AML – predictive model for marketing purposes

Deep Learning

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Assignment description

- Marketing campaign target identification task
- Binary classification based on numerical variables
- 5000 observations
- 500 features
- Aim for a minimum number of features used
- Number of positive class predictions limited to 1000

Methodology

- Models trained and tested on the provided X_train and y_train data with a single train-test split
- Experiments conducted in batches
- Models evaluated in terms of score, accuracy, precision, and number of correct positive class predictions

Scoring formula

$$score = \frac{10c - 200f}{10n - 400}$$

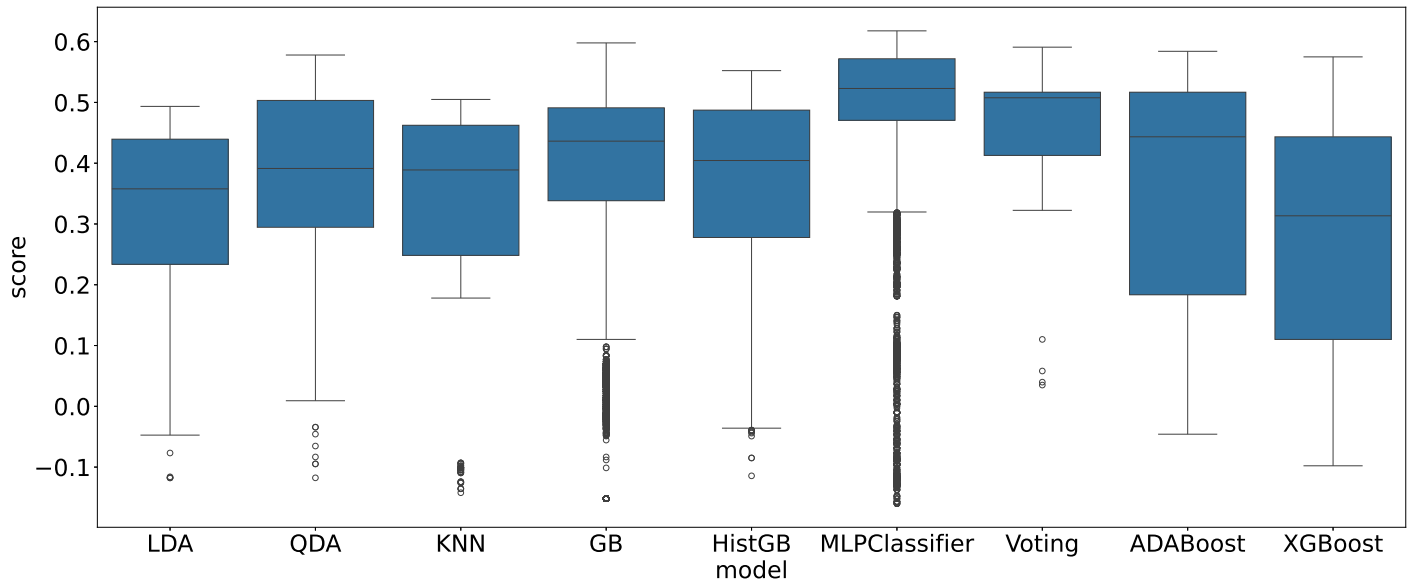
- c – the number of correct predictions
- f – the number of features used
- n – the limiting number of predictions

Models and Methods

- Feature Selectors: SelectKBest, RFE, RFECV, FPR, FDR, FWE, PCA, None
- Classifiers: LDA, QDA, KNN Classifier, Histogram-based Gradient Boosting, MLP Classifier, Gradient Boosting, XGBoost, Voting, AdaBoost
- Data Scalers: Standard Scaler, Robust Scaler, None
- Feature Generators: Polynomial Feature Generator, None

Results

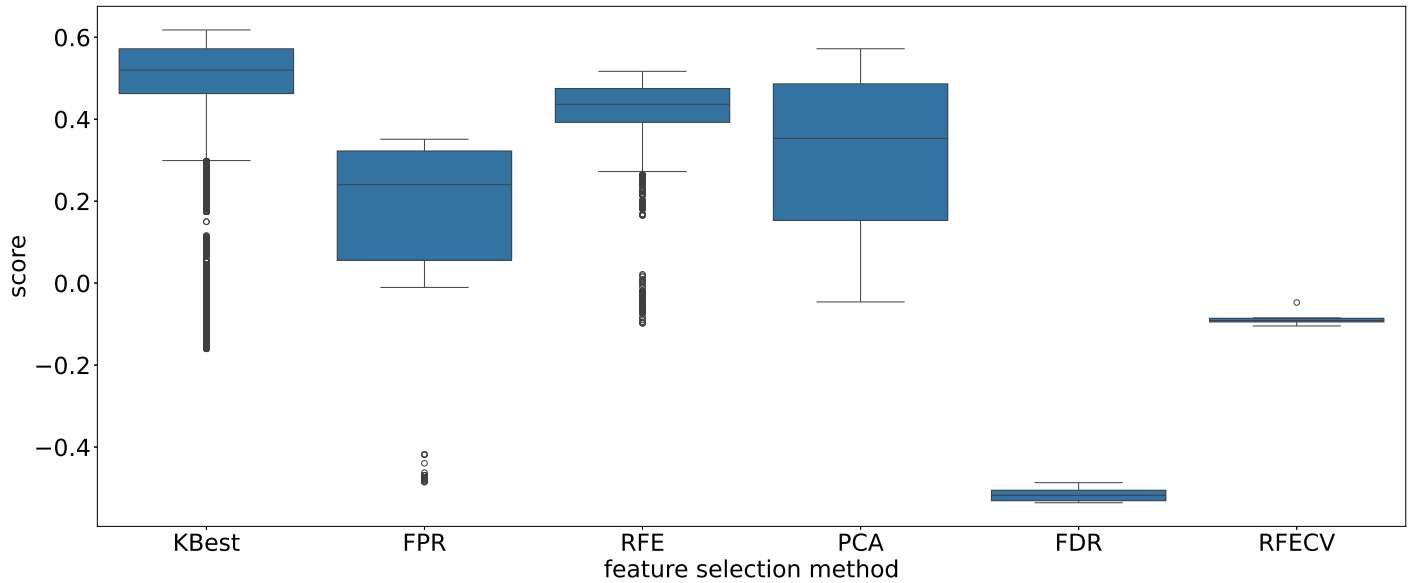
Results for different classifiers



Some outliers have been removed from the diagram for clarity.

Results

Results for different feature selection methods



Some outliers have been removed from the diagram for clarity.
Family-wise error rate based method didn't produce any results.

Final solution

Characteristics of the final solution

Parameter	Value
Score	0.617737
Number of true positives	242
Accuracy	0.56303
Precision	0.572519
Number of features	2
Model	MLPClassifier
Feature selector	KBest
Scaler	Robust

Final solution

MLP Classifier parameters of the final solution

Parameter	Value
activation	relu
solver	adam
beta_1	0.95
beta_2	0.999
alpha	0.3
learning_rate	adaptive
learning_rate_init	0.008
hidden_layer_sizes	(13,)
max_iter	1600
random_state	42

Conclusions

- In total, 101,261 experiments were performed
- Gradient Boosting and MLP classifiers were the top contenders
- FDR and FWE did not yield any reasonable results
- The Robust Data Scaler slightly improved the score
- The features generated using the Polynomial Feature Generator failed to improve the score