

# Home Work

1. Insert a column in the data set where the entries are 1 if the stock outperforms SPY in the earnings period and -1 if it underperforms or has the same return
2. Insert a column in the data set with entries: 2 if the stock return is more than 5% higher than the SPY return, 1 if it is more than 1% but less than 5% higher, 0 if it is between -1% and 1%, -2 if the stock underperforms the SPY by more than -5% and -1 if the performance is between -1% and -5%

3. A regression tree is used when the labels are real numbers instead of categories. Think of a linear regression situation when we have data points  $\{x_i\}$  and response variables  $\{y_i\}$  that are real numbers.

A regression tree uses the variance of the response variables instead of the Gini index. If  $n_j$  is a node with data  $\{x_{ij}\}$  and  $\{y_{ij}\}$  the variance of the response variables is

$$Var(\{y_{ij}\}) = \frac{1}{\#\{y_{ij}\}} \sum_i (y_{ij} - \bar{y}_{ij})^2$$

where  $\bar{y}_{ij}$  is the average of the  $\{y_{ij}\}$

To split the node into  $n_{j1}$  and  $n_{j2}$  we look for the split that minimizes

$$\frac{\#n_{j1}}{\#n_j} Var(\{y_{ij1}\}) + \frac{\#n_{j2}}{\#n_j} Var(\{y_{ij2}\})$$

In the notebook “Visualizing Trees” use a `DecisionTreeRegressor` instead of the `DecisionTreeClassifier`, directly on the `data1` and the target (so do not transform the target into labels).

Instead of taking max in each rectangle take the average and generate the image.

Experiment with different color schemes (cm.?)