

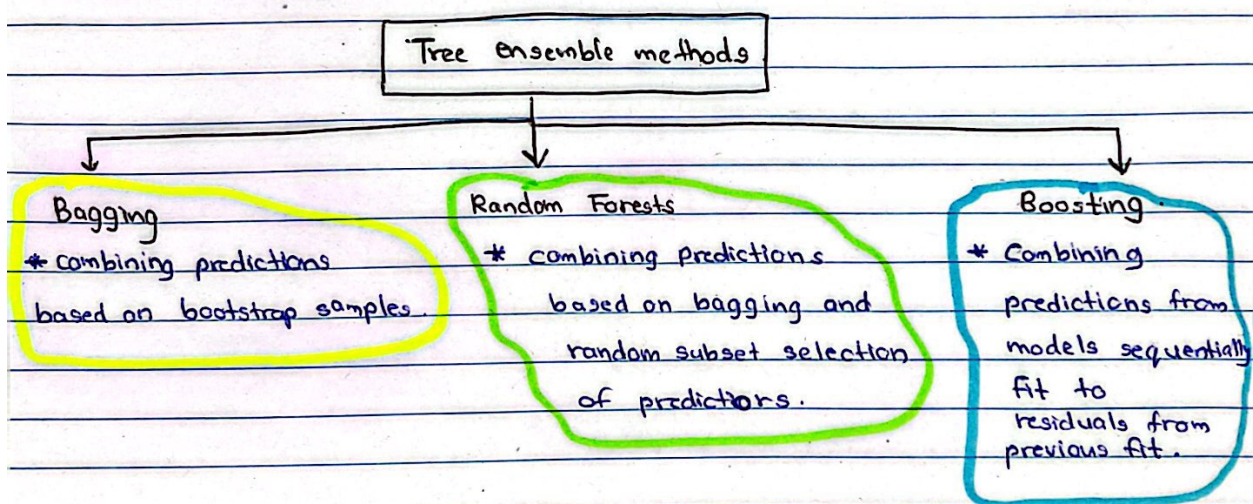
## Decision trees.

- \* Single tree suffers from high variance which means that your fitted tree may be quite different if you fit to subsets of the data.
- \* Still bias is low.

## Ensemble methods

- \* Ensemble methods combine predictions from multiple models, which lead to get better predictive performance than a single model by "averaging out" the ~~in~~ errors.

- \* These aggregation generally reduces the variances but loses the interpretation of the single models.



### \* Bootstrap aggregating / bagging

- \* This is an ensemble learning method that combines predictions from trees to bootstrapped data.

- \* Sampled across observations.
- \* The same predictors are used across trees.
- \* The trees are often highly correlated.
- \* Costly to compute.

} Drawbacks.



## Random Forests.

- \* Sampling across observations and variables.
- \* Reduces the correlation between trees, and thus reducing variance.
- \* Since consider only subset of predictors. for each tree, it's faster.
- \* Random forests build an ensemble of deep independent trees.

## Boosting

- \* Boosted trees build an ensemble of shallow trees in sequence with each tree learning and improving on the previous one.