Angela-Mukulu-Mwanzia /
H1N1-and-Seasonal-Flu-Vaccines

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H1N1-and-Seasonal-Flu-Vaccines

Vaccine Uptake Prediction Project

Overview

This project is part of a challenge to predict whether individuals are likely to receive the H1N1 and/or seasonal flu vaccines. The predictions are based on demographic, social, and behavioral data collected during the National 2009 H1N1 Flu Survey. This is a binary classification task designed to provide actionable insights for public health organizations aiming to improve vaccine uptake.

Objectives

- Predict vaccination status for:
  - **H1N1 vaccine**: Binary outcome (1: vaccinated, 0: not vaccinated).
  - **Seasonal flu vaccine**: Binary outcome (1: vaccinated, 0: not vaccinated).
- Use insights from the model to guide targeted vaccination campaigns and policy decisions.

Business Problem

Stakeholders

- Public health organizations
- Healthcare providers

Problem Statement

Identify individuals most likely to receive vaccines based on various factors. These predictions can help design more effective vaccination campaigns, reduce the spread of illnesses, and optimize resource allocation.

Dataset

Overview

The dataset includes:

- **Target Variables**:
    - `H1N1_vaccine` : Binary indicator of H1N1 vaccine uptake.
    - `seasonal_vaccine` : Binary indicator of seasonal flu vaccine uptake.
- **Predictors**:
    - Demographic data (e.g., age, gender, education level).
    - Social factors (e.g., marital status, employment status).
    - Behavioral indicators (e.g., health conditions, awareness about vaccines).

Objective

To build a predictive model for one of the target variables (minimum viable product).

Key Steps

1. **Data Understanding**:
    - Analyze the dataset to understand the features, targets, and their relationships.
2. **Data Preprocessing**:
    - Handle missing values.
    - Encode categorical variables.
    - Normalize or scale numerical data as needed.
3. **Exploratory Data Analysis (EDA)**:
    - Identify trends and correlations.
    - Visualize the distribution of features and target variables.
4. **Model Development**:
    - Choose appropriate classification algorithms (e.g., logistic regression, random forests, gradient boosting).
    - Perform hyperparameter tuning to optimize performance.
5. **Model Evaluation**:
    - Use metrics such as accuracy, precision, recall, F1 score, and AUC-ROC.
    - Validate the model using cross-validation.
6. **Insights and Recommendations**:
    - Derive actionable insights from the model outputs.
    - Propose strategies to increase vaccine uptake.

Deliverables

- **Predictive Model**: A trained model capable of predicting vaccination status.
- **Insights Report**: Key findings and actionable recommendations for stakeholders.
- **Code and Documentation**: Fully documented code for reproducibility.

Requirements

Tools and Libraries

- Python
- Jupyter Notebook
- Libraries: `pandas`, `numpy`, `scikit-learn`, `matplotlib`, `seaborn`

Prerequisites

- Knowledge of Python programming.
- Understanding of machine learning concepts, especially classification.
- Basic data analysis skills.

How to Run

1. Clone the repository.
2. Install dependencies:

```
pip install -r requirements.txt
```

3. Open the Jupyter Notebook:

```
jupyter notebook index.ipynb
```

4. Follow the instructions in the notebook to execute the analysis and build the model.

Acknowledgments

This project uses data from the National 2009 H1N1 Flu Survey. Special thanks to the organizers of the competition for providing this valuable dataset.

Releases

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Languages

● **Jupyter Notebook** 100.0%