



Start-Tech Academy

# Ensemble Methods

## Types

1. Bagging
2. Random Forest
3. Boosting

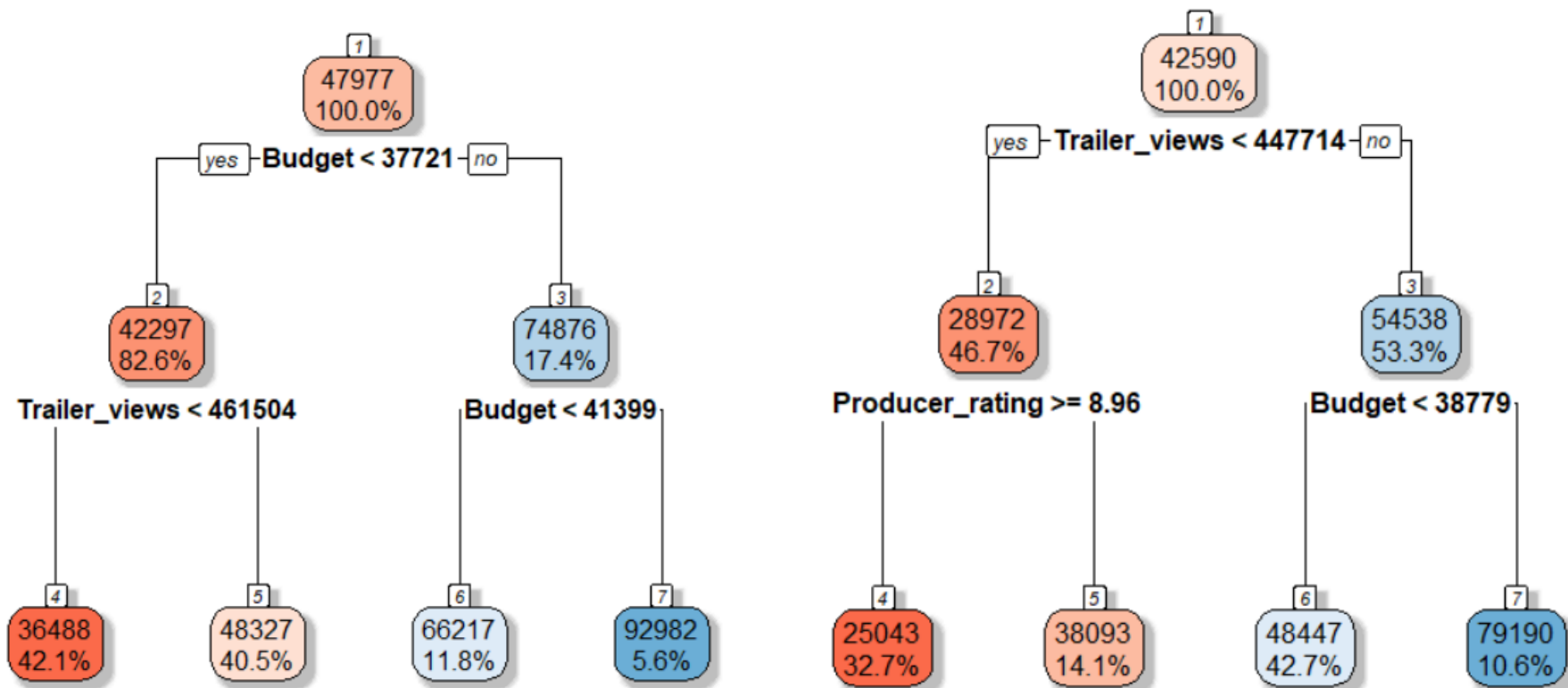
**Problem with normal decision tree**

- High Variance



# Ensemble Methods

## Example

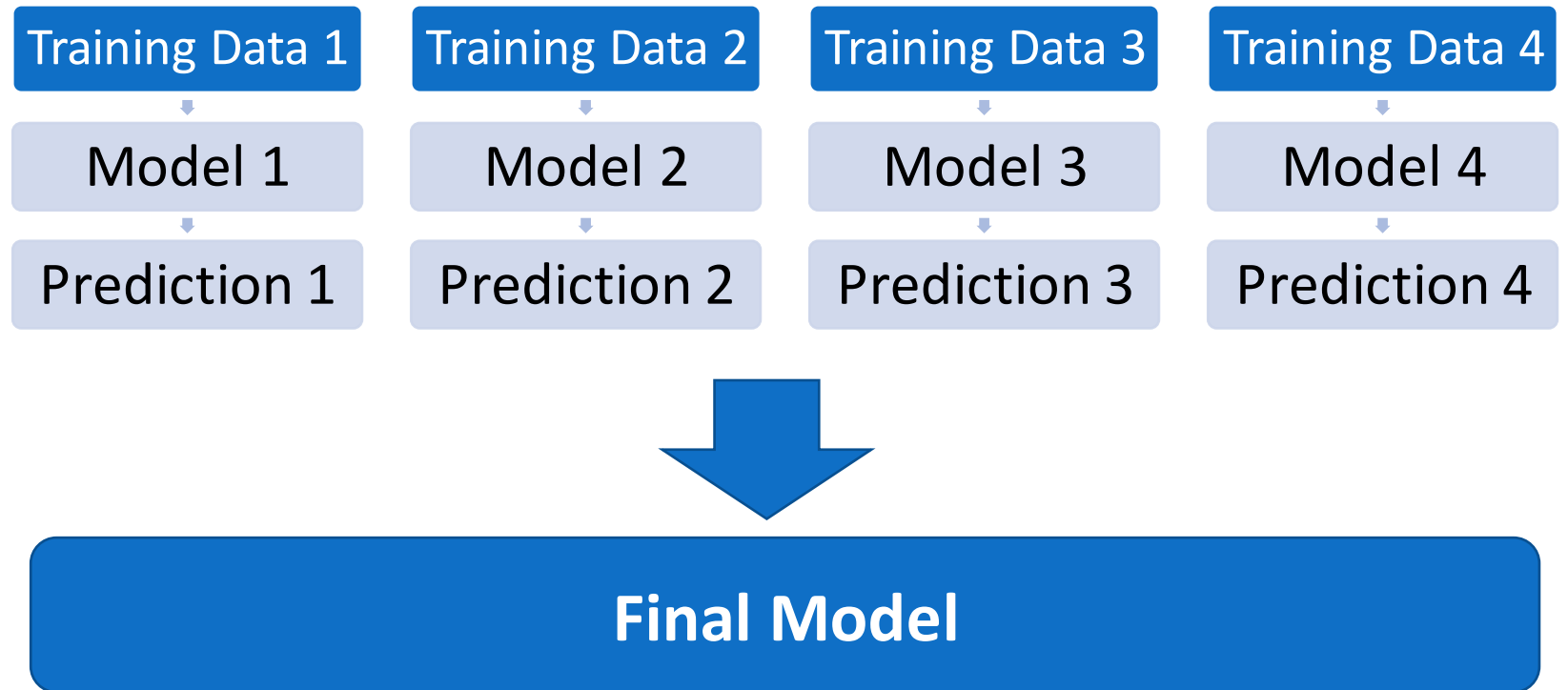


# Bagging

## Methods

Concept:-

If  $N$  observations have variance  $\sigma^2$  ( $s^2$ ), then variance of mean of these observations is  $(s^2)/N$



# Bagging

## Bootstrapping

	7	9	5	4	3	
Sample 1 -	9	5	4	3	4	
Sample 2 -	7	9	5	4	7	
Sample 3 -	7	9	9	4	3	



# Bagging

## Methods

1. While bagging pruning is not done, Full length trees are grown
2. Individual trees have high variance and low bias, averaging reduces the variance
3. In regression, we take the average of predicted values
4. In Classification, we take majority vote i.e. most predicted class will be taken as the final prediction

