BIL 470 PROJECT REPORT

Ali Azak   
Senior Year Electrical and Electronical Engineering Student  
TOBB ETÜAnkara, Turkey  
aazak@etu.edu.tr

*Abstract*—This report various machine learning models will be examined in a specific problem and a full machine learning pipeline (Data preprocessing to evaluating results) will be discussed in depth.

Keywords—machine learning, data analyzing, model evaluation

# Introduction

Machine learning is one of the fastest growing areas in computer science. Due to its high success and applicability in practical areas, importance given this area will not foreseen to be deteriorated in next years. Computer’s ability to process big data and web2 improvements in data collection made many improvements which could not be predicted. Because of these important aspects, in this report we will select a problem and use it to explore many workflows of machine learning and analyze the results.

# PROBLEM AND GOALS

## Problem Description

In this project we will basically try to predict if a person chooses to get vaccinated for h1n1 and seasonal flu based on their survey results. Link for the problem is

<https://www.drivendata.org/competitions/66/flu-shot-learning/>

Since the problem is a contest, we will also try to outperform other models performance as well.

## Motivation

Since all around the world struggled with COVID-19 disease last few years, we believe improving machine learning models to predict vaccination trends will be important in future pandemics and current vaccination tendencies.

## Classifying / Regression

## Goal

When we analyze the leaderboard of the contest, we see maximum of 0.8658 AUCROC score, since for any machine learning model 0.5 AUCROC score accepted as base level. Our goal is to clearly analyze and understand the problem as well as achieving over 0.8 AUCROC score.

# Dataset Features

## Origin of Dataset

## The data for this competition comes from the National 2009 H1N1 Flu Survey (NHFS). The target population for the NHFS was all persons 6 months or older living in the United States at the time of the interview. Data from the NHFS were used to produce timely estimates of vaccination coverage rates for both the monovalent pH1N1 and trivalent seasonal influenza vaccines. Link for the dataset is given below.

https://www.drivendata.org/competitions/66/flu-shot-learning/data/

## Features of dataset

Dataset consists of 35 features and 2 labels. It consists of 26707 rows which stands for every person conducted the survey.

# METHODOLOGY

## Data Preparation

Data has 35 features and 26707 rows. These rows includes NaN values and they will be need to processed accordingly. We see that if we remove all the rows including NaN values, most of the dataset will be excluded and a lot of information will be lost. We choose other methods because of that.

As we analyze the data, it is also acknowledged that there are numerical values as well as categorical values. Since most of the machine learning models need encoding to handle categorical data, we applied necessary preprocessing methods.

## A.1. Handling Categorical Data

Most of the machine learning models needs to transform categorical data into numerical data. As we analyze the dataset there are 12 out of 35 categorical features in dataset. To deal with them we tried 5 different encoding methods (One-hot, Binary, Mean, Frequency, Ordinal) and applied most successful two of them.

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