Task Description

Given the Young People Survey Dataset, task is to predict a person's "Empathy" on the scale of 1 to 5 (Option 1)

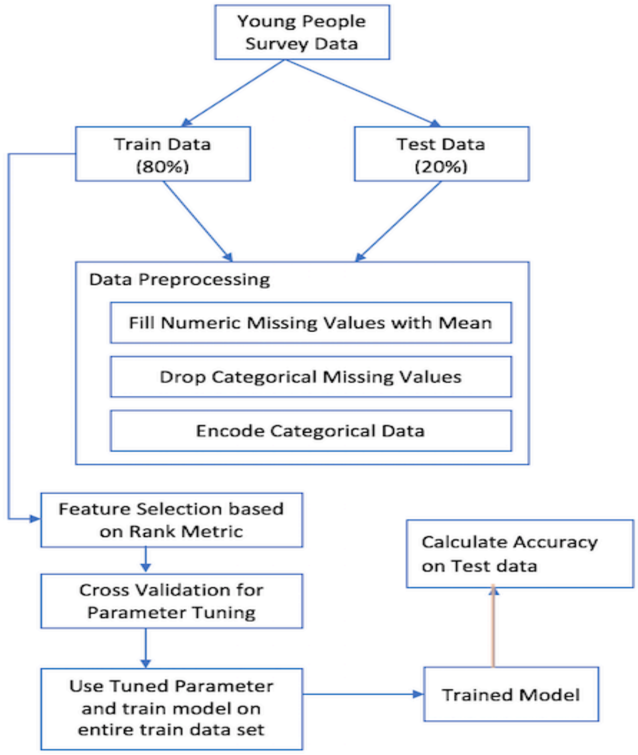
Young People survey captures various aspects of a person such as hobbies, health habits, personal traits and so on. Most of this aspect are given rating by a person on the scale of 1-5.

Data Preprocessing

- Missing Values:
  - There are two types of Input Data – Numeric and Categorical
  - We follow different approach on both the types of Data.
    - Categorical: On inspecting the training data, we can see that there are in total very few rows which are empty for categorical data, so the best solution in such a scenario where the missing data amounts to very less number of rows, we drop the rows.
    - Numerical: Here on the basis of training data analysis we see that there are missing data and in this scenario dropping such rows can drastically reduce the number of training data as they are greater in number. So here we perform imputation using the column means.
- Categorical Data Conversions:
  - In order to convert categorical data to numeric we perform one hot encoding technique.

Solution

First, we test the Baseline accuracy by creating a baseline model which returns the most common class label.


Young People Survey Data
Train Data (80%)
Test Data (20%)
Data Preprocessing
Fill Numeric Missing Values with Mean
Drop Categorical Missing Values
Encode Categorical Data
Feature Selection based on Rank Metric
Cross Validation for Parameter Tuning
Use Tuned Parameter and train model on entire train data set
Trained Model
Calculate Accuracy on Test data

Steps followed in solution:

1. Split Data into Train (80%) and Test Data (20%)
2. Apply Data preprocessing techniques applied above.
3. Perform feature selection based on feature importance using different Algorithms like Random forest and RFE (Recursive Feature Elimination Techniques)
4. Apply 10-Fold Cross Validation on train data and tune hyper parameters for SVM and XGBoost Classifier.
5. Select hyper parameter and train model using entire train data
6. Evaluate model on test data.

Results

Our baseline model gives accuracy of around 38%. Below we present the accuracy of our SVM and XGBoost. To test the model, we use the sklearn's accuracy_score metric to compute the accuracy of the model.

SVM Model with RBF Kernel: Accuracy ranges in between 44% - 48%

XGBoost Classifer: Accuracy ranges in between 45% - 50%

To further evaluate the model, we calculate the confusion metric which is plotted in the notebook uploaded on bitbucket.

References

Libraries used: Pandas, Numpy, sklearn, seaborn,and matplotlib

Extra Credit Bitbucket Link: https://bitbucket.org/mmulla4/hw5_mohammed-noman-mulla/src/master/