# Regression Random Forest

About the method - reg\_rf: Random Forest for regression. Averages many decision trees trained with randomness; tends to reduce variance. - Hyperparameters: mtry (variables per split), ntree (number of trees).

# installation   
#install.packages("daltoolbox")  
  
# loading DAL  
library(daltoolbox)

# Dataset for regression analysis

Load Boston dataset and inspect types/values.

library(MASS)  
data(Boston)  
print(t(sapply(Boston, class)))

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## crim zn indus chas nox rm age dis rad tax ptratio black lstat medv  
## 1 0.00632 18 2.31 0 0.538 6.575 65.2 4.0900 1 296 15.3 396.90 4.98 24.0  
## 2 0.02731 0 7.07 0 0.469 6.421 78.9 4.9671 2 242 17.8 396.90 9.14 21.6  
## 3 0.02729 0 7.07 0 0.469 7.185 61.1 4.9671 2 242 17.8 392.83 4.03 34.7  
## 4 0.03237 0 2.18 0 0.458 6.998 45.8 6.0622 3 222 18.7 394.63 2.94 33.4  
## 5 0.06905 0 2.18 0 0.458 7.147 54.2 6.0622 3 222 18.7 396.90 5.33 36.2  
## 6 0.02985 0 2.18 0 0.458 6.430 58.7 6.0622 3 222 18.7 394.12 5.21 28.7

# Optional conversion to matrix (may improve performance in some cases).

# for performance, you can convert to matrix  
Boston <- as.matrix(Boston)

# Train/test split

Random and reproducible train/test split.

# preparing random sampling  
set.seed(1)  
sr <- sample\_random()  
sr <- train\_test(sr, Boston)  
boston\_train <- sr$train  
boston\_test <- sr$test

# Training

Train Random Forest to predict medv.

model <- reg\_rf("medv", mtry=7, ntree=30) # mtry: variables per split; ntree: number of trees  
model <- fit(model, boston\_train)

# Model adjustment

Training evaluation (regression metrics such as RMSE/MAE).

train\_prediction <- predict(model, boston\_train)  
boston\_train\_predictand <- boston\_train[,"medv"]  
train\_eval <- evaluate(model, boston\_train\_predictand, train\_prediction)  
print(train\_eval$metrics)

## mse smape R2  
## 1 1.358048 0.03937262 0.984912

# Test

Test evaluation.

test\_prediction <- predict(model, boston\_test)  
boston\_test\_predictand <- boston\_test[,"medv"]  
test\_eval <- evaluate(model, boston\_test\_predictand, test\_prediction)  
print(test\_eval$metrics)

## mse smape R2  
## 1 14.60407 0.1220641 0.7573084

References - Breiman, L. (2001). Random Forests. Machine Learning 45(1):5–32. - Liaw, A. and Wiener, M. (2002). Classification and Regression by randomForest. R News.