Data Mining on Seasonal Flu Vaccination

Presented by
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Problem Statement

- As the world struggles to vaccinate the global population against COVID-19, understanding how people's backgrounds, opinions, and health behaviors are related to their personal vaccination patterns can provide guidance for future public health efforts.

Mission

- The goal is to predict how likely individuals are to receive their seasonal flu vaccines
- Which factors are important for increasing vaccination coverage?

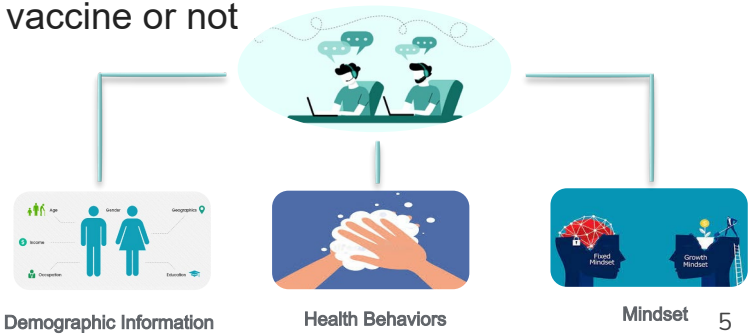
Methodology: Obtain & Scrub Data

- Data collected in the National 2009 H1N1 Flu Survey (CSV file)

- There are 25 features in this dataset including:

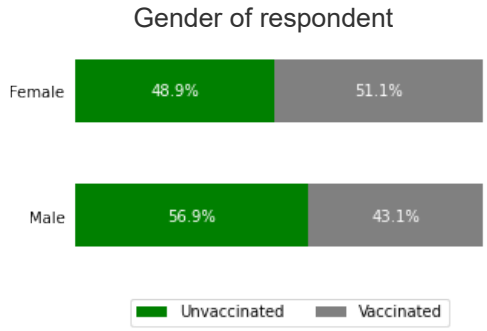
  - Demographical Information (gender, age,…..)
  - Health behaviors (wearing mask, washing hands…..)
  - People's Mindset (getting sick with vaccine, risk of vaccination,….)

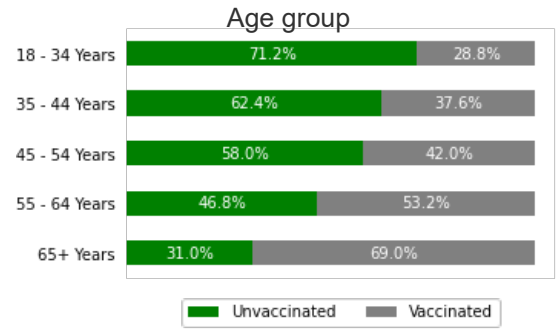
- Prediction: Whether respondent received seasonal flu vaccine or not

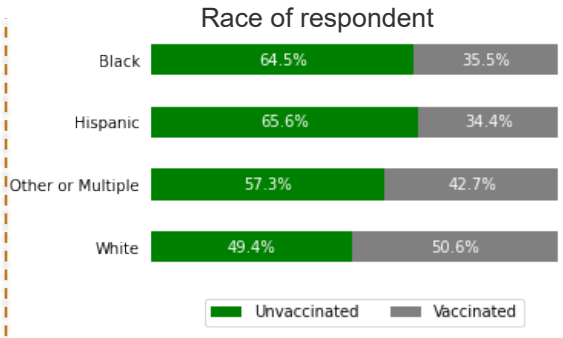


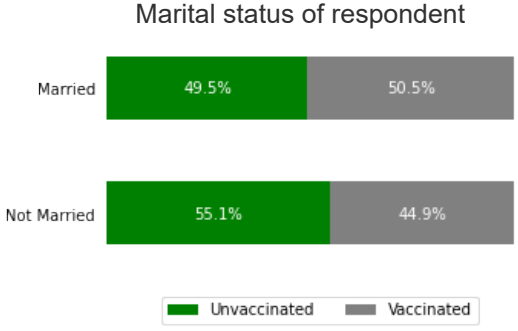
Methodology: Explore Data

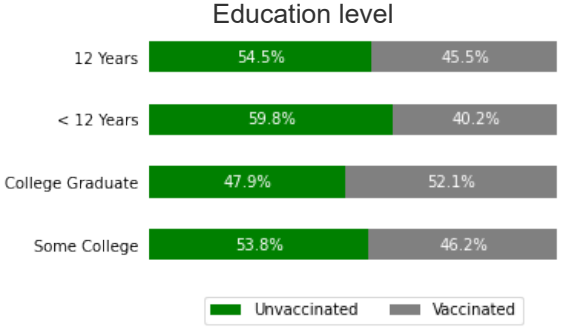
What is the relationship between demographic information and receiving vaccine?

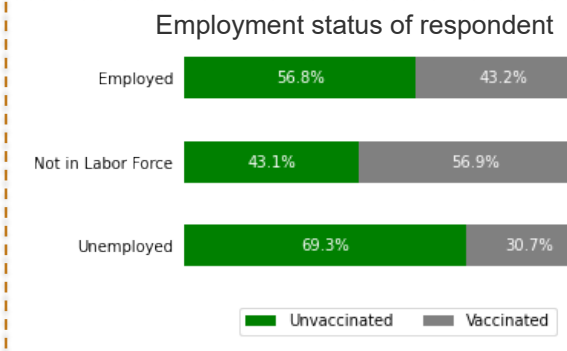












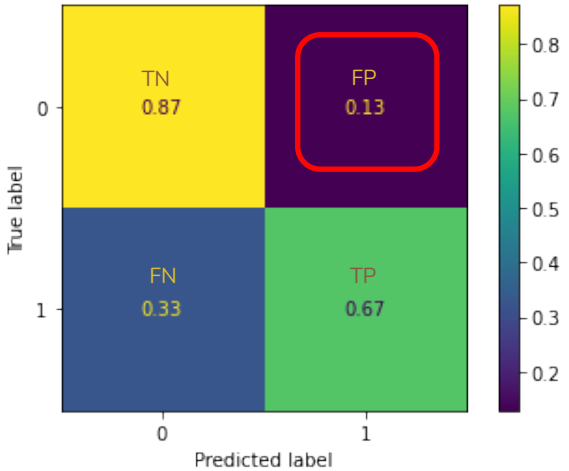
Methodology : Model Data & Interpretation

Extreme Gradient Boosting (XGBoost)

Accuracy(%)	Precision(%)	Recall(%)	F1(%)	AUC
77.36	83.54	67.29	74.54	0.86

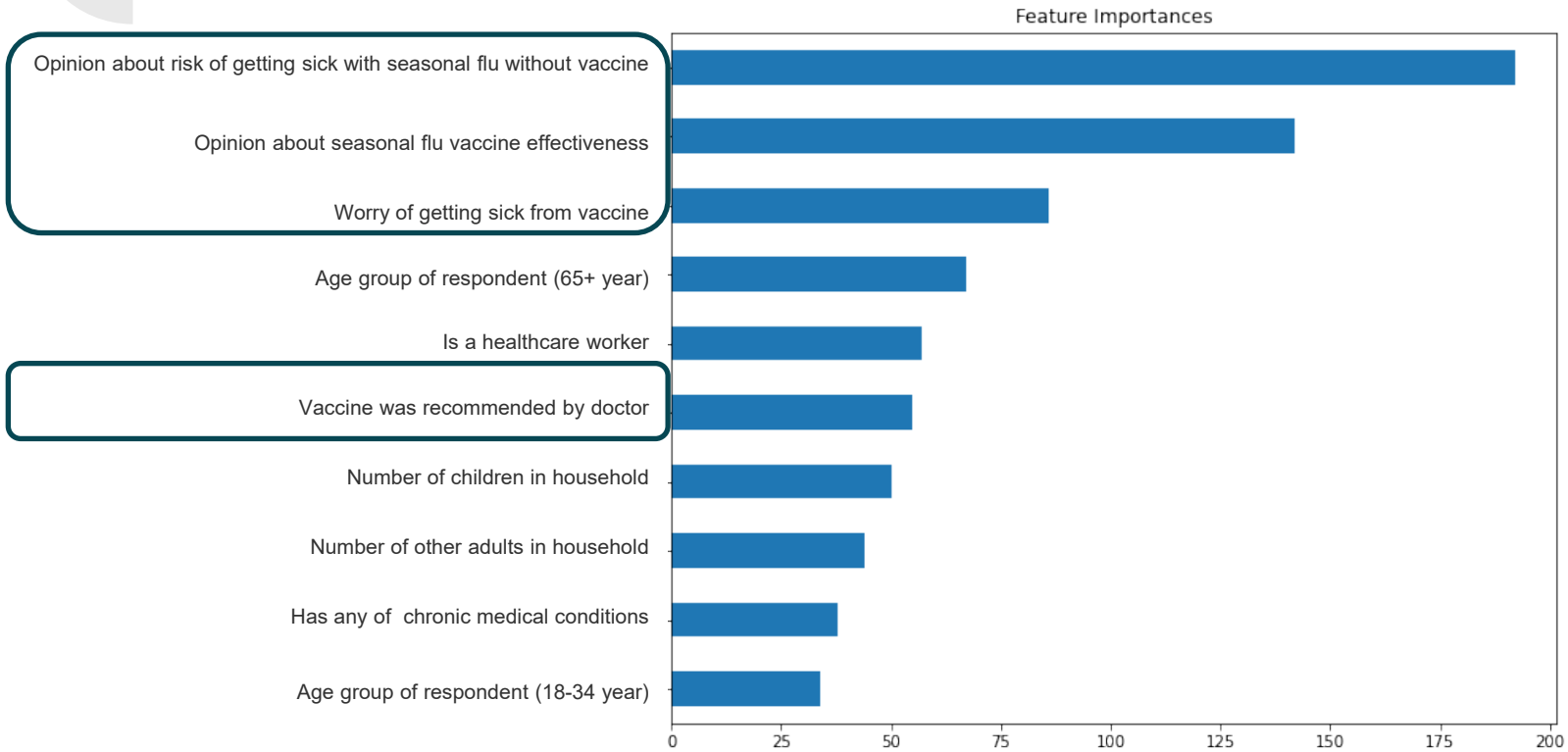
Out of the total predictions that my model has flagged as vaccinated, how many of them are in fact vaccinated ?

$$\text{Precision} = \frac{TP}{TP + FP}$$



True Negative (TN)	Unvaccinated and model predict unvaccinated
False Negative (FN)	Vaccinated and model predict unvaccinated
True Positive (TP)	Vaccinated and model predict vaccinated
False Positive (FP)	Unvaccinated and model predict vaccinated

Methodology : Model Data & Interpretation



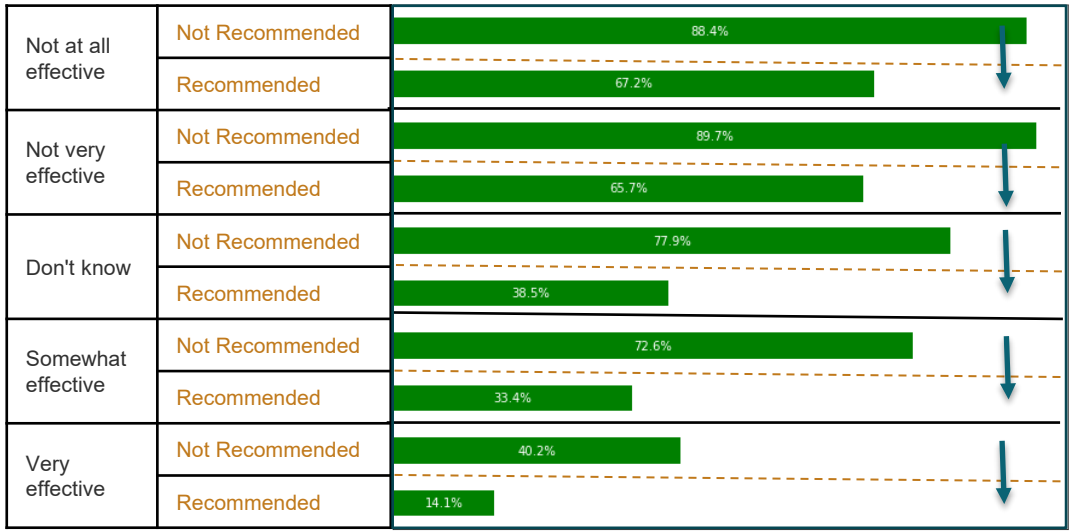
How might doctor's recommendations change people's attitudes towards vaccination?

Opinion about risk of getting sick with seasonal flu without vaccine

Very low	Not Recommended	85.8%
	Recommended	52.9%
Somewhat low	Not Recommended	72.0%
	Recommended	35.1%
Don't know	Not Recommended	53.7%
	Recommended	18.7%
Somewhat high	Not Recommended	43.5%
	Recommended	17.2%
Very high	Not Recommended	34.8%
	Recommended	11.9%

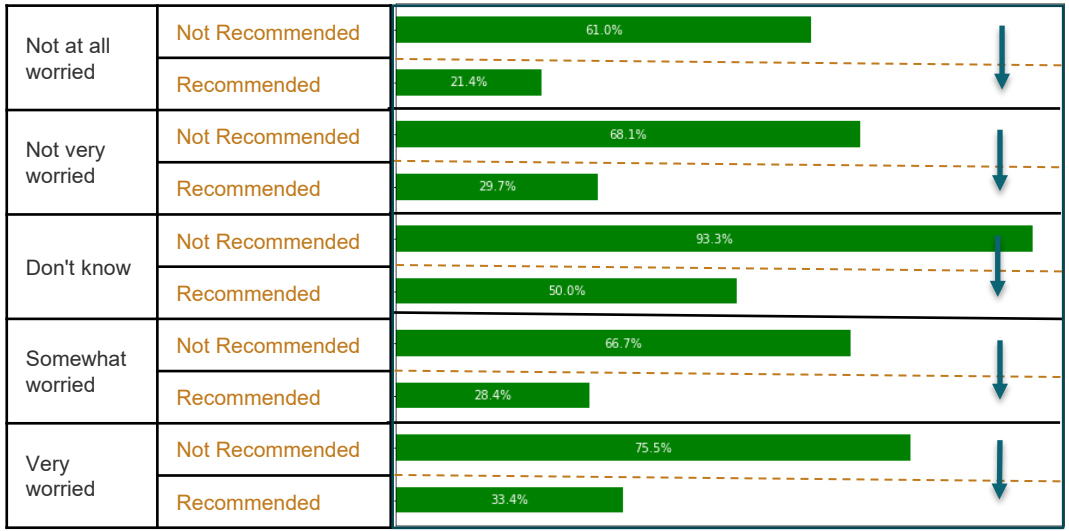
How might doctor's recommendations change people's attitudes towards vaccination?

Opinion about seasonal flu vaccine effectiveness



How might doctor's recommendations change people's attitudes towards vaccination?

Respondent's worry of getting sick from taking seasonal flu vaccine



Recommendation & Conclusion

Recommendation:

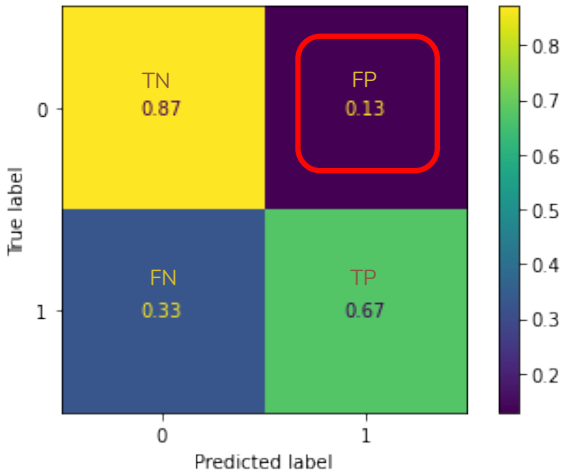
- Various factors can influence people's attitudes towards vaccination.
- People's opinions about vaccination are an important predictor of vaccination patterns in societies
- Ask doctors for advice about immunizations during the patients' routine check - up.

Conclusion:

- The proposed model showed 83.54 % precision which means the model predicting less unvaccinated people as vaccinated.
- People's opinions about vaccination are an important predictor of vaccination patterns in societies. Raising public awareness of the benefits of vaccination is key to increasing vaccination coverage. Physician recommendations, on the other hand, can make a big difference in people's attitudes toward vaccination.

Thank You!

Email: mar.ghaffari@gmail.com
GitHub: https://github.com/MarGhaf/Predict-Seasonal-Flu-Vaccine



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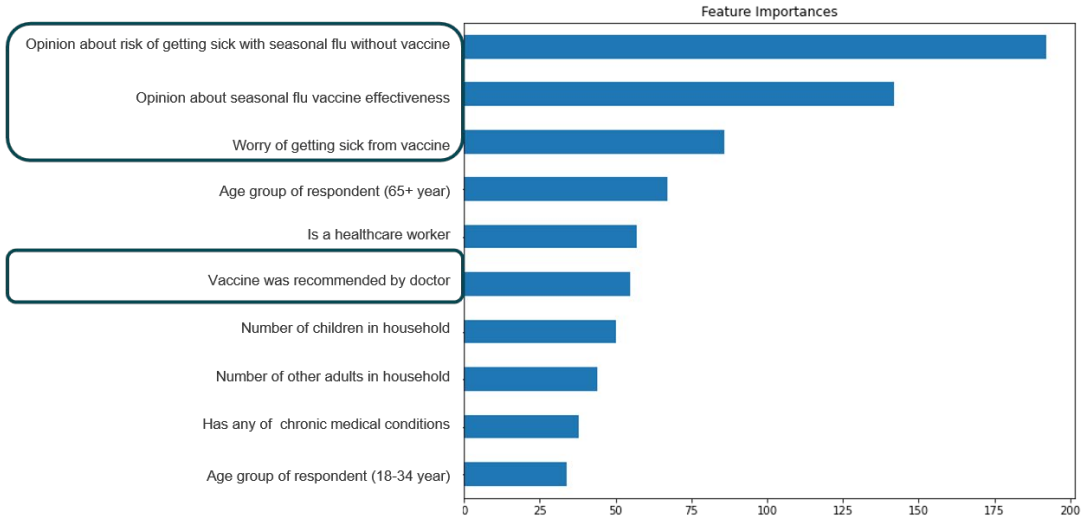


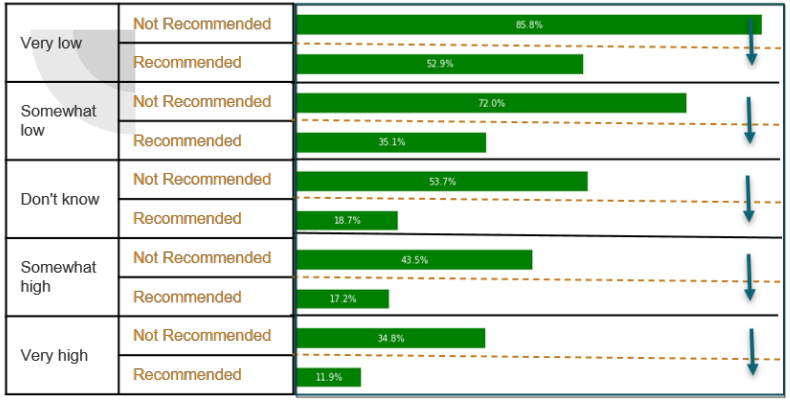
Sci-Kit learn pipeline on several models [1]

Model	Accuracy	Precision	Recall	F1
Logistic Regression	0.7814	0.7814	0.7814	0.7814
Linear Discriminant Analysis	0.7807	0.7807	0.7807	0.7807
K-Nearest Neighbors	0.6874	0.6874	0.6874	0.6874
Decision Trees	0.6787	0.6780	0.6781	0.6795
Ada Boost	0.7842	0.7842	0.7842	0.7842
Gradient Boosting	0.7883	0.7883	0.7883	0.7883
Random Forest	0.7760	0.7775	0.7772	0.7768
Extra Trees	0.7703	0.7702	0.7697	0.7681

Extreme Gradient Boosting (XGBoost)

	Accuracy(%)	Precision(%)	Recall(%)	F1(%)	AUC
Traing set	79.42	83.68	70.35	76.44	0.88
Test set	77.36	83.54	67.29	74.54	0.86

Opinion about risk of getting sick with seasonal flu without vaccine



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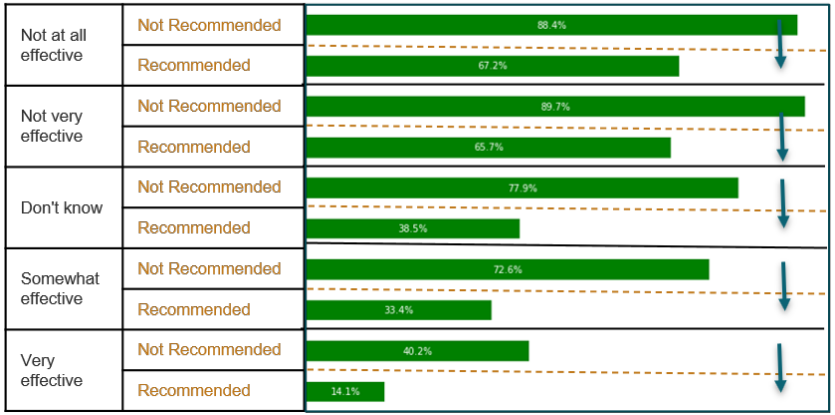

Respondent's worry of getting sick from taking seasonal flu vaccine