Random Forests

Presentation

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Agenda

1. Definition
2. Analogy
3. Flowchart
4. Model tuning
5. Advantages & Disadvantages
6. Conclusions
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Definition

Random Forests

- **Random Forests** builds lots of trees so that the correlation between trees gets smaller and the majority of the predicted classes wins.
- Ensemble method uses multiple learning models to extract more accurate results.
- For supervised and unsupervised learning
- **Panacea**
- **Bagging =** average noisy and unbiased model → low variance → ***combine learners!***

Panacea lat. = a remedy for all ills or difficulties

Definition

Random Forests Analogy

- **Analogy “Ask the audience”**
  - **Majority of vote is correct**
  - **Why**?
  - Individuals have different experience, different “**data**” to decide
  - Individuals have different knowledge , different “**variables**” to decide

Random Forests is a **hybrid** of the **Bagging** algorithm and the random subspace method **(RSM).**

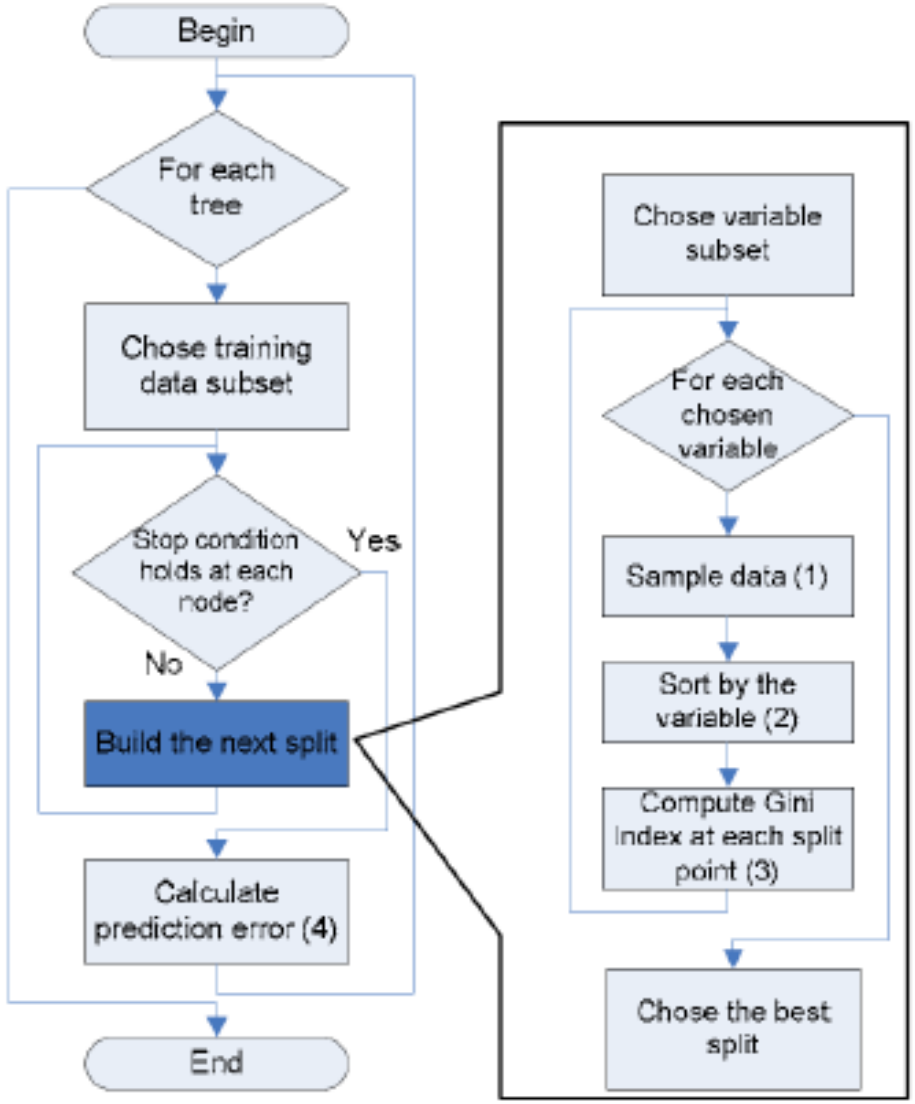
Experience = Bagging

Knowledge = Random Subspace Method

Random Forests

Flowchart

Forest



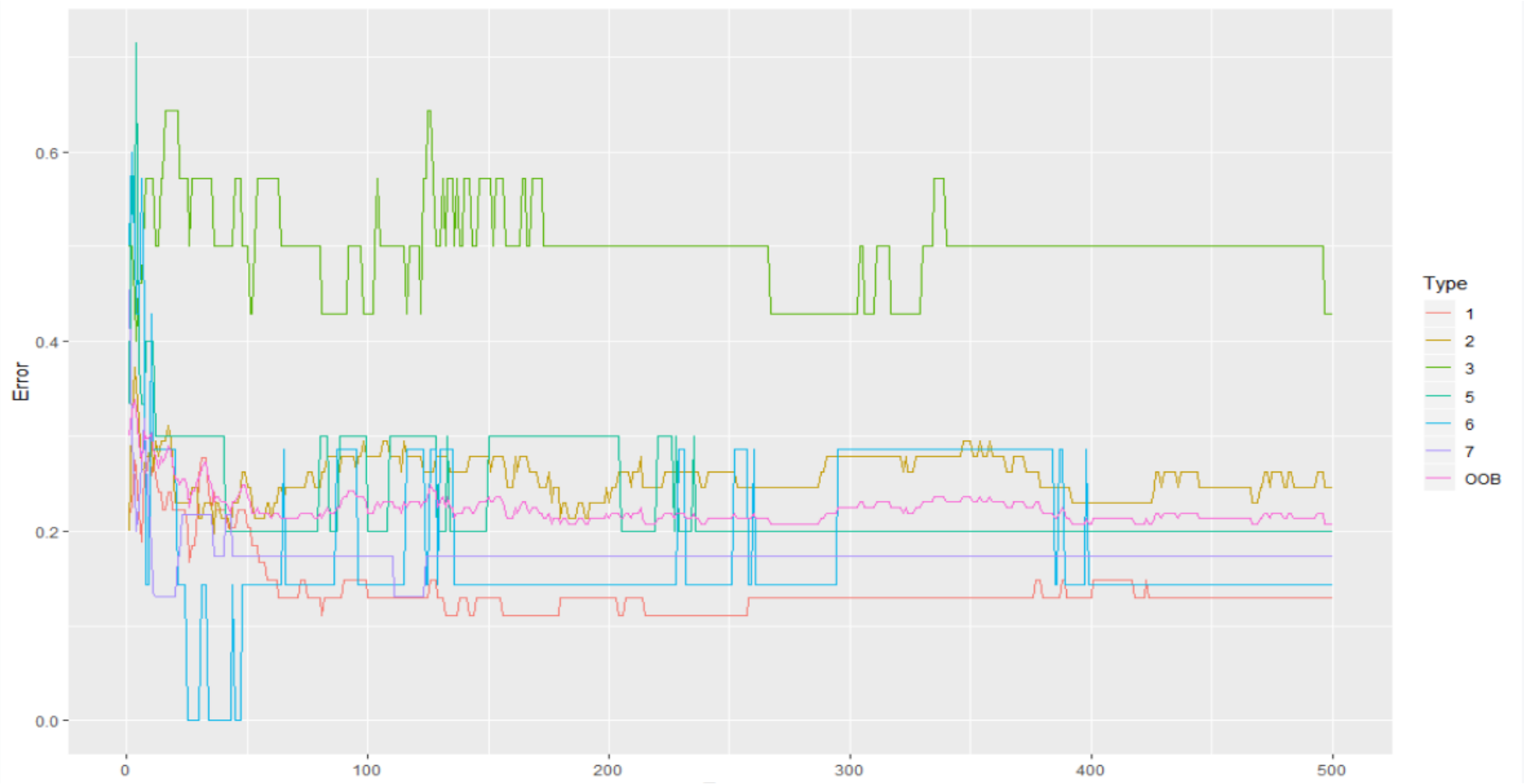
Random

Random Forests

Model Tuning

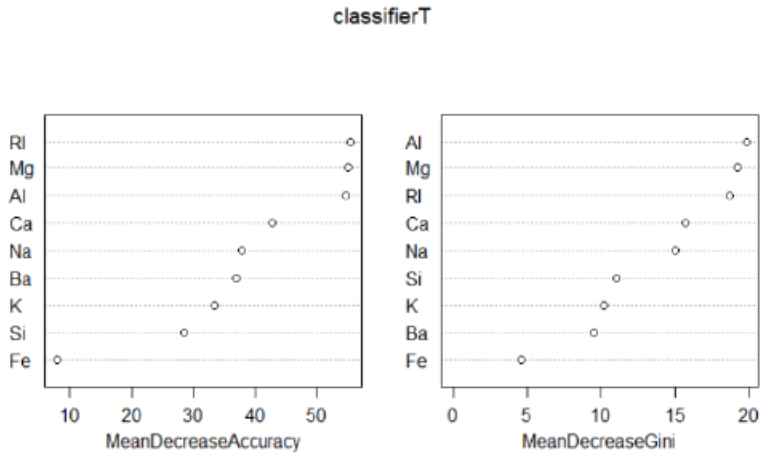
- **Trial and error approach**
- Splits are chosen according to a **purity measure**:
  - i.e. regression → squared error and Gini index or deviance for classification
- How to select ntrees?
  - Grow trees until the no longer out-of-bag-error decreases
- How to select mtry? *(variables for each split)*
  - Take default parameters, half of them and twice of them and pick the best!
  - Loop through to find out where the error is low.

Plot(ClassifierT)



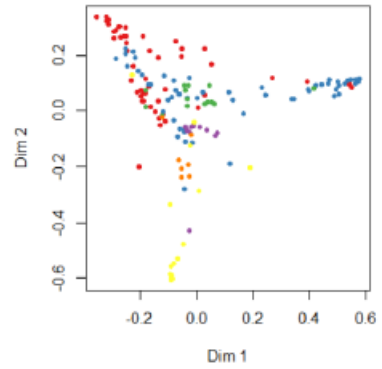
Advantages and Disadvantages

Random Forests



+ **Advantages**
  - Great out-of-the-box learner
  - Works on both regression and classification
  - Variable Importance

- **Disadvantages**
  - Less to control
  - Slow on large datasets
  - Quite accurate but not comparable to advanced boosting algorithms (AdaBoost)



Conclusions

Random Forests

- Easy to implement
- Robust against outliers, can handle data without preprocessing
- Best first hands-on approach algorithm
- Great data exploration features including Multidimensional scaling (MDS) plots

- *Algorithm: Random Forests → Breiman et. Al.*
- *Implementation R: "randomForest" → Andy Liaw from* MERCK

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