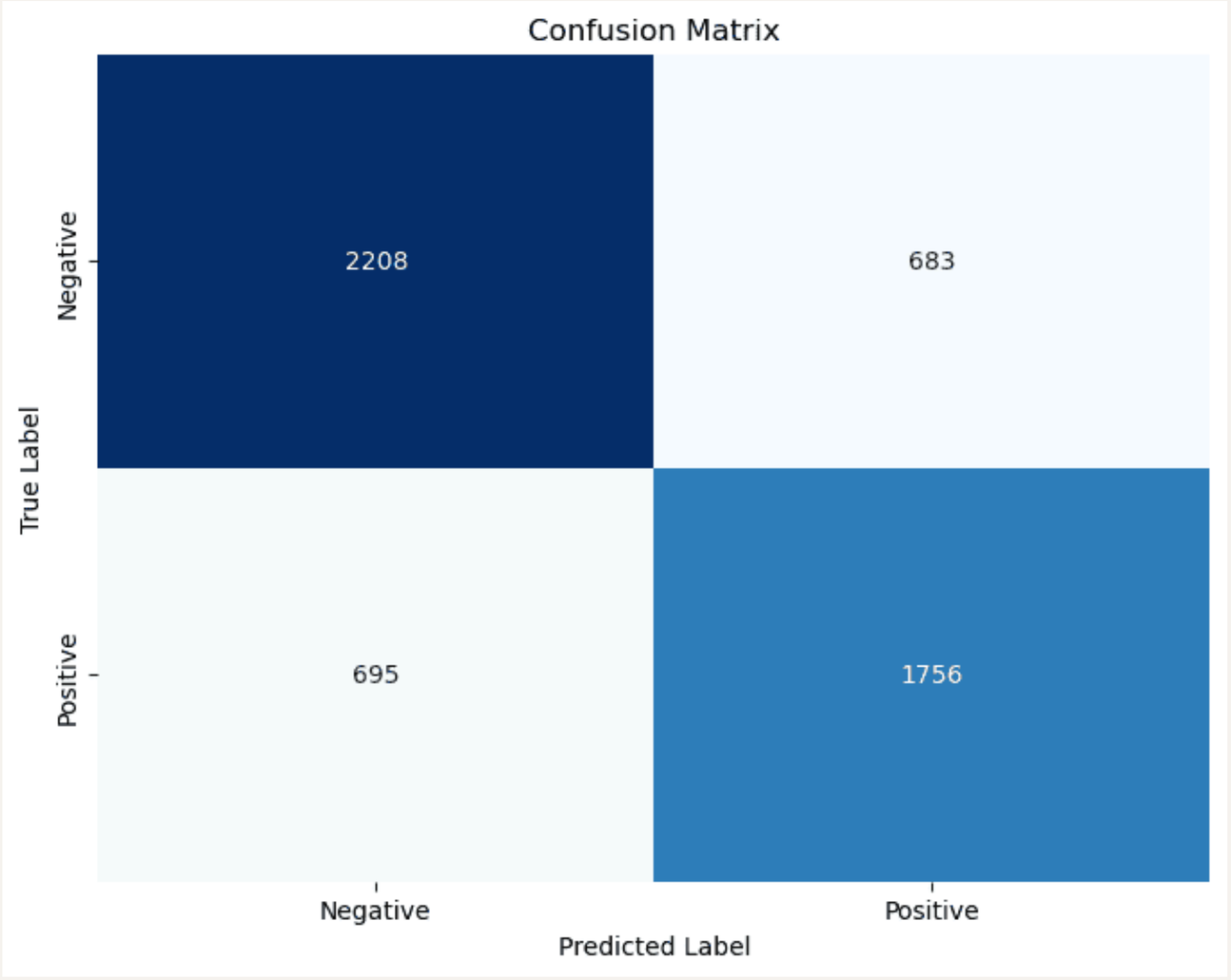
doctor_recc_seasonal
chronic_med_condition
child_under_6_months
health_worker
opinion_seas_vacc_effective
opinion_seas_risk
opinion_seas_sick_from_vacc
household_adults
household_children
seasonal_vaccine
1.0
0.8
0.6
0.4
0.2
0.0

Model Development and Results

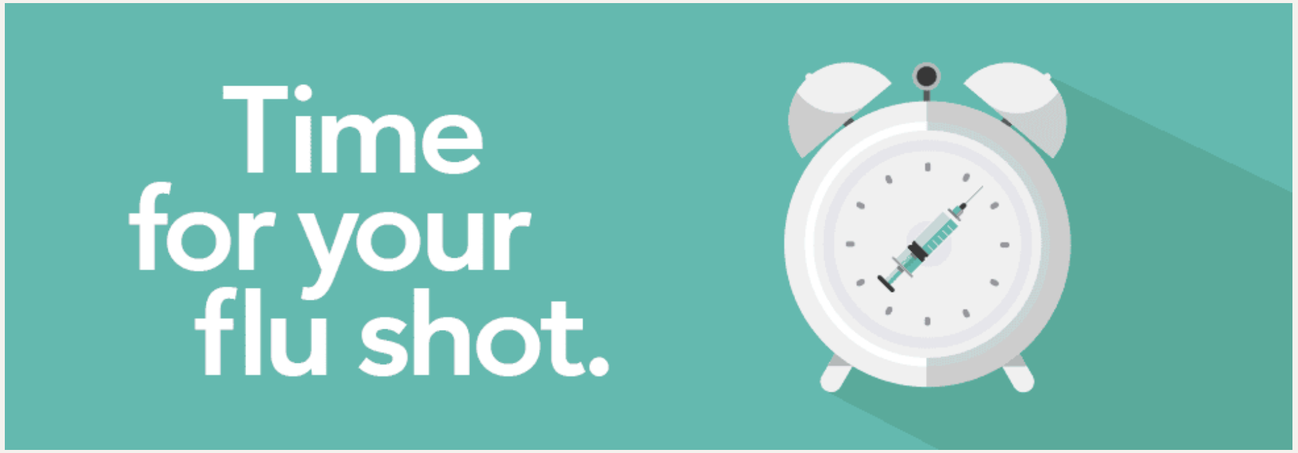


- Employed Logistic Regression and Decision Tree Classifier models.
- Achieved 73% recall scrore in predicting vaccine uptake.
- Highlighted the influence of demographics, health attitudes, and doctor recommendations.


Confusion Matrix
Negative
Positive
True Label
2208
683
695
1756
Negative
Positive
Predicted Label

Recommended Next Steps

- Focus on education and increasing vaccine availability.
- Incorporate additional data (e.g., temporal trends, social media sentiment).
- Target initiatives to reach individuals with barriers to vaccine access.



Conclusion and Impact

- Predictive model offers valuable insights for vaccine distribution planning.
- Emphasizes the need for continuous improvement and model adaptation.
- Future directions include refining predictions and enhancing model interpretability.

Thanks!

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