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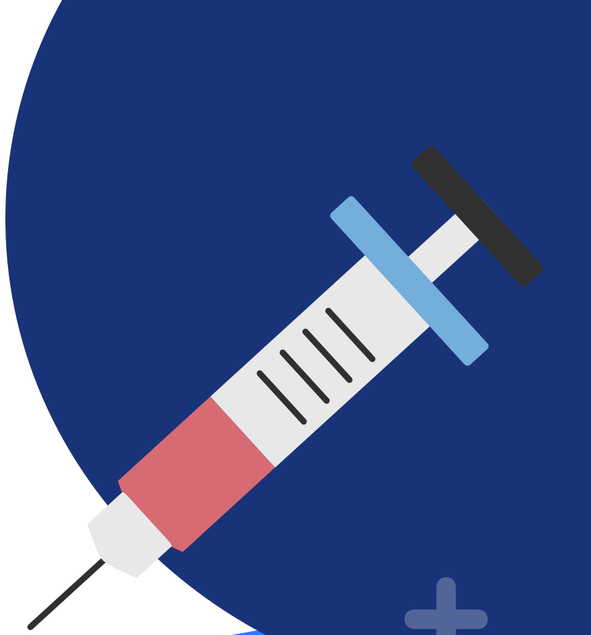

Neuro Shot:
A Flu Shot Learning Project: Predict H1N1 and Seasonal Flu Vaccines

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Problem

- Data comes from the National 2009 H1N1 Flu Survey in the United States, so results should be considered within the context back then.
- However the importance of vaccination remains, especially in this post-pandemic world with anti-vaccination movements.
- Through this analysis we seek to know what factors (demographical, geographical, behavioral) influence vaccine uptake and can we use them to predict real world data.

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Training set:
26,707 rows, 36 features
Labels:
26,707 rows, 2 targets (`h1n1_vaccine`, `seasonal_vaccine`)
Test set:
26,708 rows, 36 features
Features include:
behavioral, opinion-based, demographic, and household information.
Target variables:
H1N1 vaccine: (21% vaccinated vs 79% not vaccinated).
Seasonal vaccine: (46% vaccinated vs 54% not vaccinated)
No meaningful outliers.

Source: DataDriven (2020) https://www.drivendata.org/competitions/66/flu-shot-learning.

Exploratory Data Analysis – 1

Demographics

- Age is fairly balanced but slightly skewed towards older groups (65+).
- Sex: More females (59%) than males (41%).
- Race: Majority White (79%), with smaller representation of other groups.
- Income: Most respondents above poverty threshold.
- Employment: Majority employed (54%), ~41% not in labor force, small unemployed group.

Potential Challenges

1. **Class imbalance** for H1N1 vaccine → may require resampling, class weights, or careful metric choice.
2. **High missingness** (~50%) in employment and insurance data → decisions needed: drop, impute, or encode "unknown".
3. **Mixed feature type**s (ordinal, categorical, binary, continuous) → preprocessing pipeline must handle appropriately.
4. **High-cardinality categories** (employment_industry, employment_occupation, hhs_geo_region) → need encoding strategies (target encoding, frequency encoding, etc.).
5. **Correlation among opinion variables** → risk of multicollinearity, might need dimensionality reduction or feature grouping.

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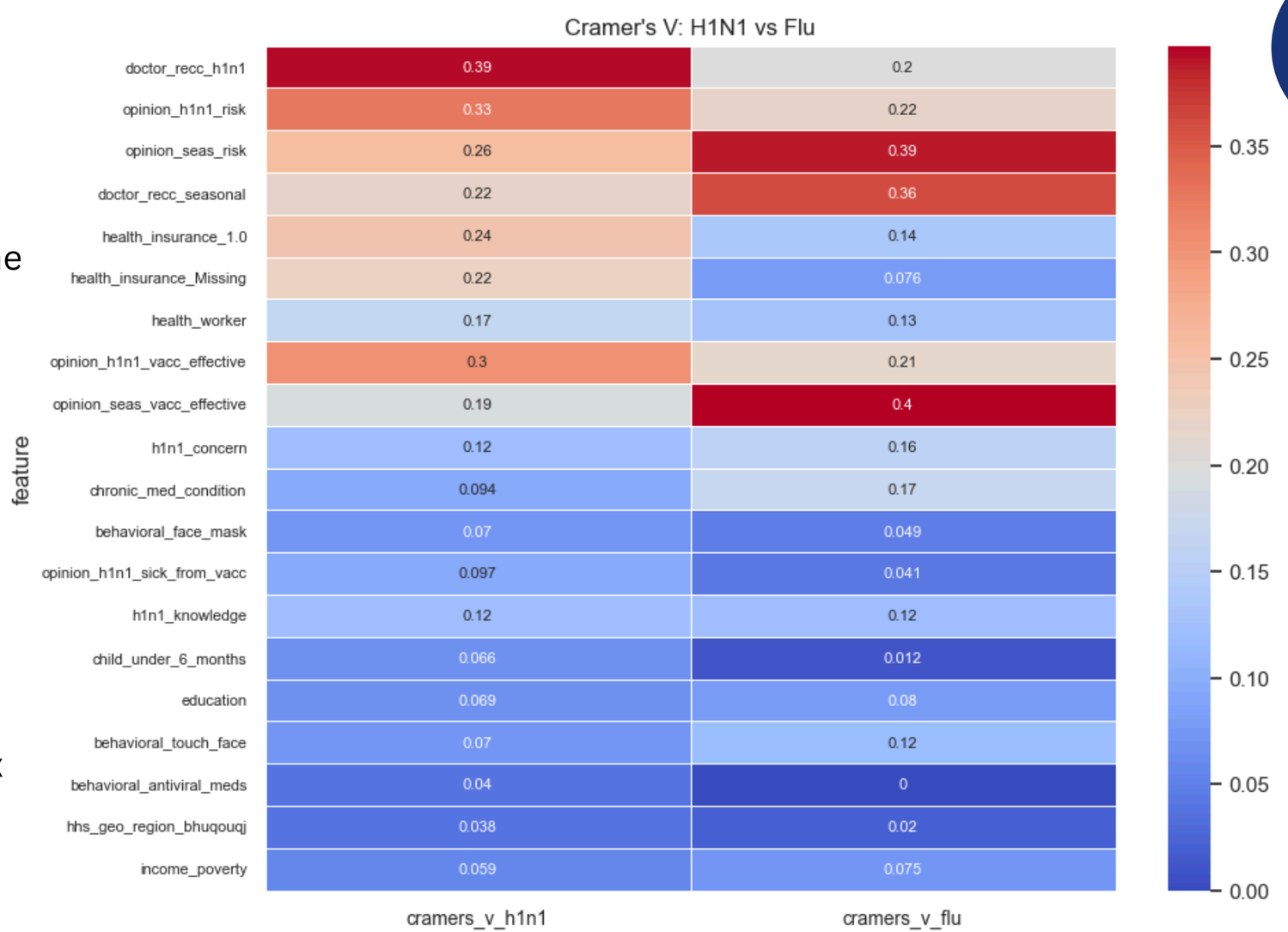
Exploratory Data Analysis – 2

Feature Analysis

- Doctor recommendation is a shared important feature for both vaccines.
- Perceived personal risk and belief in vaccine effectiveness are also highly associated, health insurance also plays a moderate association.
- Demographics and geography have low association compared to opinion and behavior.
- Perceptions about one vaccine might influence uptake of the other.

→ Next step for feature selection is a model-based feature selection utilizing more complex models (ex. gradient boosting).



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Thank You.

For Your Attention

https://github.com/americano-diana/neuro_flushot/