greatlearning
Learning for Life

FMT

Model Performance Measures, ML Pipeline and Hyperparameter Tuning (Week 2)

Topics covered in Week 3

- Performance measures
- ROC-AUC
- Concept of Pipeline
- Building a Pipeline
- Performance on train vs test data
- Hyperparameter tuning
- Grid Search and Random Search
- Hands-on Exercises

greatlearning
Learning for Life

Session Agenda

- Quick recap of classification metrics
- Use of AUC and ROC
- Use of a pipeline object
- The Train, Validation and Test sets
- Hyperparameter tuning – GridSearchCV and RandomSearchCV
- Case Study
- Questions

Classification Metrics

- Sensitivity/Recall/True positive rate:

$$\frac{tp}{tp + fn}$$

- Specificity/True negative rate:

$$\frac{tn}{tn + fp}$$

- Precision:

$$\frac{tp}{tp + fp}$$

- F1 Score:

$$\frac{2 \times precision \times recall}{precision + recall}$$

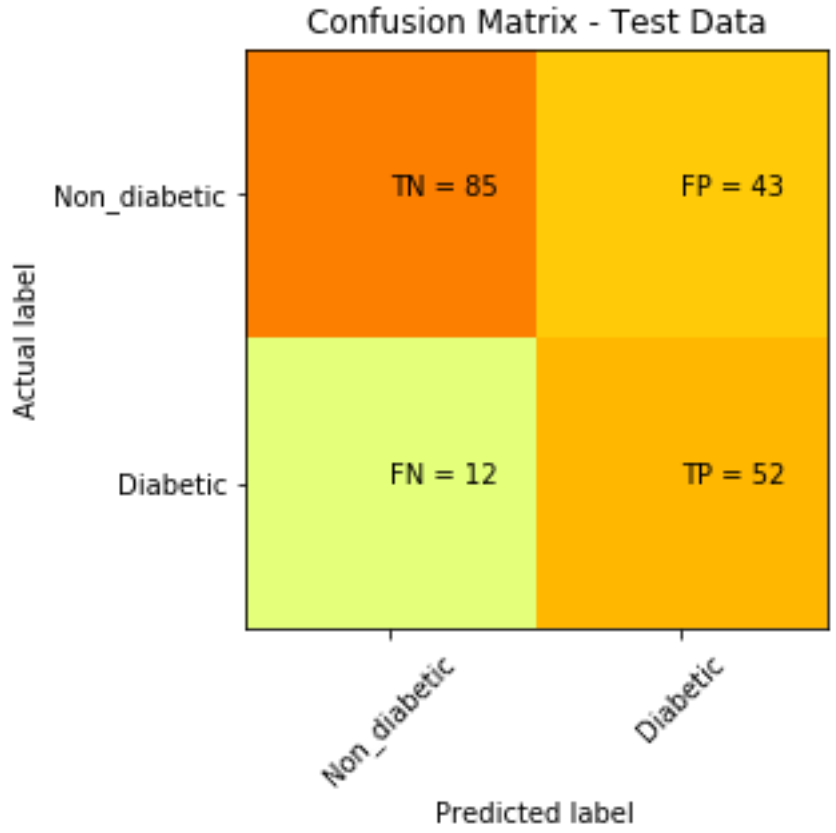
- Accuracy:

$$\frac{tp + tn}{tp + tn + fp + fn}$$

Classification metrics

For the given Confusion matrix, what is the F1 score?

65.4%

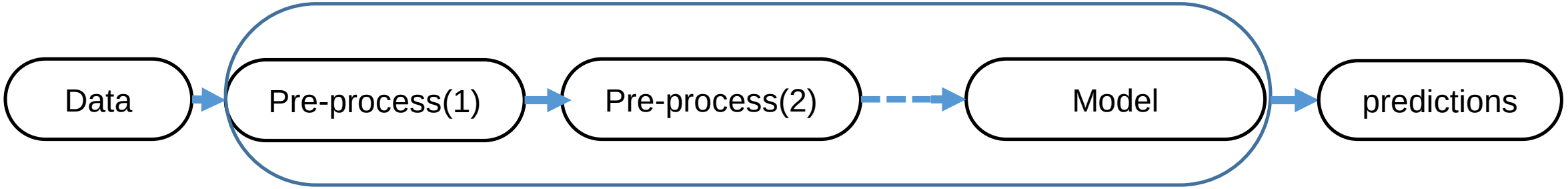


ROC and AUC

- ROC (Receiver Operating Characteristics) is a probability curve with True positive rate in the vertical axis and False positive rate on the horizontal axis for different threshold values
- AUC is the area under the ROC curve

Need for a Pipeline

- Streamlines the process of transforming data, training an estimator and using it for prediction



Train, Validation and Test sets

- It is a general practice to split our data into three sets
- The train set
  - The data that we use to train the model
- The validation set
  - The data that we use to ‘validate’ a model
  - Any hyper-parameter tuning that is done, is based on the performance of the model on the validation set
- The test set
  - The data that is used to simulate real unseen data

- Always tune the model based on the performance on the validation set, once the model is trained on the Train set
- Never fine-tune a model based on its performance on the test set
- Test set is meant to aid in assessing a model's performance in production before the model hits production

greatlearning
Learning for Life

Hyper-parameter tuning

- As opposed to parameters (like the ones in linear regression slope and constant term) which change based on the data for a given parametric model, hyper-parameters are preset values even before a non-parametric model gets trained on the data
- Parameters change during the training process
- Hyper-parameters are preset and do not change while training
- The process of setting the right hyper-parameters to get max performance out of a given model, is called Hyper-parameter Tuning

greatlearning
Learning for Life

Grid Search and Random Search

- Both are the two most common methods of choosing the right hyper-parameters
- In Grid search, each and every combination of hyper-parameters tested before selecting the ‘best’ combination of hyper-parameters
- In Random search, only a subset of combinations can be tested before selecting the ‘best’ combination of hyper-parameters
- We use Random Search when the parameter grid is fairly large and we want to save on processing time
- GridSearchCV and RandomizdSearchCV are included in the sklearn library to perform the same over a parameter grid, that is passed as an argument to the functions along with the estimator

greatlearning
Learning for Life

Case study

Case Study – Airline Satisfaction Prediction

Data background

- The data we have at hand is of passengers and their feedback regarding their flight experience.
- Each row is one passenger. Apart from the feedback from the customers across various attributes(15 in total) like food, online support, cleanliness etc. We have data about the customers' age, loyalty to the airline, gender and class.
- The target column is a binary variable which tells us if the customer is satisfied or neutral/dissatisfied

Case Study – Airline Satisfaction Prediction

- Let us now have a look at the notebook for this case study

greatlearning
Learning for Life

Q and A

HappyLearning