Stone Flakes: Analysis of Prehistoric Tool Use

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INTRODUCTION

- *STONEFLAKES* DATA SET RETREIVED FROM MACHINE LEARNING REPOSITORY AT UCI
- MEASURING AVERAGE OF STONE RESIDUE FROM A VARIETY OF SITES AROUND GERMANY AND CENTRAL EUROPE

INTRODUCTION

- FLAKES CREATED AS BYPRODUCTS OF STONE TOOL CREATION AND USE
- ARCHEOLOGISTS MEASURE VARIABLES ON THESE FLAKES SUCH AS:
  - LENGTH
  - WIDTH
  - STRIKING ANGLE
  - FREQUENCY OF FACETS

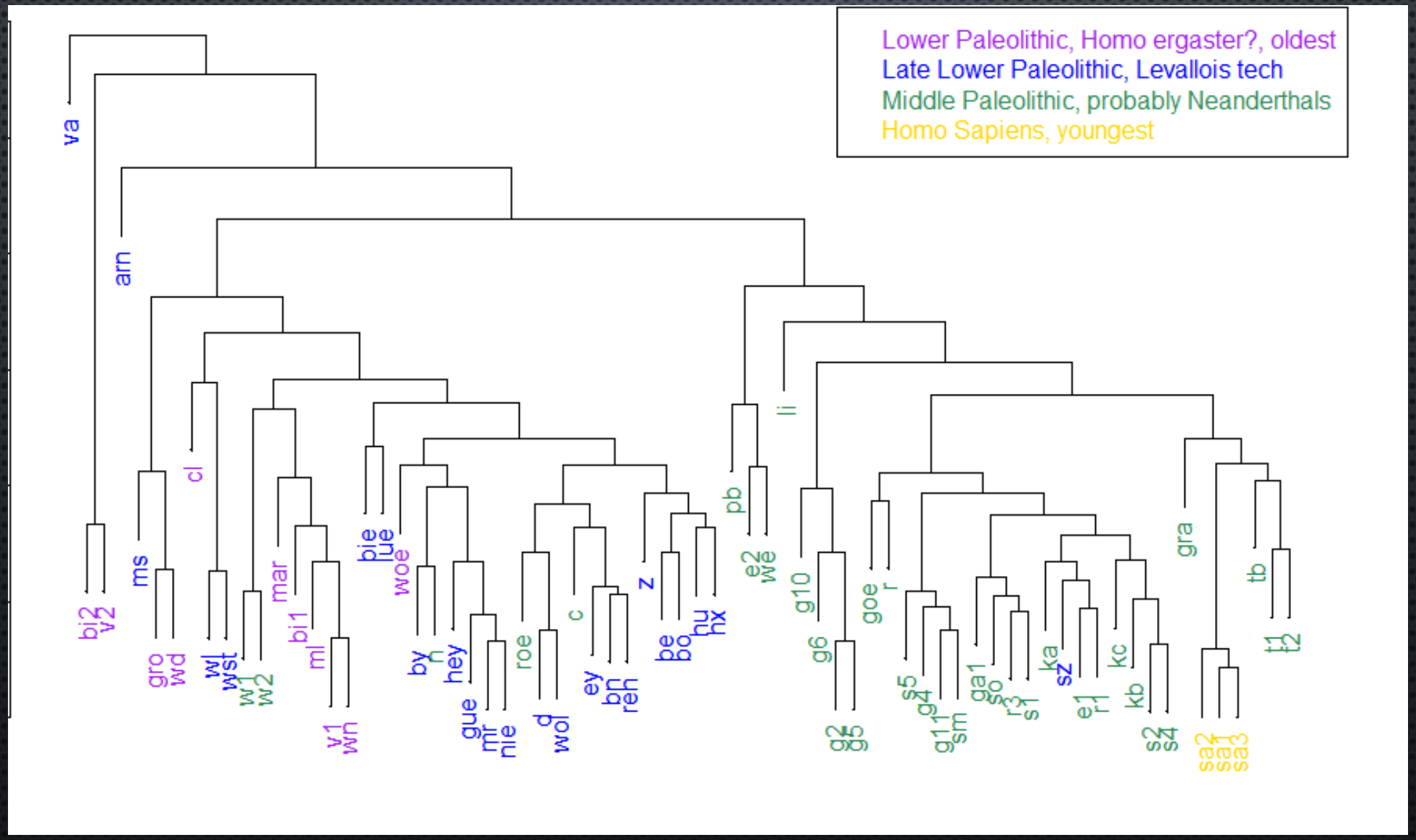
INTRODUCTION

- ALONG WITH THESE FLAKE MESUREMENTS IS A SERIES OF GEOGRAPHICAL AND DATING DATA
  - SITE NUMBERS AND AGE OF STONE BASED ON DATING
- DATES RANGE FROM 40 -400 THOUSAND YEARS
  - LATE LOWER PALEOLITHIC TO EARLY UPPER

DATA

- Each point is labeled by the site ID from the data set
- each is assigned a grouping based on factors such as age and hominid type by the archeologists
- Model consists of mostly age as a response to 8 variables from archeologists measurements
- Using complete cases and model clarification

CLUSTERING


Lower Paleolithic, Homo ergaster?, oldest
Late Lower Paleolithic, Levallois tech
Middle Paleolithic, probably Neanderthals
Homo Sapiens, youngest
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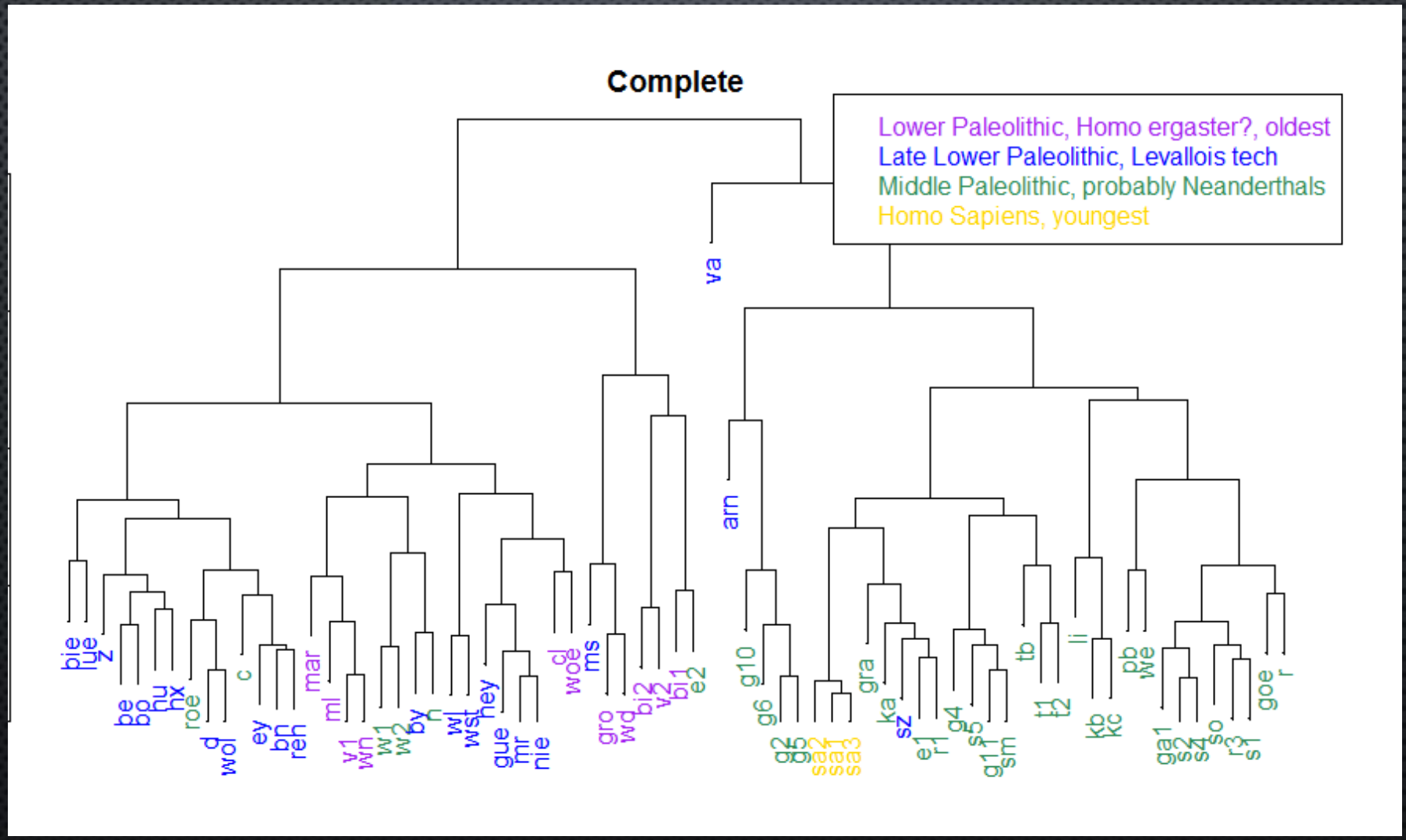
CLUSTERING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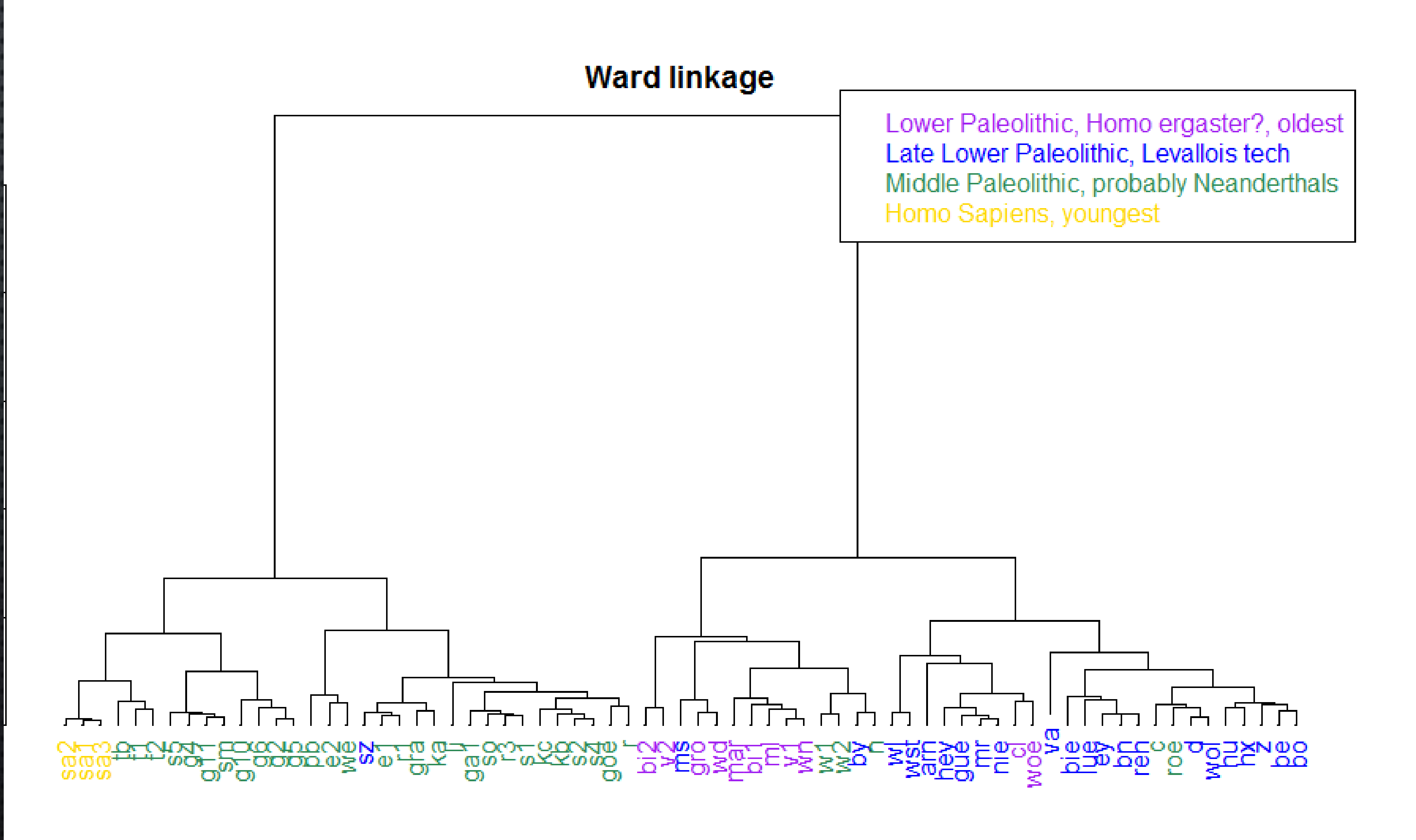
CLUSTERING


Ward linkage
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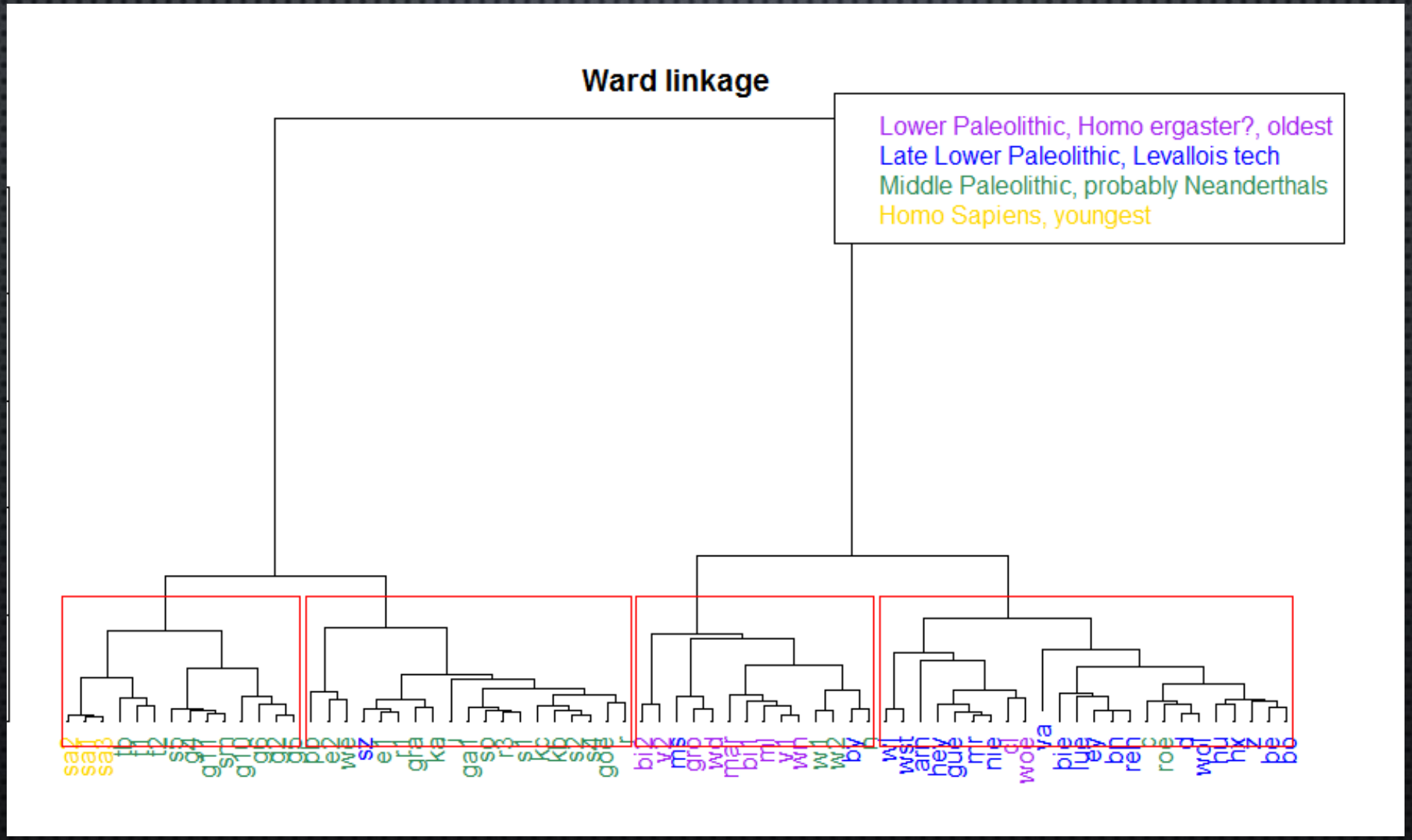
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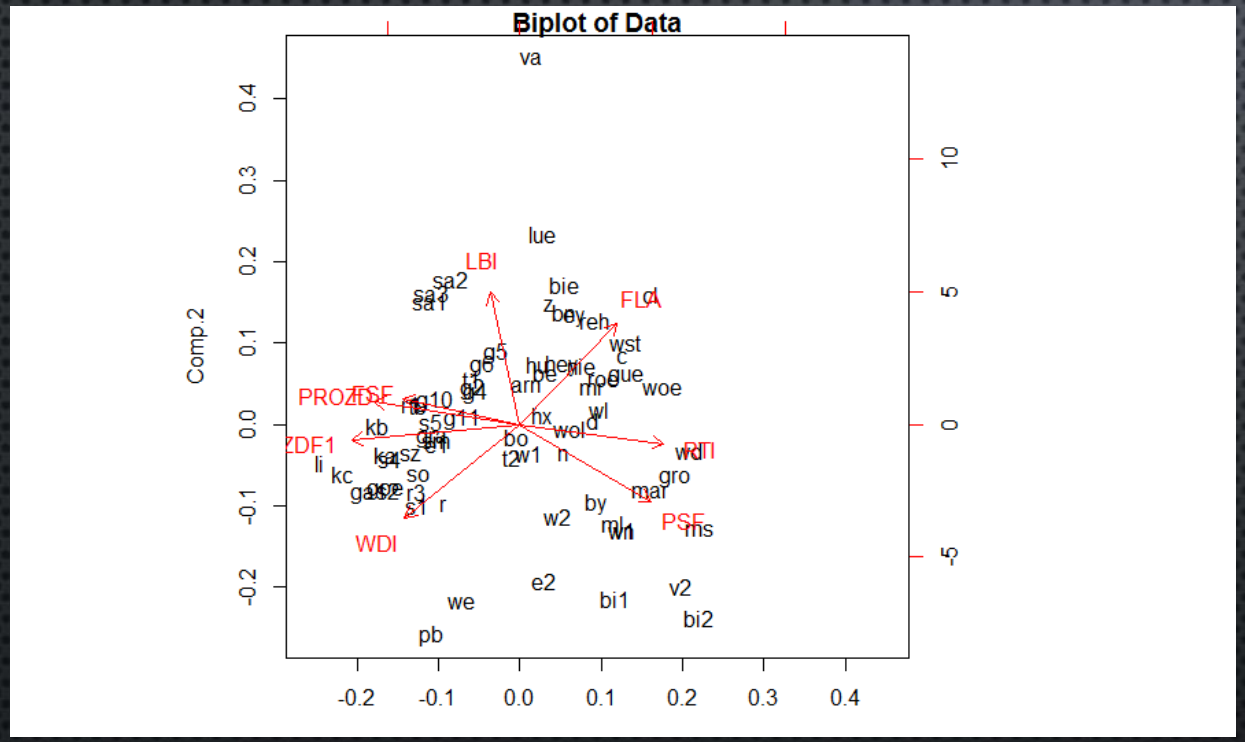
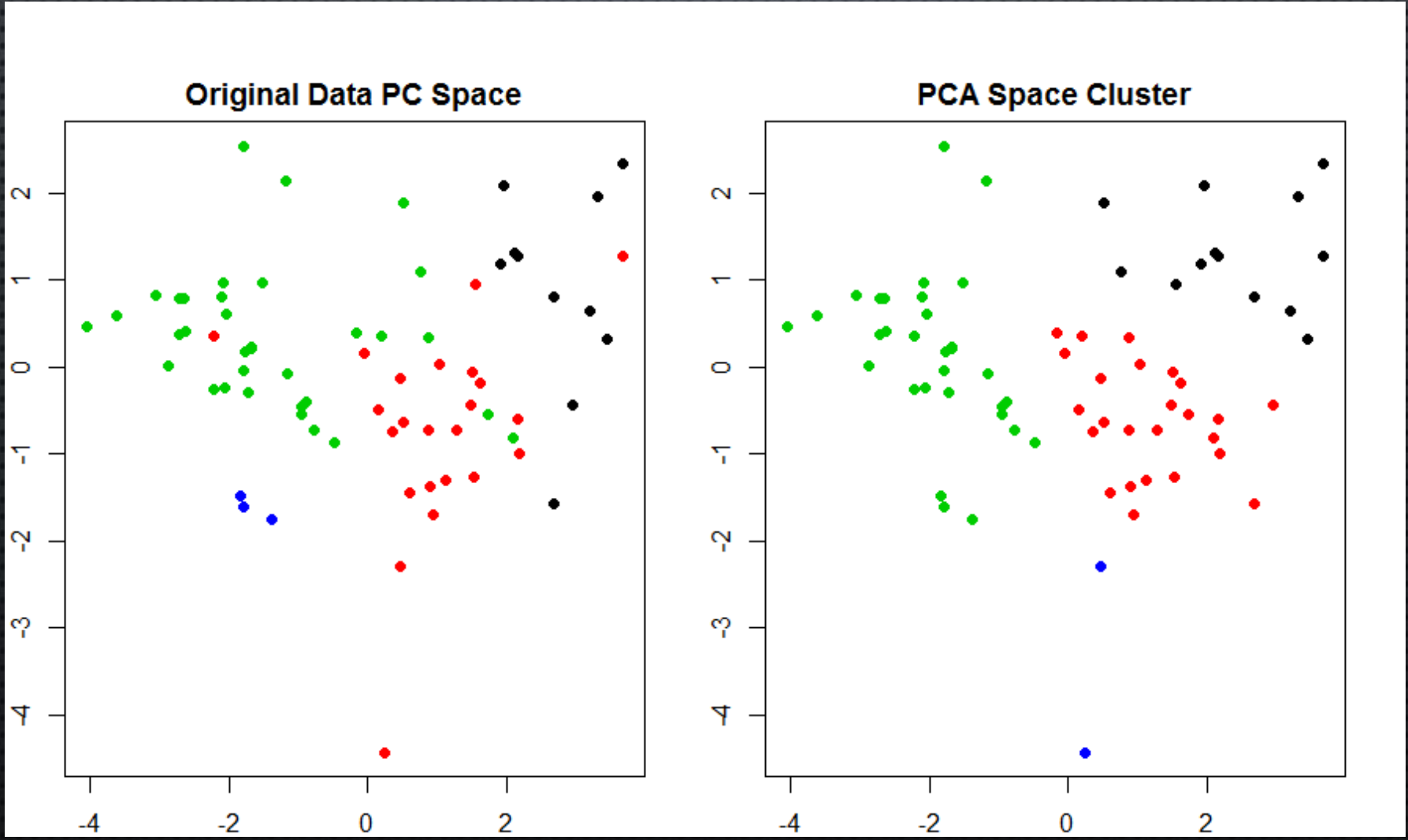
PCA

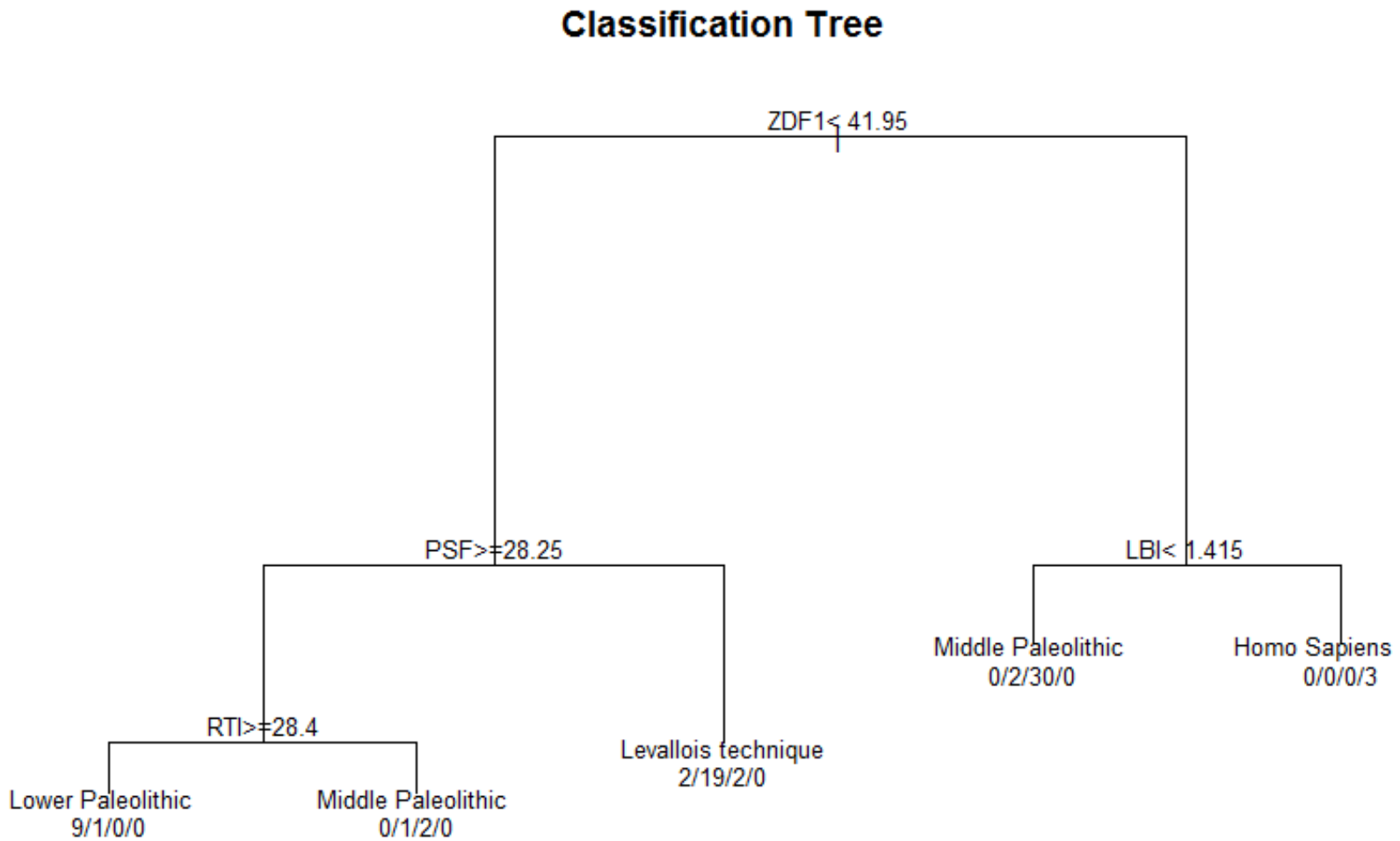


	PC1	PC2
LBI	0.08353495	0.62934222
RTI	0.40814766	0.09025955
WDI	0.32520276	0.44596791
FLA	0.27519939	0.48080250
PSF	0.37225126	0.36452757
FSF	0.33009028	0.12286919
ZDF1	0.47592915	0.07252034
PROZD	0.41340865	0.11174422

PCA



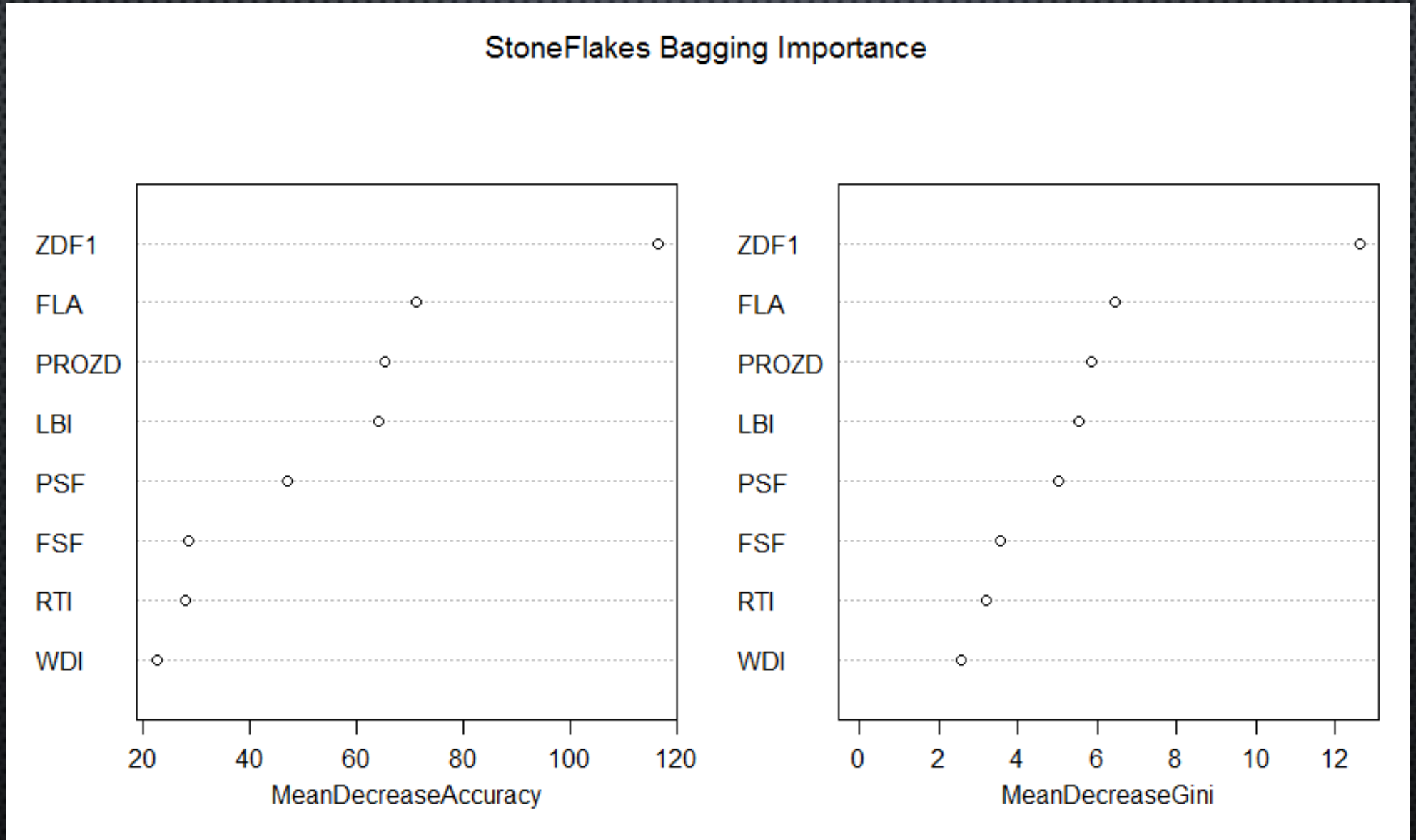
CLASSIFICATION



Classification

- By using the Group variable as a classifier made predictions with 8 original variables (not age)
- 11.3% resubstitution and Leave one out CV error rates
- Also use Bagging and RandomForest

CLASSIFICATION



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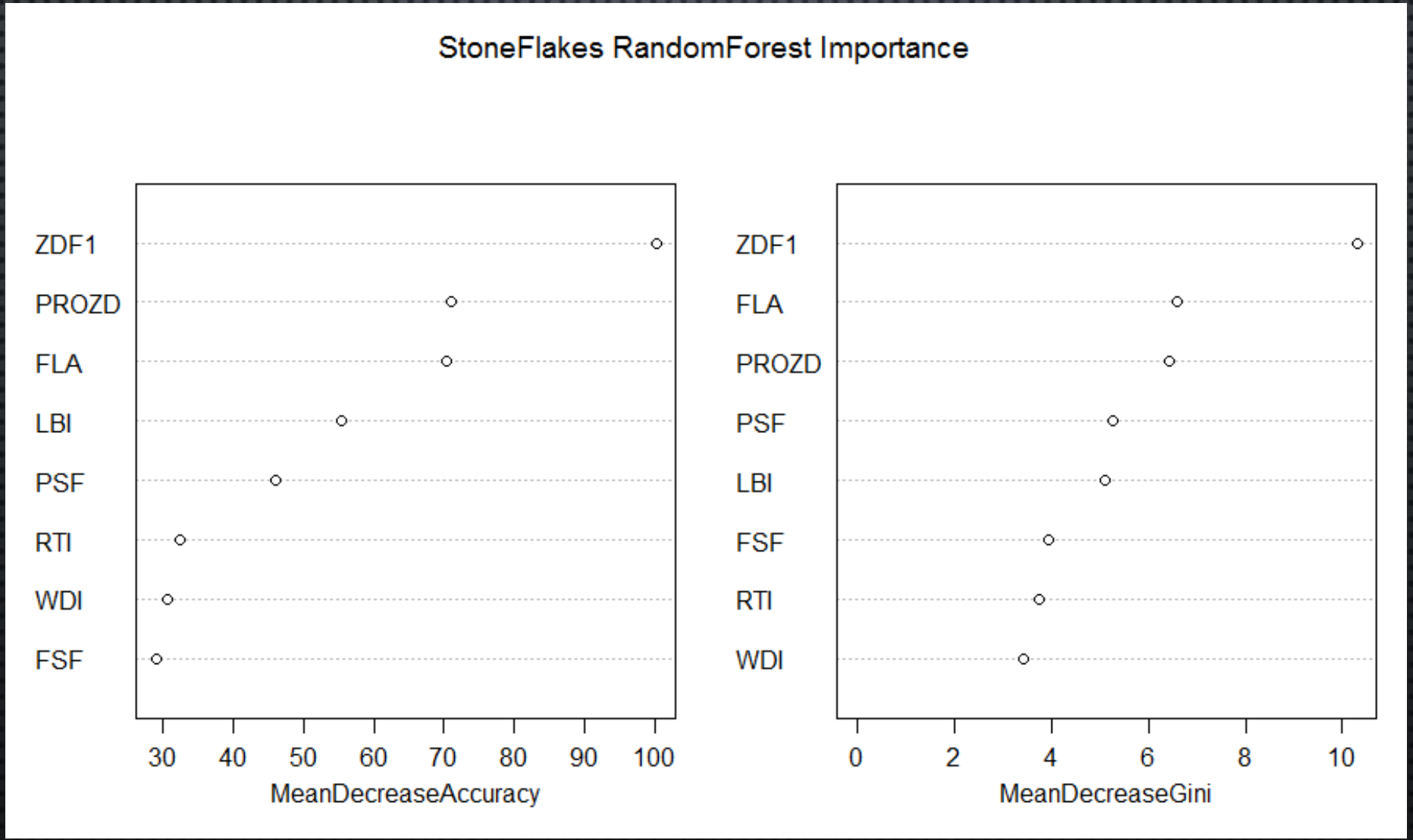

Classification

- Both models show similar importance in ZDF1, FLA, and PROZD variables
- Error Rates
  - 16.9% Bagging
  - 19.7% RF

Conclusion

- Clustering shows good amount of variation between groups
- Classifier is fairly accurate