# Predicting Age with MRI data

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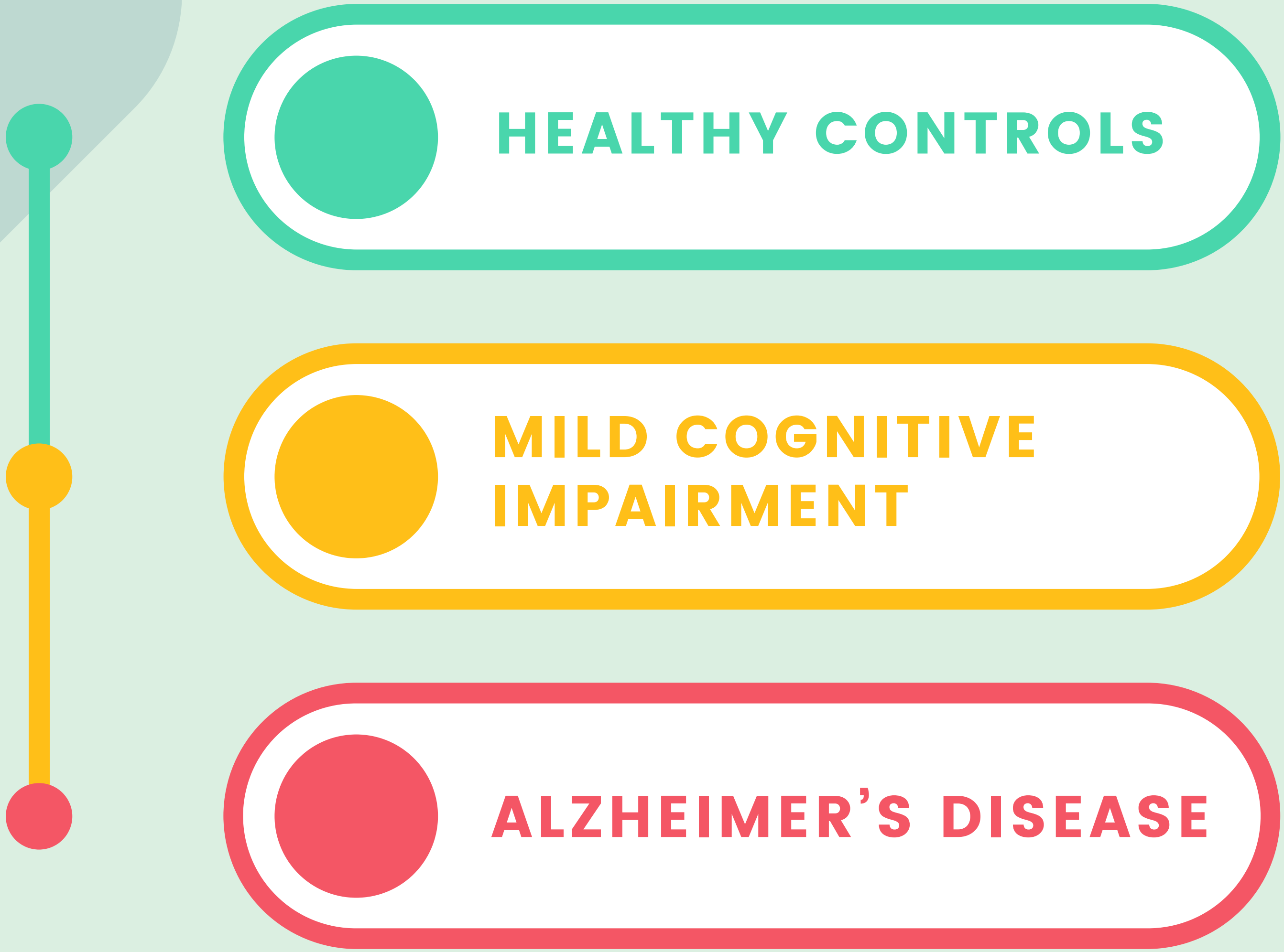
# INTRODUCTION




Kirova et al. (2015);
Davis et al. (2018)

# BIOMARKERS OF MCI AND AD

1. Hippocampal atrophy
2. Ventricular enlargement rates

Leung et al. (2013); Moon et al. (2018)

# WHY PREDICT AGE AND DIAGNOSIS?

## DISEASE DEDVELOPMENT

Provides insights into disease progression over time

## BIOMARKER DEVELOPMENT

Enhancing diagnostic accuracy and potentially enabling the identification of individuals at higher risk of disease conversion

# AIMS & OBJECTIVES

I plan to investigate different models to find what best predicts age based on MRI features

# RANDOM FOREST CLASSIFIER/ REGRESSOR

- Constructs multiple decision trees on subsets of the data and aggregates their predictions to make final classifications
- Handles non-linearity and complex relationships
- Can handle data with large amounts of features

# SUPPORT VECTOR CLASSIFIER

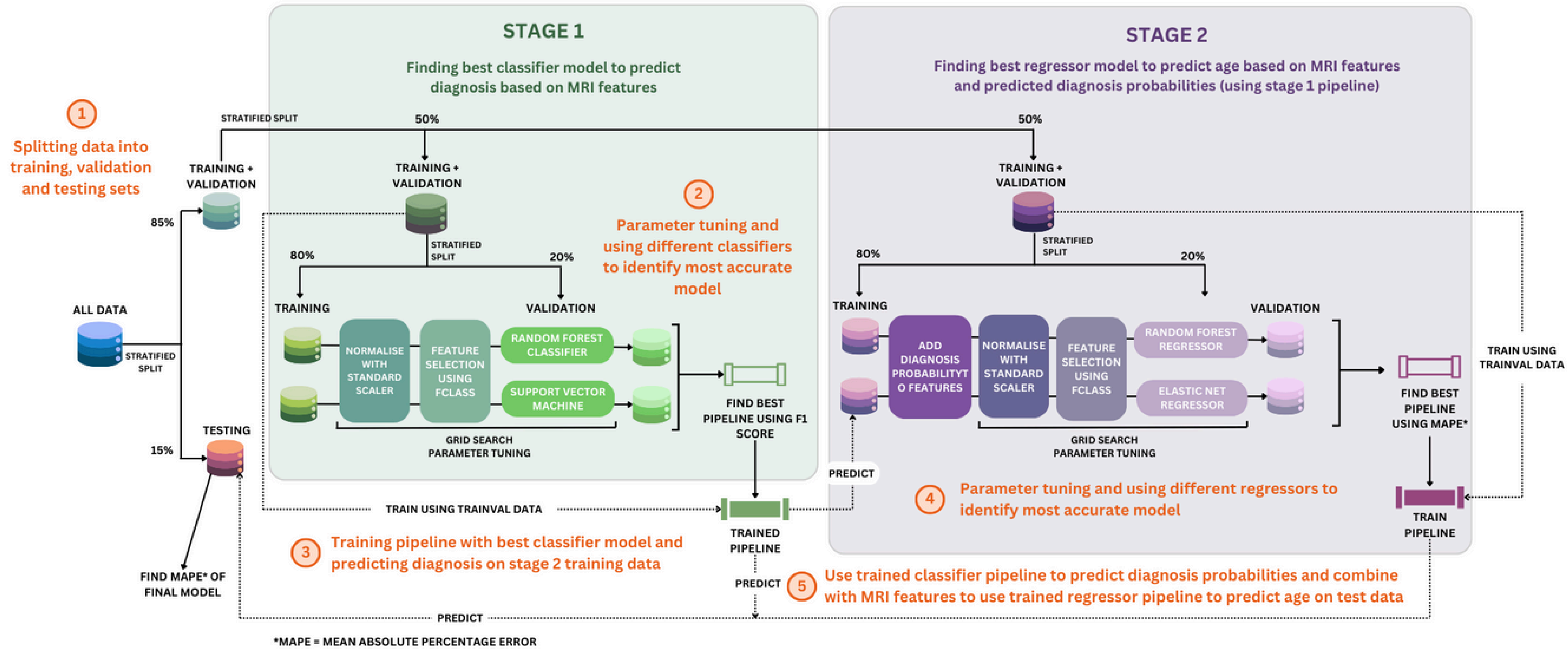
- Finds the hyperplane that separates classes in the feature space while maximizing the margin between the classes, for effective classification of data points.
- Can capture complex relationships
- Can accommodate feature interactions

# ELASTIC NET REGRESSION

- Takes into account both l1 and l2 penalties, similar to a combined linear and lasso regression
- Robust model to outliers, which may be useful as we have lots of features to predict from
- Obtain sparse models with a reduced number of predictors, making it easier to interpret the model's coefficients and understand the relationships between predictors and the target variable.

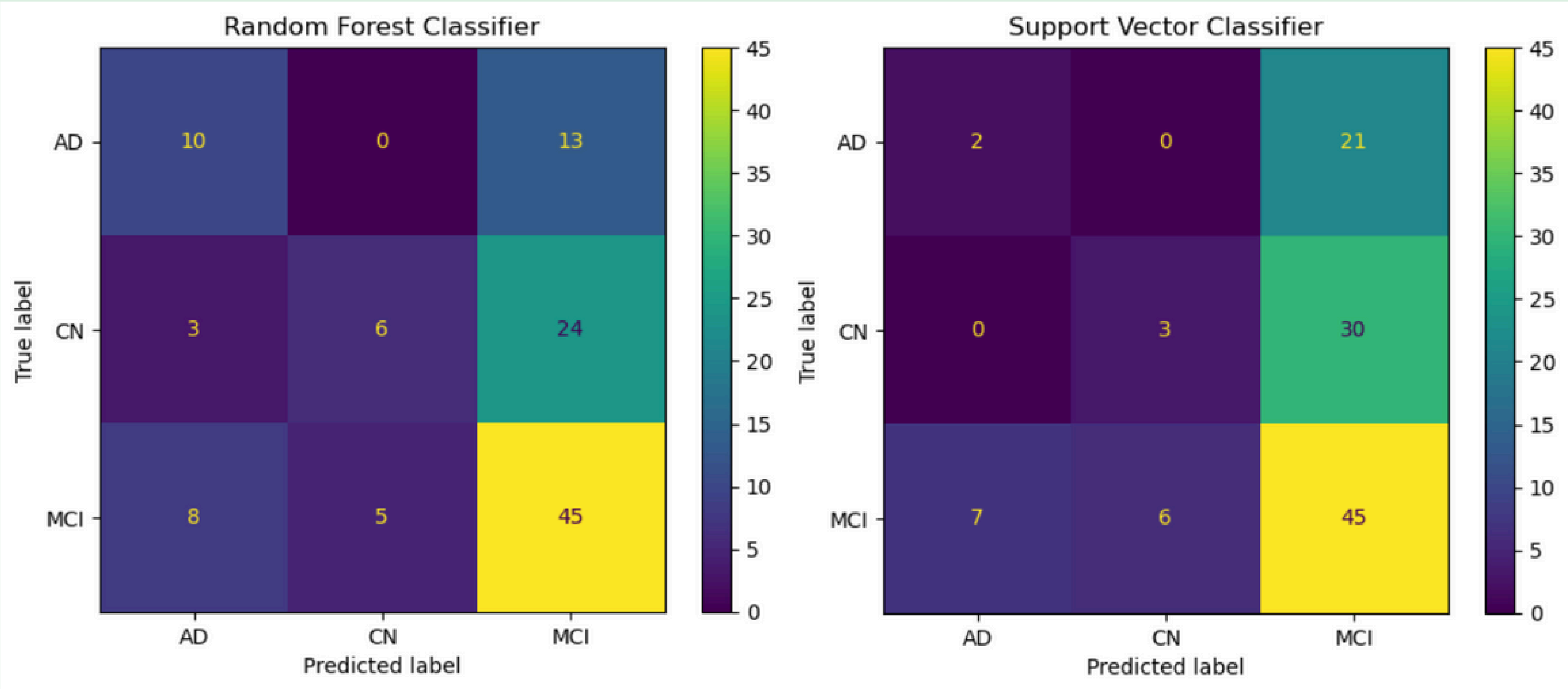
# METHODS

# Methods Graphic



# RESULTS

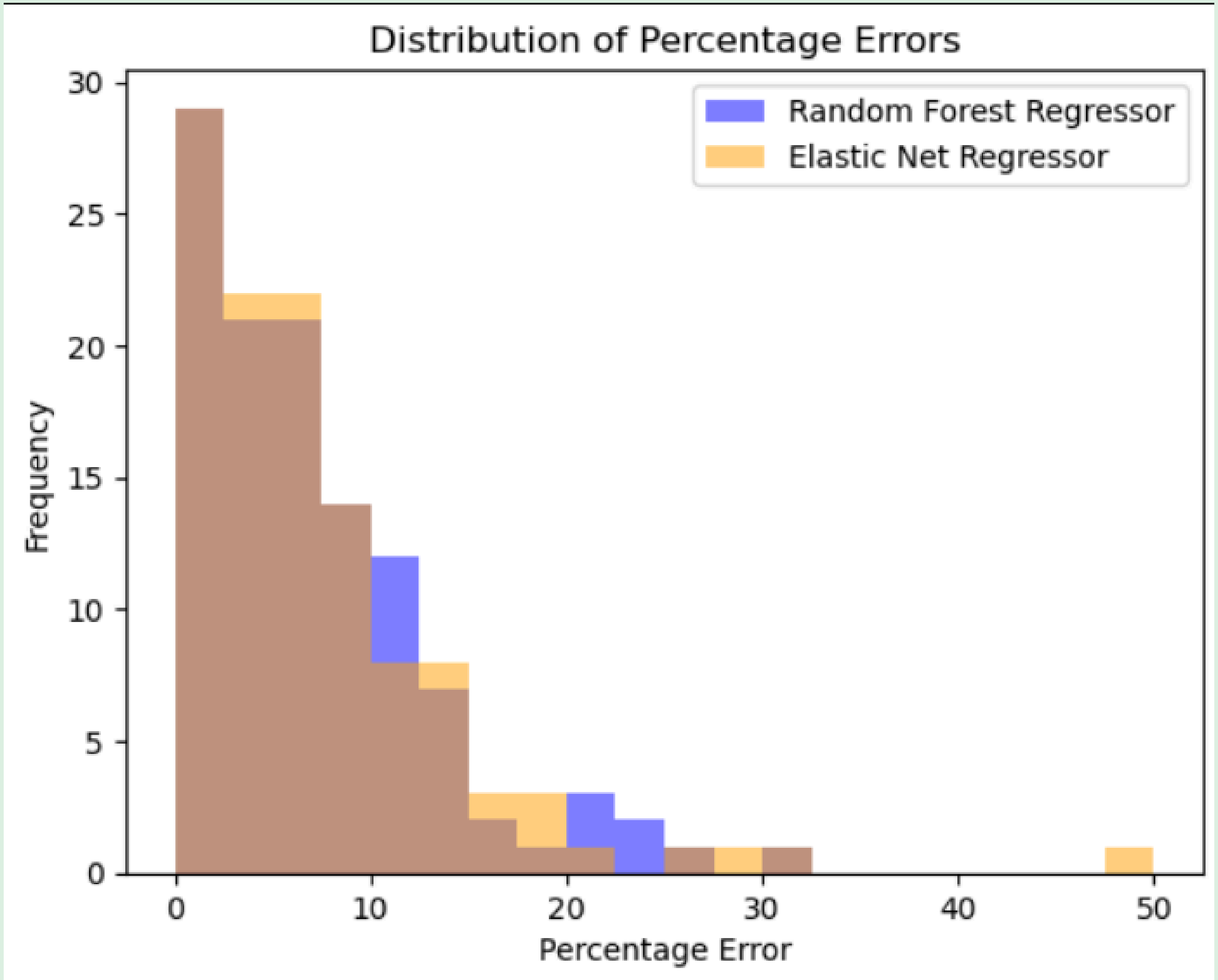
# RESULTS: CLASSIFIERS




RFC accuracy = 54%

SVC accuracy = 44%

# RESULTS: REGRESSORS



# BEST MODELS

## RANDOM FOREST CLASSIFIER

compared to SVC f1 score = 0.36

**F1 SCORE**

**0.50**

## RANDOM FOREST REGRESSOR

compared to elastic net MSE = 7.3%

**MEAN ABSOLUTE PERCENTAGE ERROR**

**7.1%**

# OVERALL PIPELINE PERFORMANCE

**MEAN ABSOLUTE PERCENTAGE ERROR**

**6.8%**

# DISCUSSION

# BEST MODELS: WHY?

## RANDOM FOREST CLASSIFIER

Possibly more robust to noisy data and overfitting, which is important in medical diagnosis where data might be noisy or incomplete.

## RANDOM FOREST REGRESSOR

Ensemble of trees in this model may have been able to handle complex interactions between feature and age that ElasticNet could not

# BIOMARKERS OF MCI AND AD

1. Hippocampus
2. Ventricles
3. Amygdala

Leung et al. (2013);
Moon et al. (2018)

# EVALUATION

SMALL DATASETS

# REFERENCES


Reference list

Davis, M. et al. (2018) Estimating Alzheimer's Disease Progression Rates from Normal Cognition Through Mild Cognitive Impairment and Stages of Dementia. Current Alzheimer Research. 15 (8), 777–788. [online]. Available from: https://www.eurekaselect.com/article/88040 (Accessed 8 March 2024).

Kirova, A.-M. et al. (2015) Working Memory and Executive Function Decline across Normal Aging, Mild Cognitive Impairment, and Alzheimer's Disease [online]. Available from: https://www.hindawi.com/journals/bmri/2015/748212/.

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# THANK YOU