Imbalanced Dataset

Example of balanced and imblanced data

50% male	50% female
Negatives ≈ Positives	
Balanced	

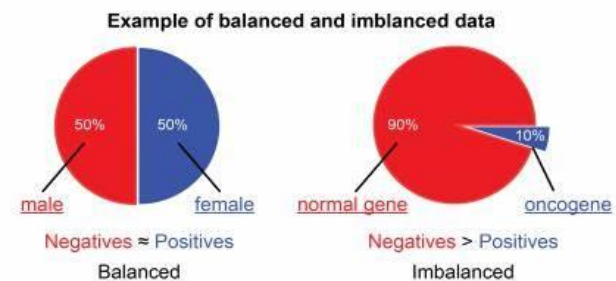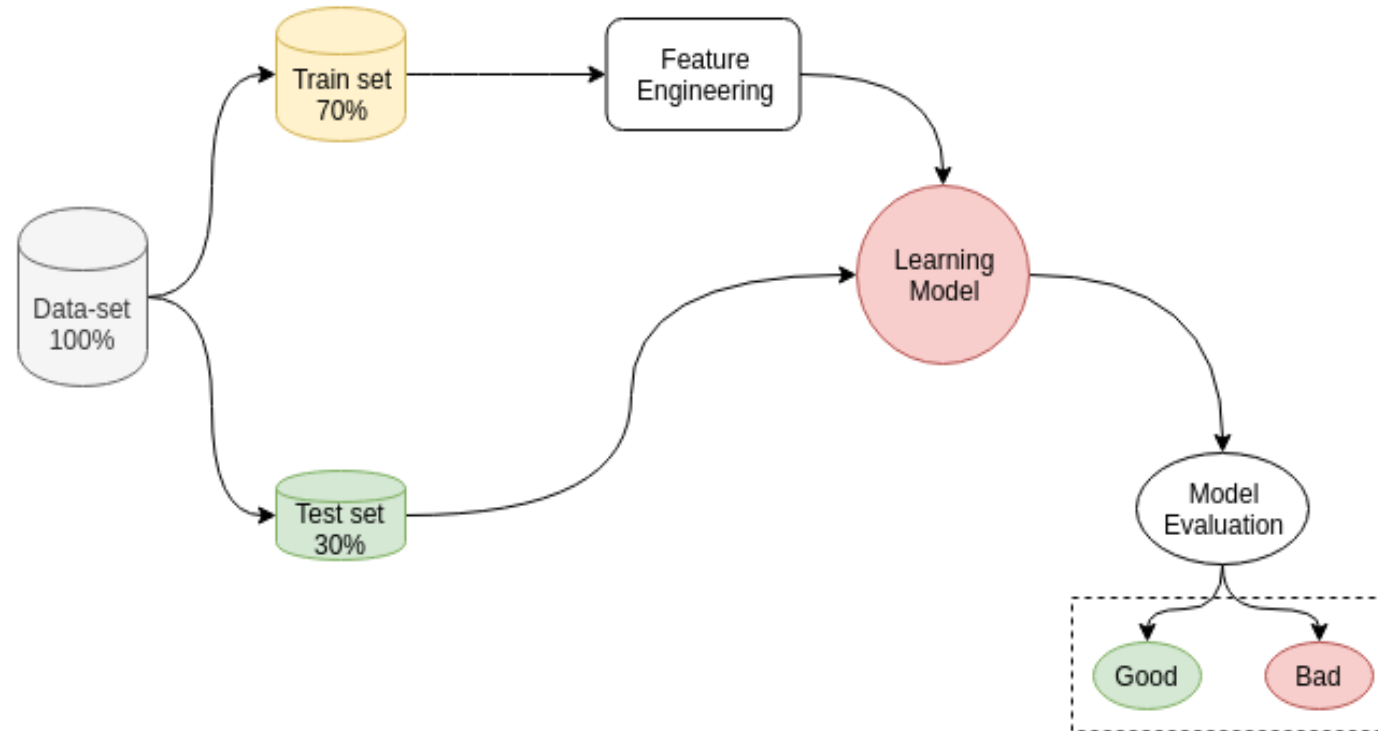|	
90% normal gene	10% oncogene
Negatives > Positives	
Imbalanced	

Cross-validation is a resampling procedure used to evaluate machine learning models on a limited data sample. It is a technique used to protect against overfitting in a predictive model, particularly in a case where the amount of data may be limited. In cross-validation, you make a fixed number of folds (or partitions) of the data, run the analysis on each fold, and then average the overall error estimate.

Cross Validation

- Hold Out Cross Validation
- K-Fold Cross Validation
- Leave One-Out Cross Validation (LOOCV)
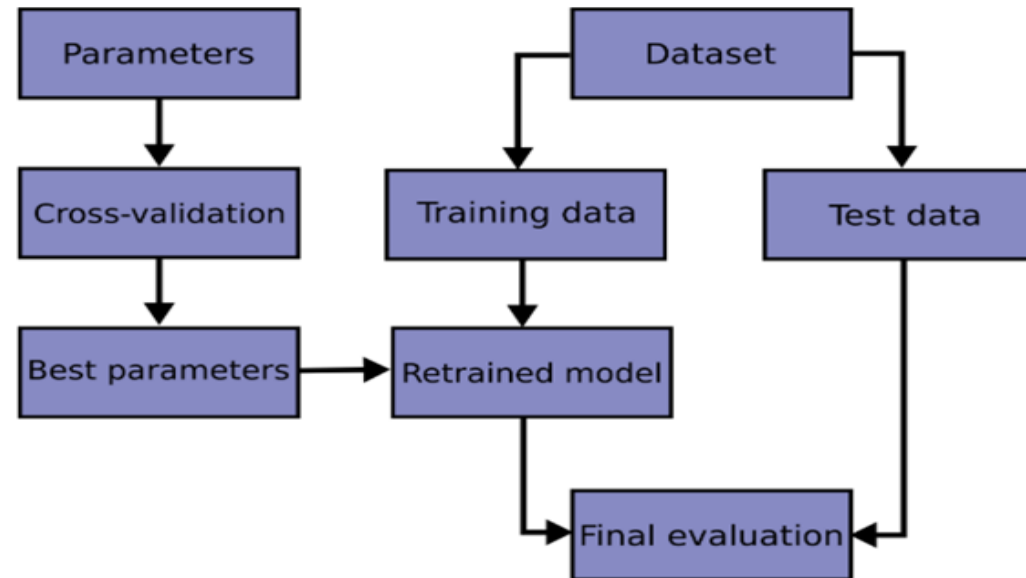- Stratified K Fold Cross Validation

Machine Learning Model

Cross Validation

Cross-validation is a resampling procedure used to evaluate machine learning models on a limited data sample.
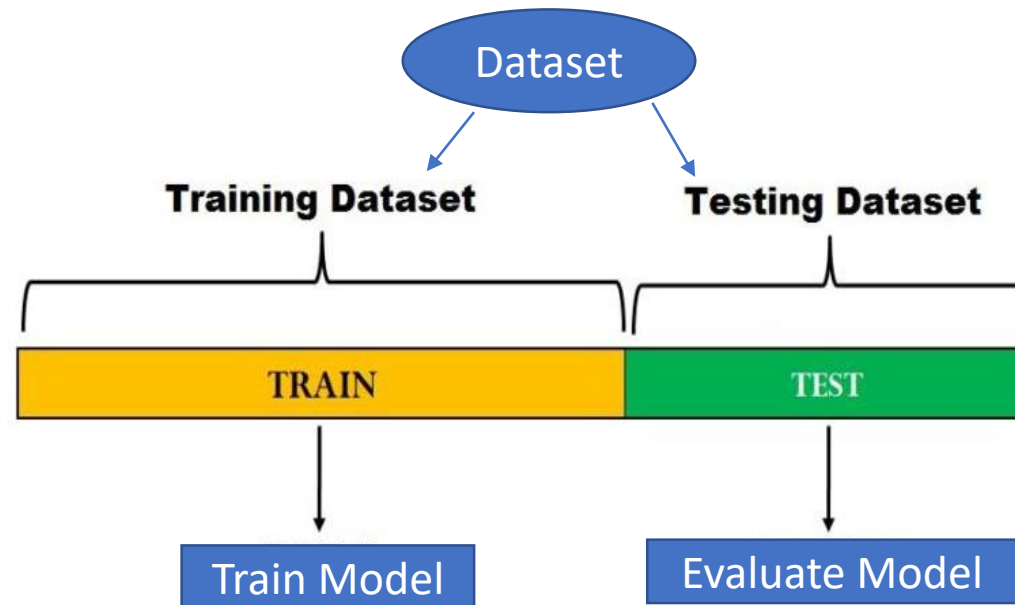

K = 5

Cross Validation

Hold Out Cross Validation

Cross Validation

Hold Out Cross Validation

```
from sklearn.model_selection import train_test_split

xtrain, xtest, ytrain, ytest = train_test_split(x,y, train_size=0.7, random_state=1)
```

K-Folds Cross Validation

The general procedure is as follows:

1. Shuffle the dataset randomly.
2. Split the dataset into k groups
3. For each unique group:
    1. Take the group as a hold out or test data set
    2. Take the remaining groups as a training data set
    3. Fit a model on the training set and evaluate it on the test set
    4. Retain the evaluation score and discard the model
4. Summarize the skill of the model using the sample of model evaluation scores

Cross Validation

K-Folds Cross Validation
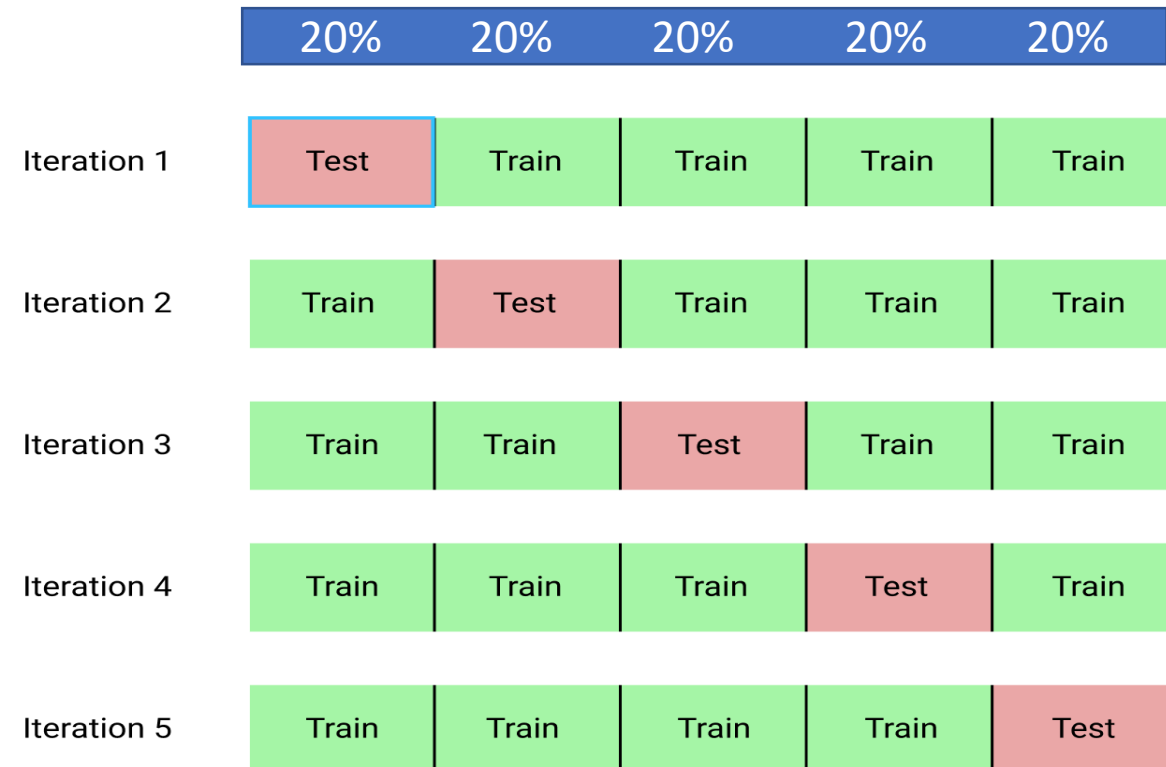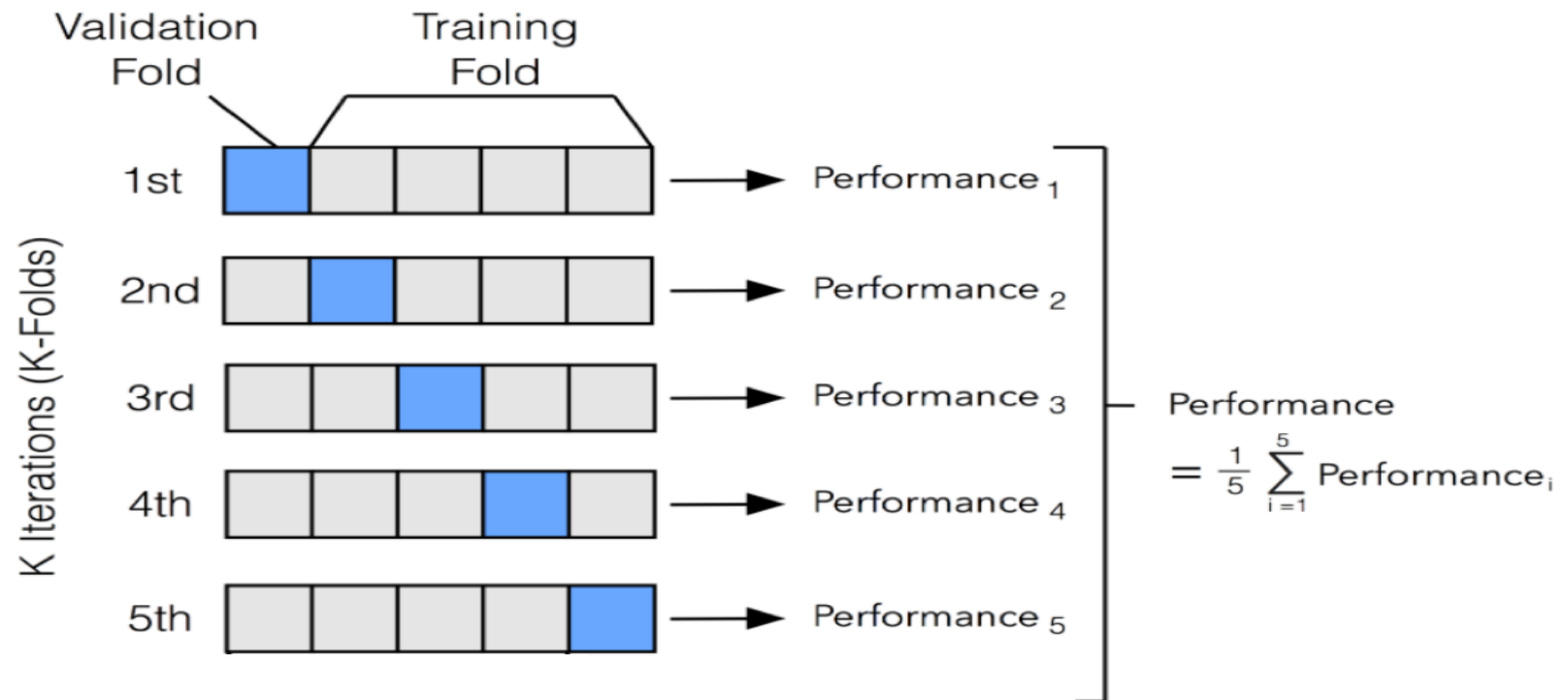
The general procedure is as follows:

1. Shuffle the dataset randomly.
2. Split the dataset into k groups
3. For each unique group:
   1. Take the group as a hold out or test data set
   2. Take the remaining groups as a training data set
   3. Fit a model on the training set and evaluate it on the test set
   4. Retain the evaluation score and discard the model
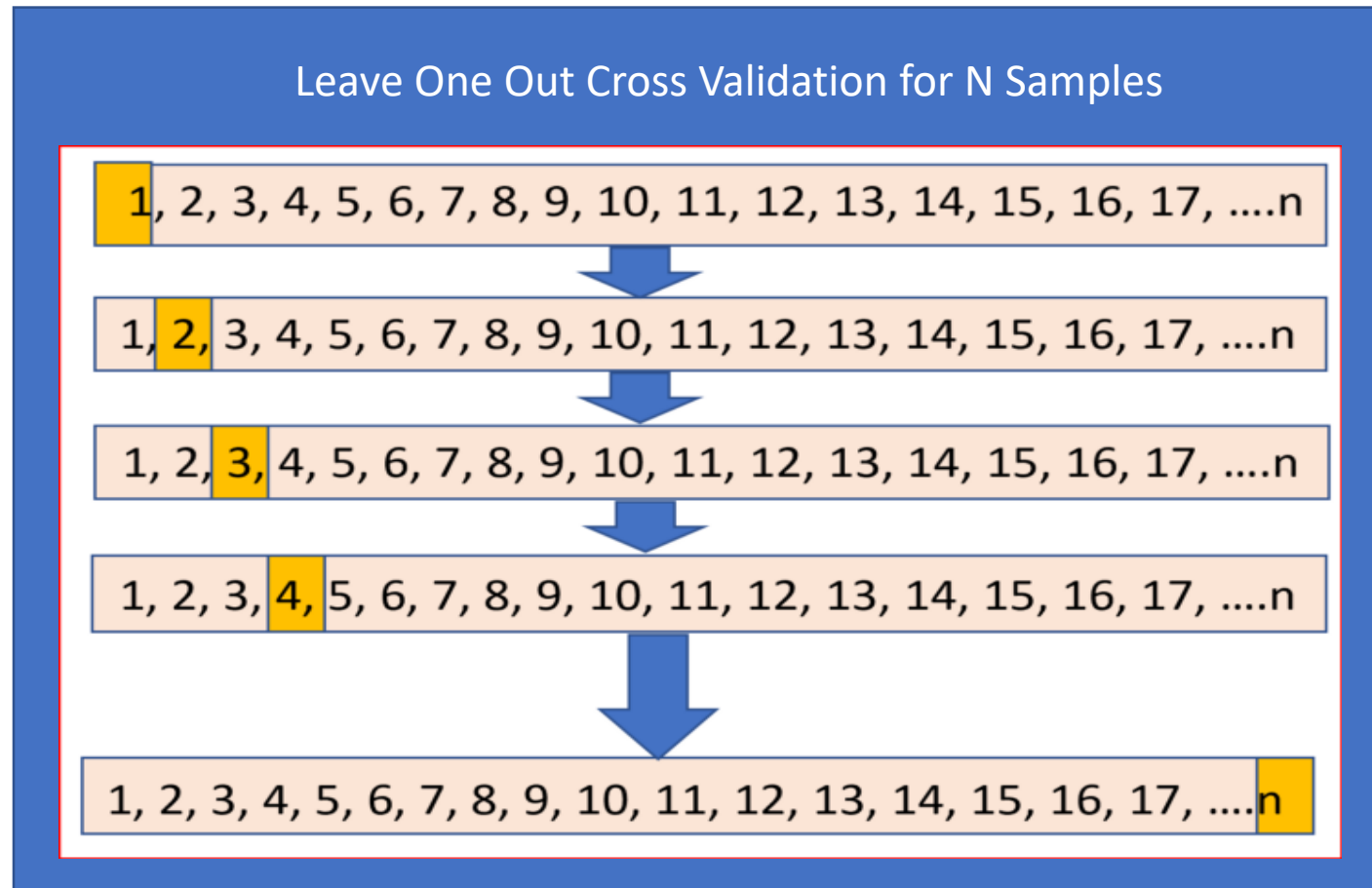4. Summarize the skill of the model using the sample of model evaluation scores

20%	20%	20%	20%	20%

	20%	20%	20%	20%	20%
Iteration 1	Test	Train	Train	Train	Train
Iteration 2	Train	Test	Train	Train	Train
Iteration 3	Train	Train	Test	Train	Train
Iteration 4	Train	Train	Train	Test	Train
Iteration 5	Train	Train	Train	Train	Test

AI Quest

Cross Validation

K-Folds Cross Validation

Validation Fold | Training Fold

K Iterations (K-Folds)

1st → $Performance_1$

2nd → $Performance_2$

3rd → $Performance_3$

4th → $Performance_4$

5th → $Performance_5$

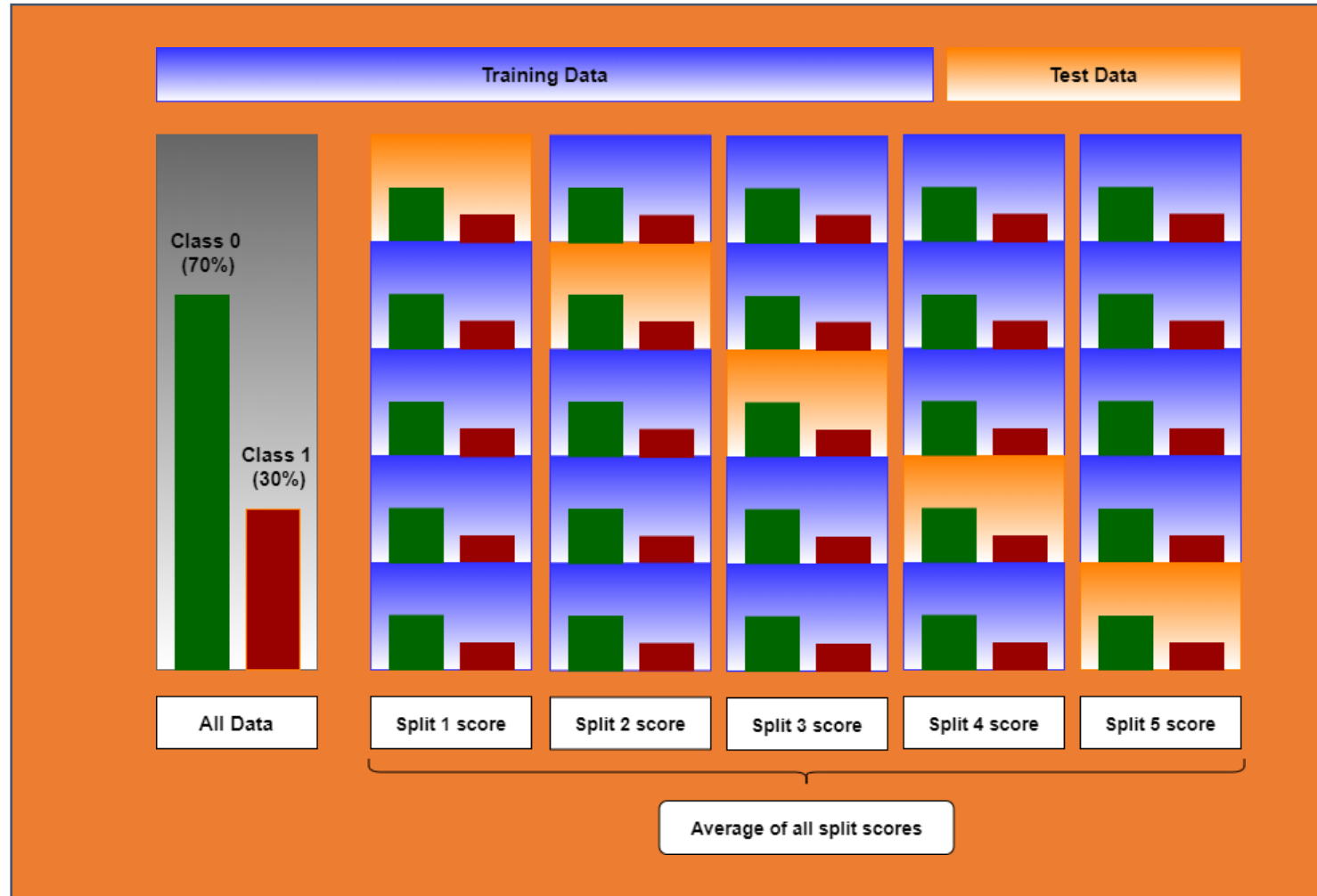$$Performance = \frac{1}{5}\sum_{i=1}^{5} Performance_i$$

Cross Validation

Leave One-Out Cross Validation (LOOCV)

Cross Validation

Stratified K Fold Cross Validation

Let's Do it with PYTHON