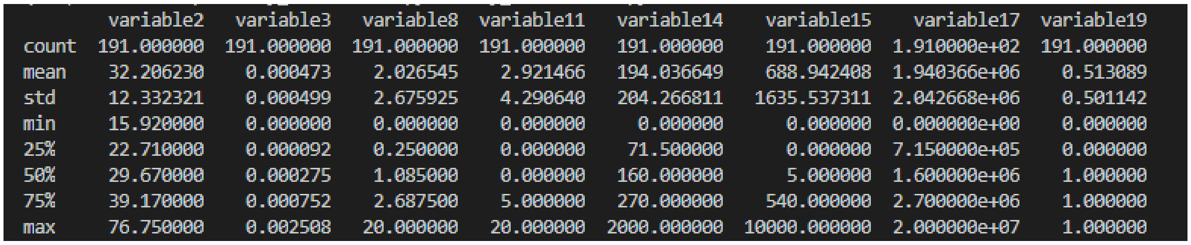
Binary Classification - Comparing Multiple Methods

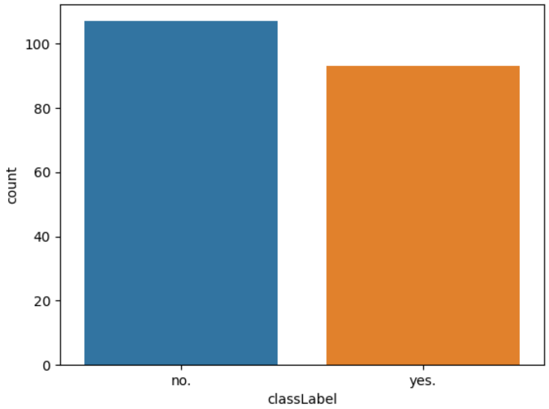
On the data set: It is not known what the data provided is about or what each feature means. Column names are arbitrary, making it difficult to perform feature selection.



```
        variable2   variable3   variable8  variable11   variable14    variable15    variable17  variable19
count  191.000000  191.000000  191.000000  191.000000   191.000000    191.000000  1.910000e+02  191.000000
mean    32.206230    0.000473    2.026545    2.921466   194.036649    688.942408  1.940366e+06    0.513089
std     12.332321    0.000499    2.675925    4.290640   204.266811   1635.537311  2.042668e+06    0.501142
min     15.920000    0.000000    0.000000    0.000000     0.000000      0.000000  0.000000e+00    0.000000
25%     22.710000    0.000092    0.250000    0.000000    71.500000      0.000000  7.150000e+05    0.000000
50%     29.670000    0.000275    1.085000    0.000000   160.000000      5.000000  1.600000e+06    1.000000
75%     39.170000    0.000752    2.687500    5.000000   270.000000    540.000000  2.700000e+06    1.000000
max     76.750000    0.002508   20.000000   20.000000  2000.000000  10000.000000  2.000000e+07    1.000000
```

Stats on the validation data after cleaning

About the Data:

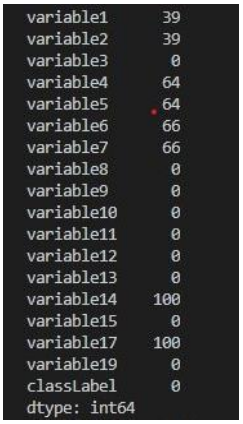


Two separate files were provided one containing training data and the other validation.

As shown this is the number of no to yes. The set is not balanced perfectly, however not warranting dedicated solutions for imbalanced cases.

Data Set preparation:

. There was also a lot of missing values, dropped the column with a number of missing values exceeding 2000, which was more than half the number rows.



```
variable1       39
variable2       39
variable3        0
variable4       64
variable5       64
variable6       66
variable7       66
variable8        0
variable9        0
variable10       0
variable11       0
variable12       0
variable13       0
variable14     100
variable15       0
variable17     100
variable19       0
classLabel       0
dtype: int64
```

Number of NaNs after dropping column 18

I then proceeded to drop the rows with missing values, their count insignificant to the total number of rows.

Testing Algorithms:

Classifiers:

- Logistic Regression
- Decision Tree
- Support Vector Machine
- Random Forest
- K-Nearest Neighbors

Scoring:

- accuracy score

Why use accuracy score?

Accuracy looks at correctly classified observations **both positive and negative** according to "F1 Score vs ROC AUC vs Accuracy vs PR AUC: Which Evaluation Metric Should You Choose?" by Jakub Czakon. Because true negatives and true positives are equally important then accuracy is the metric that is most suitable.

Conclusion:

From my observation the accuracy of the classification on the training data is very high compared to the test data. This might be because of *overfitting*.

References in this Project:

- https://medium.com/@rrfd/cleaning-and-prepping-data-with-python-for-data-science-best-practices-and-helpful-package
- https://mclguide.readthedocs.io/en/latest/sklearn/binary.html
- https://www.kaggle.com/klaudiajankowska/binary-classification-multiple-method-comparisons-af1edfbe2a3
- https://hackernoon.com/what-is-one-hot-encoding-why-and-when-do-you-have-to-use-it-e3c6186d008f
- https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.get_dummies.html
- https://neptune.ai/blog/f1-score-accuracy-roc-auc-pr-auc
- https://machinelearningmastery.com/save-load-machine-learning-models-python-scikit-learn/
- https://medium.com/datadriveninvestor/deploy-your-machine-learning-model-using-flask-made-easy-now-635d2f12c50c