CARDIOVASCULAR DISEASE DATASET ANALYSIS

7CCSONAR RESEARCH METHODOLOGIES: ANALYSIS AND REPORTING

ASSESSMENT PRESENTATION 2023-24

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AGENDA

Introduction

Research Objectives

Analysis Results

Conclusions

INTRODUCTION: THE DATASET

- Cardiovascular Disease dataset.
- Available in Kaggle.
- 1,000 patient records.
- 12 features – common in other studies.
- Patient classification.

INTRODUCTION: DOMAIN CONTEXT (FEATURES)

Demographic features

- Gender.
- Age.

Blood analysis

- Serum cholesterol.
- Fasting blood sugar.

Fluoroscopy

- Number of major vessels.

Physical test

- Resting BP.
- Resting ECG.
- Maximum HR.
- Oldpeak and Slope.
- Exercise-induced angina.

Self-reported

- Chest pain type

RESEARCH OBJECTIVES

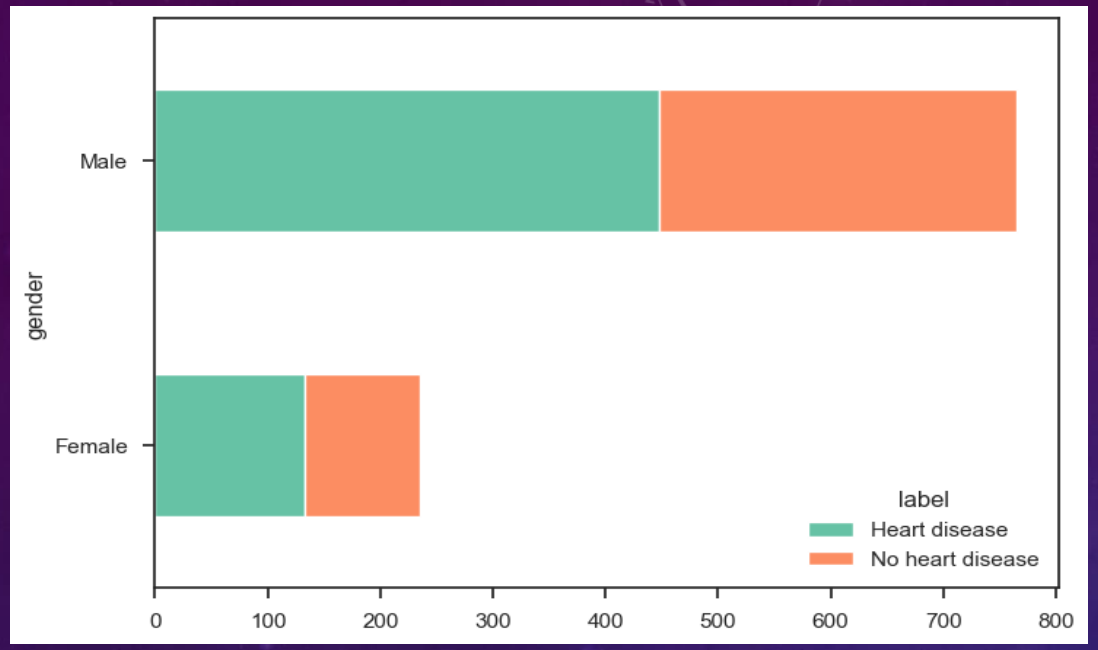
Prediction model.

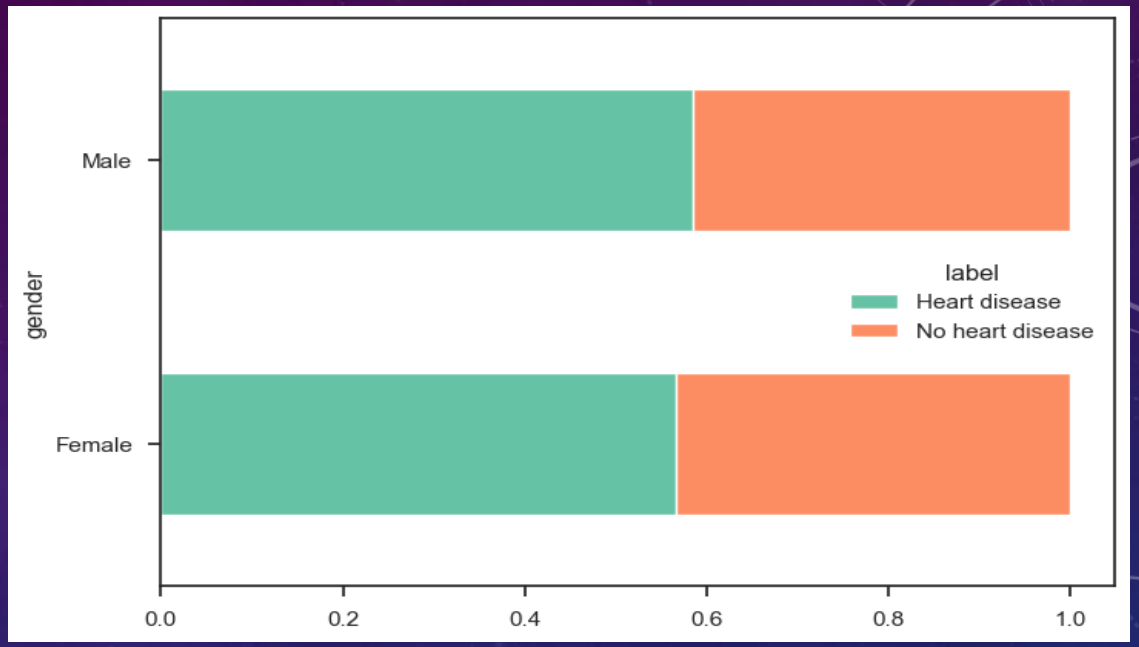
Understand dataset demographics.

Find indicators in categorical data.

Find indicators in numerical data.

ANALYSIS RESULTS DEMOGRAPHICS

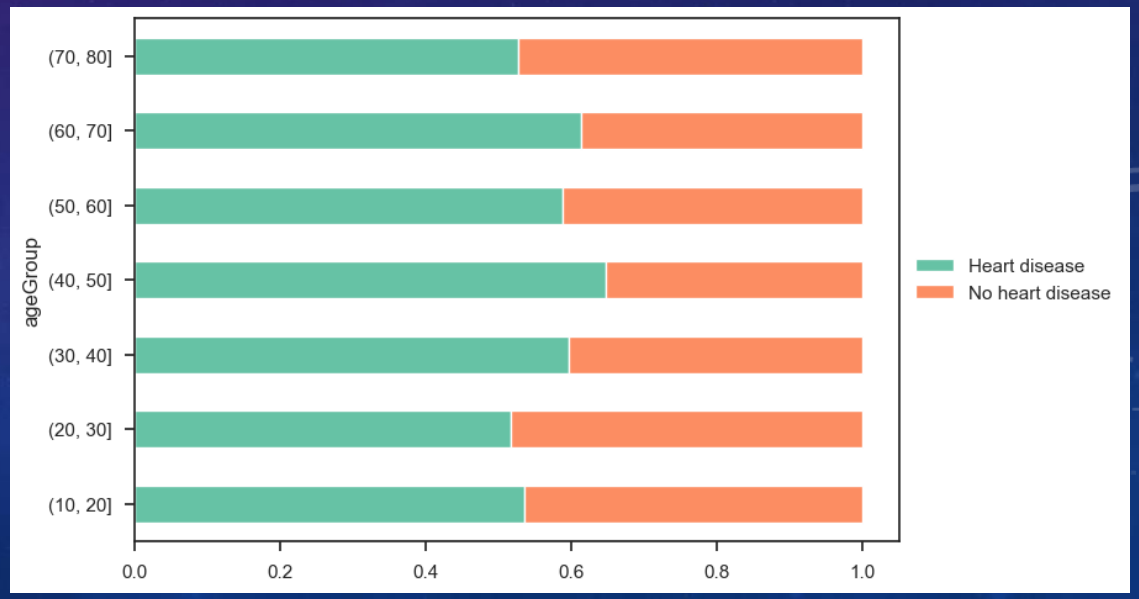


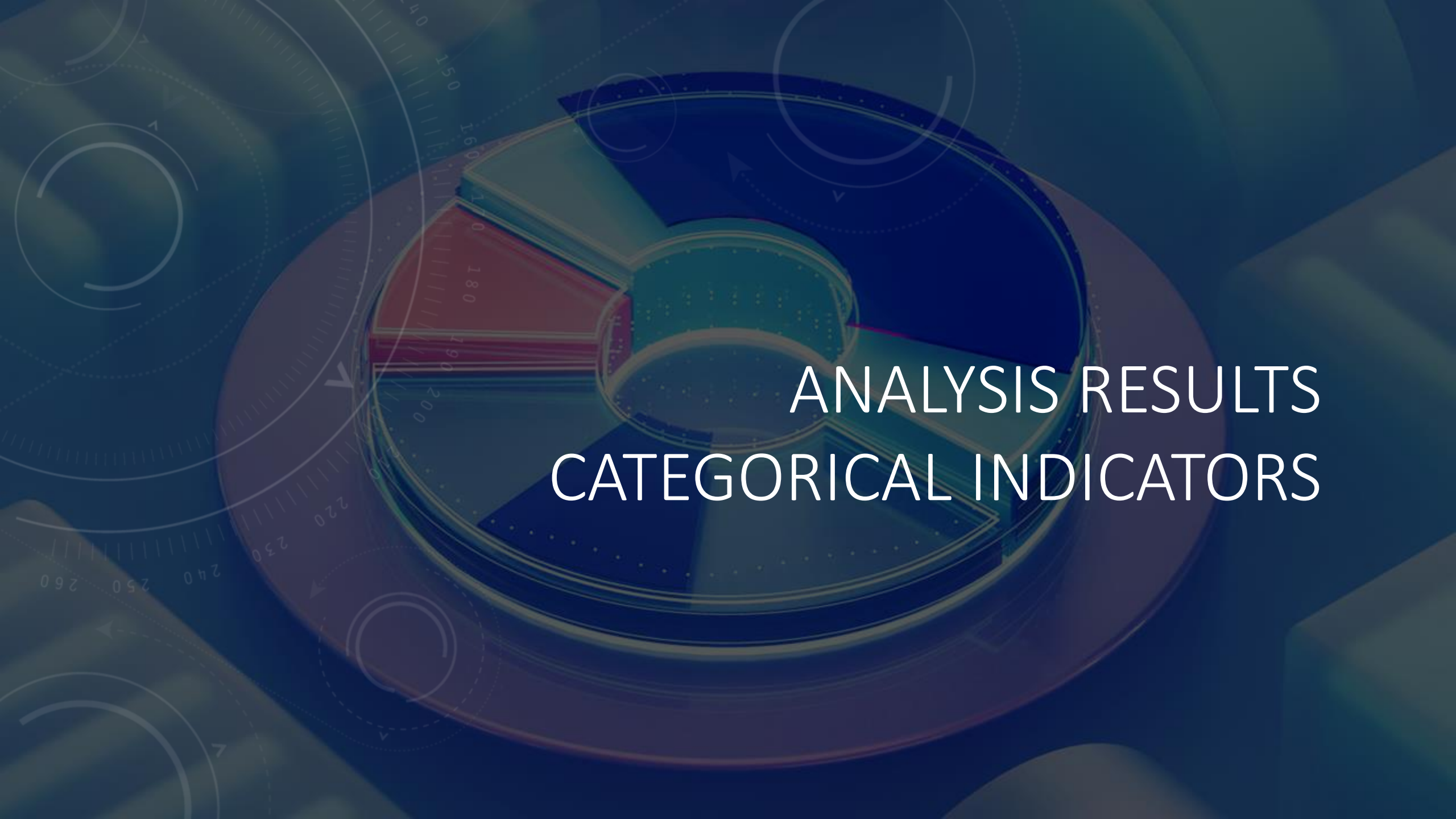


Top Left: Number of patients of each gender with and without heart disease.

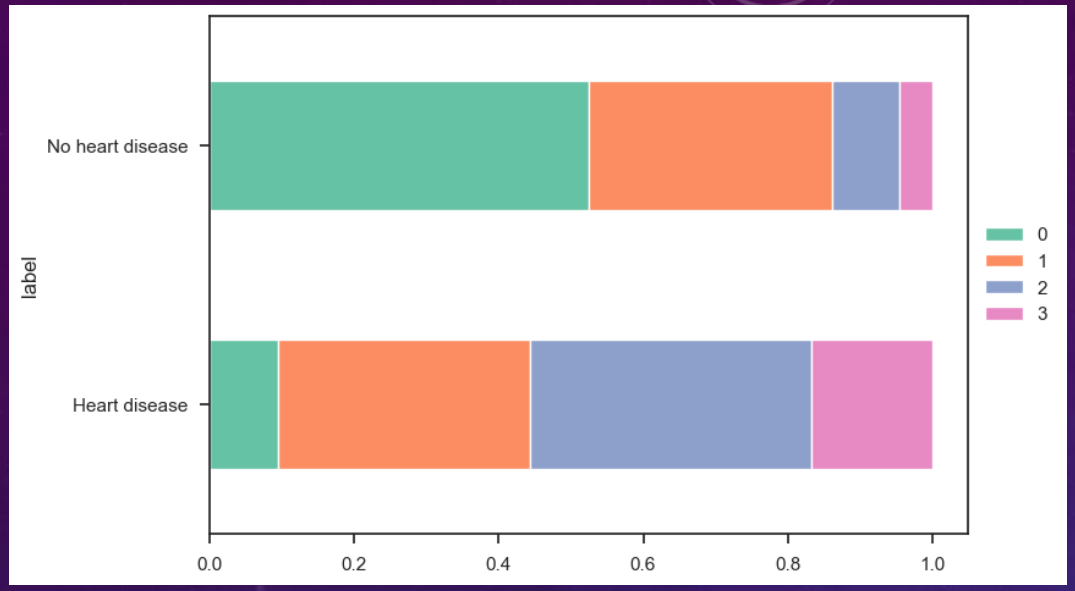
Top Right: Percentage of patients of each gender with and without heart disease.

Bottom Right: Percentage of patients of each age group with and without heart disease.





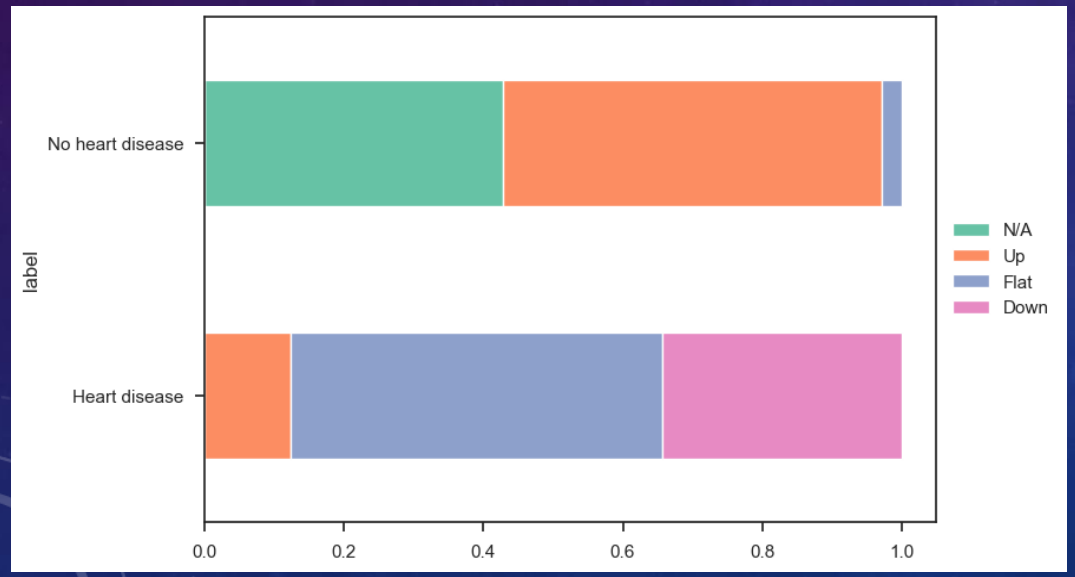
ANALYSIS RESULTS
CATEGORICAL INDICATORS

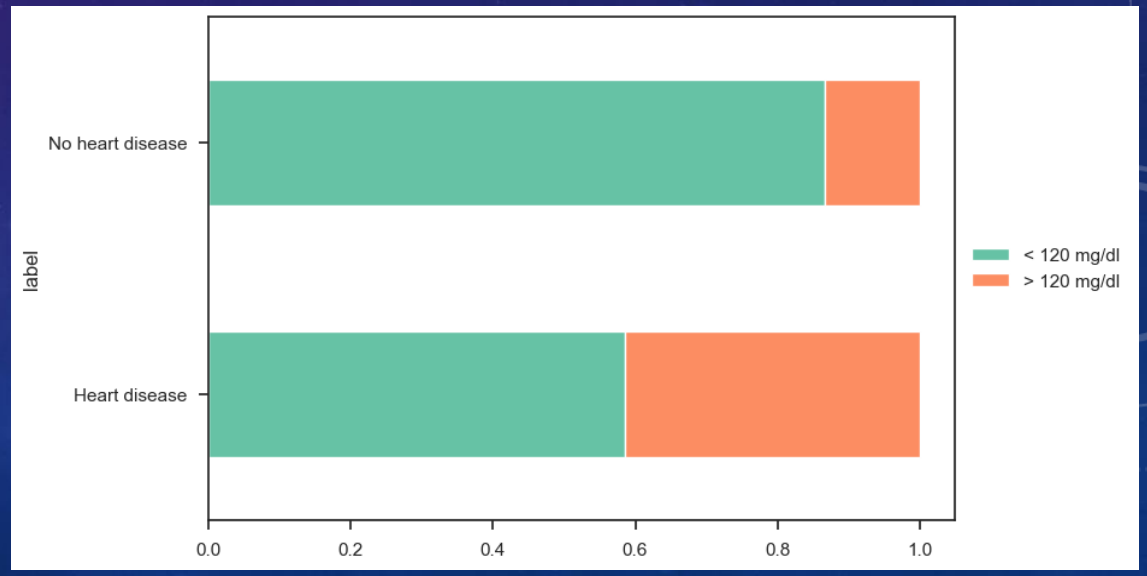


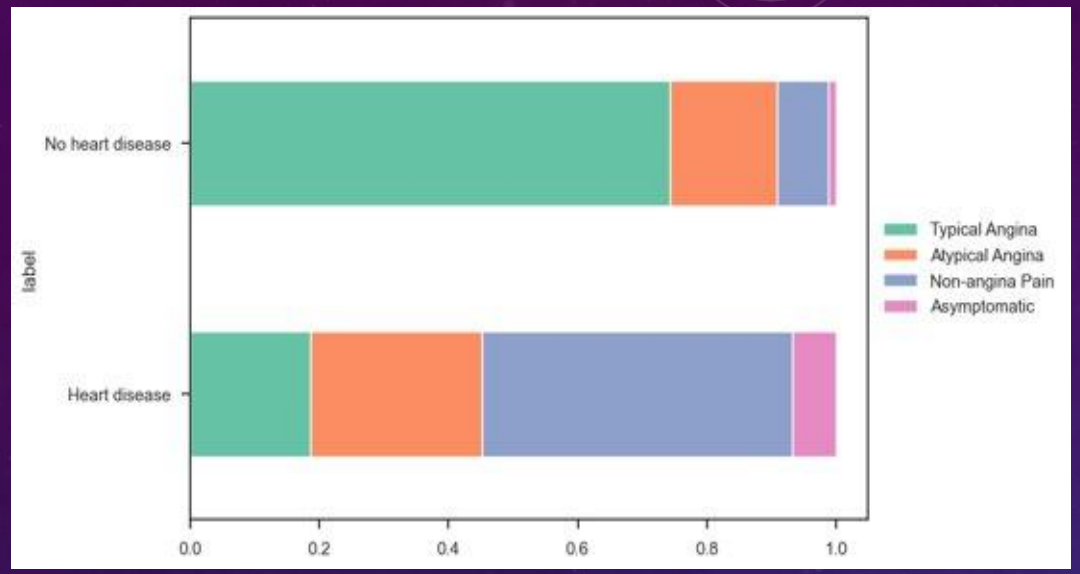
Top Left: Number of visible major vessels in fluoroscopy.

Bottom Left: Shape of the peak slope during exercise.

Bottom Right: Fasting blood sugar.

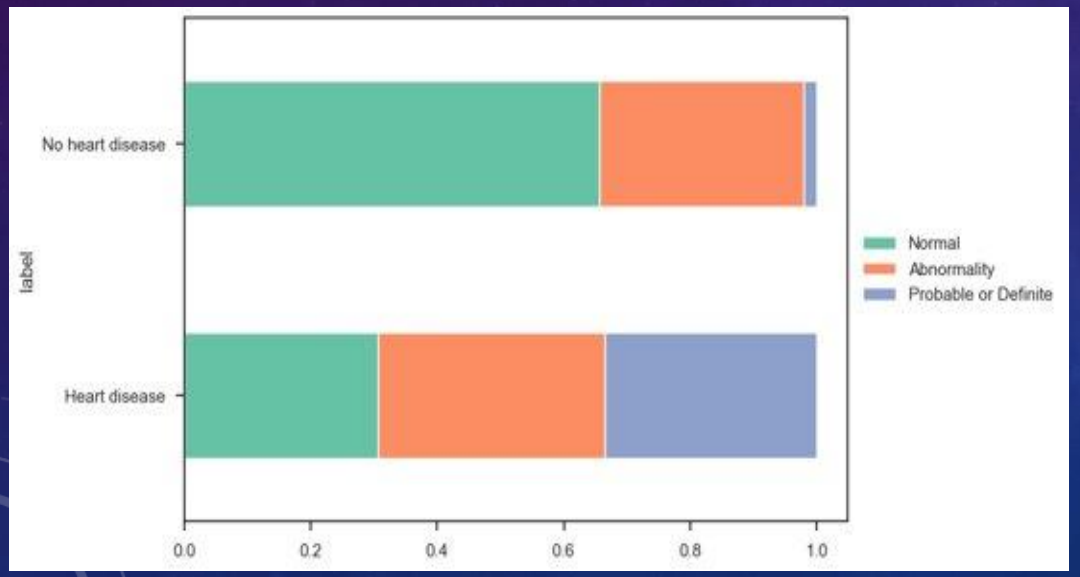


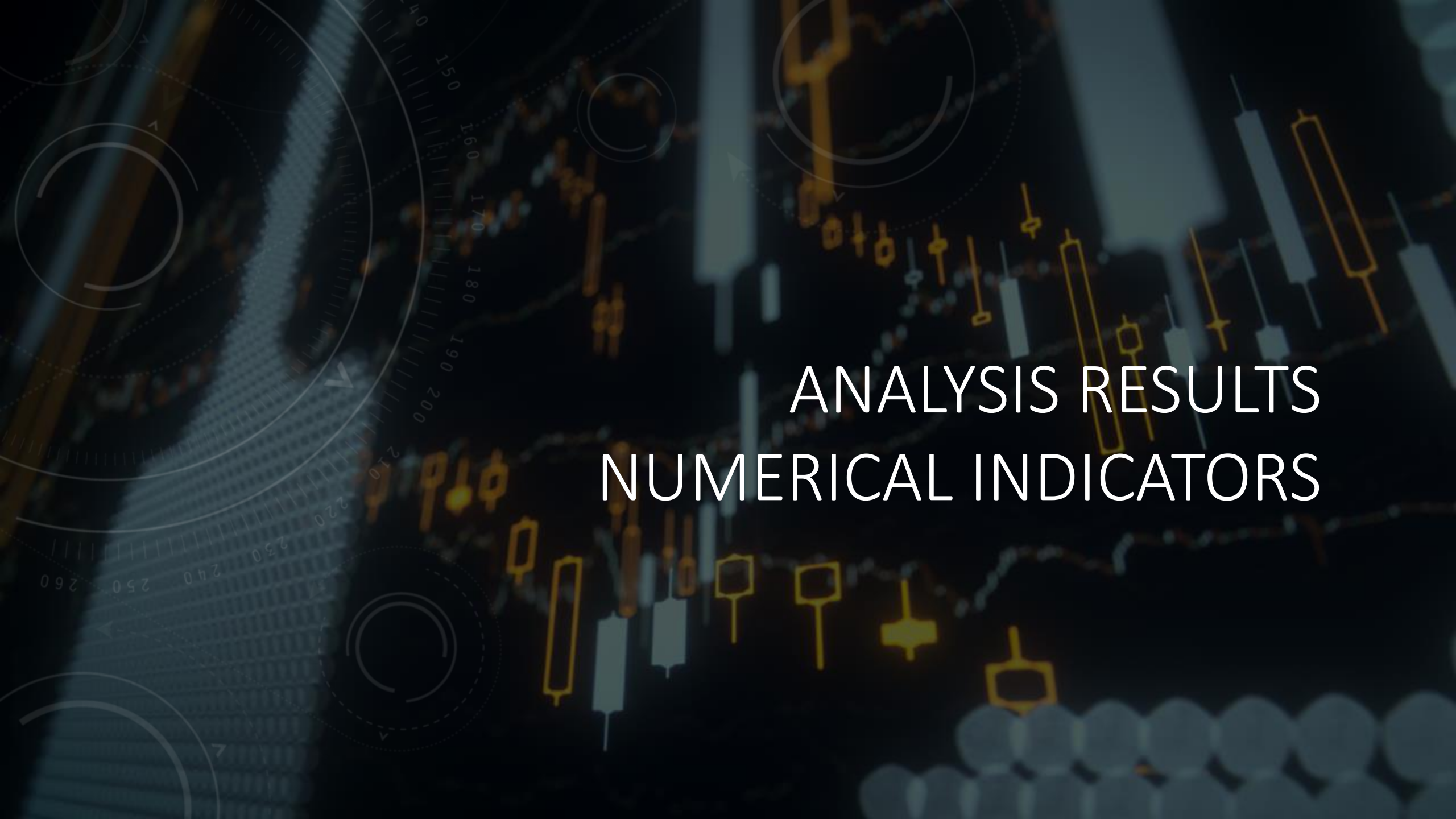




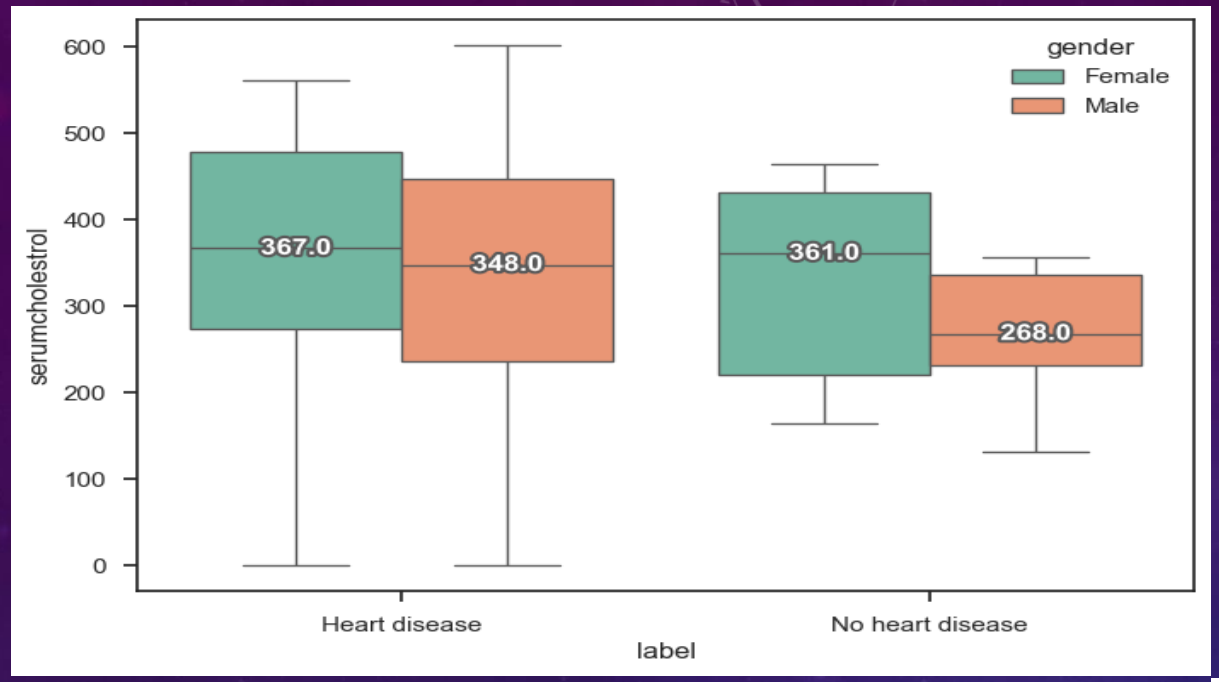
Top: Reported chest pain type.

Bottom: Results of ECG at rest.



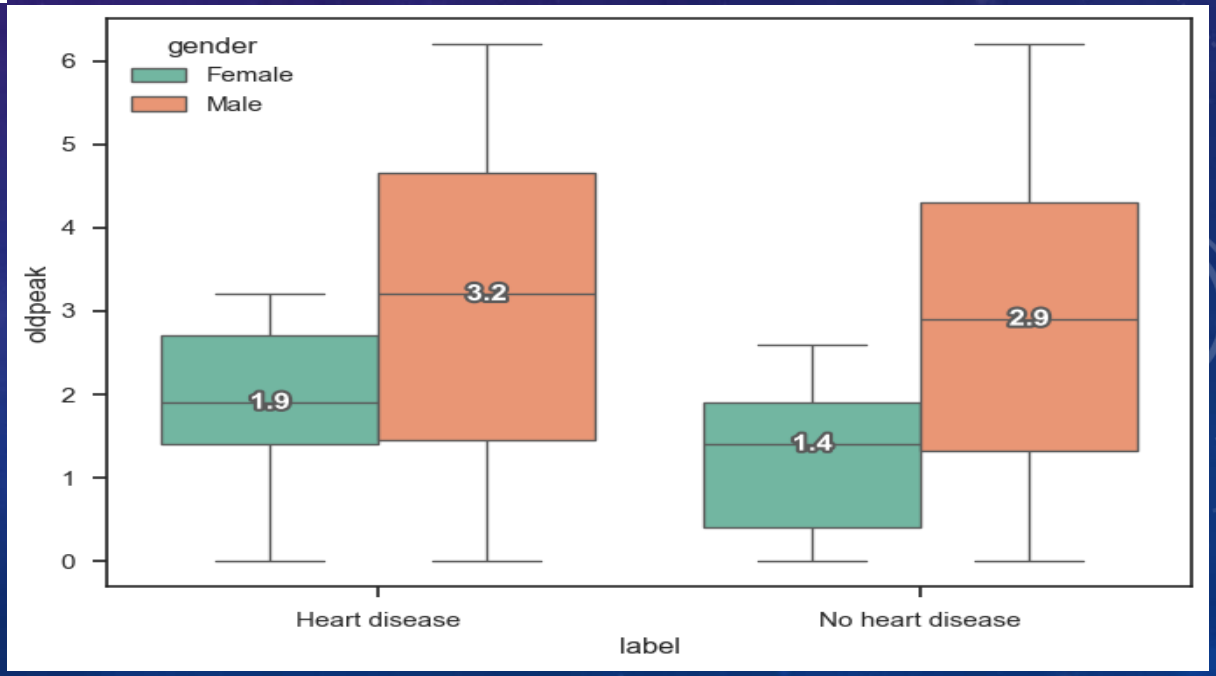


ANALYSIS RESULTS
NUMERICAL INDICATORS

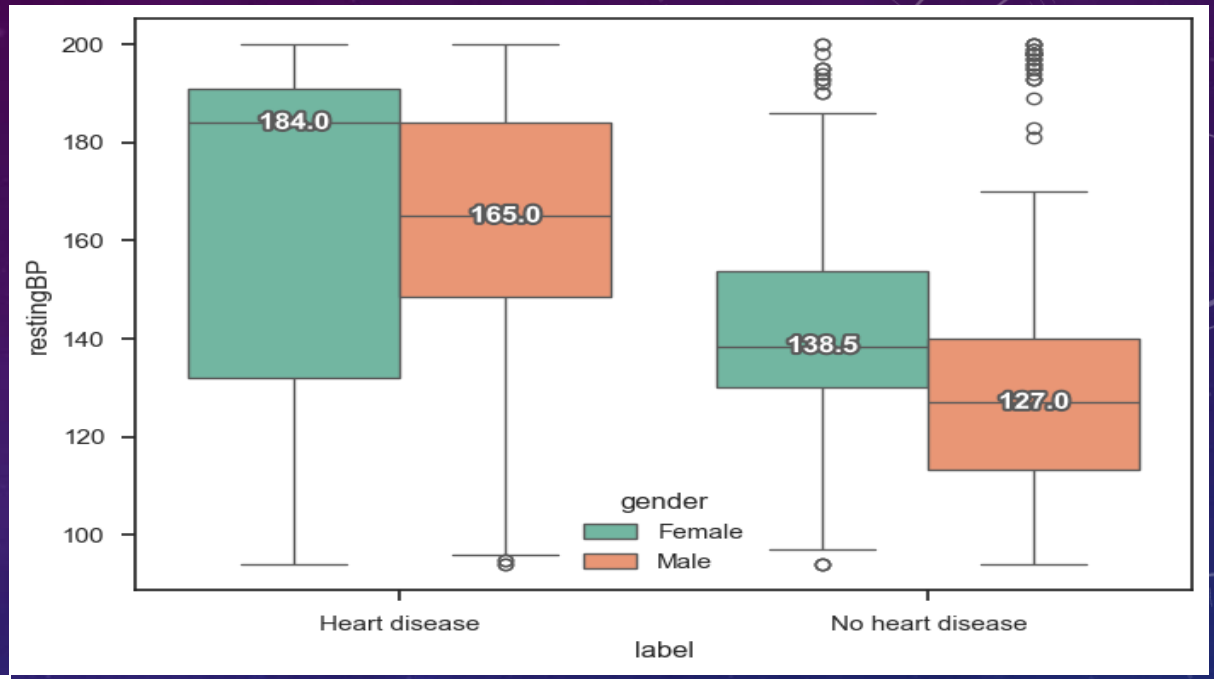


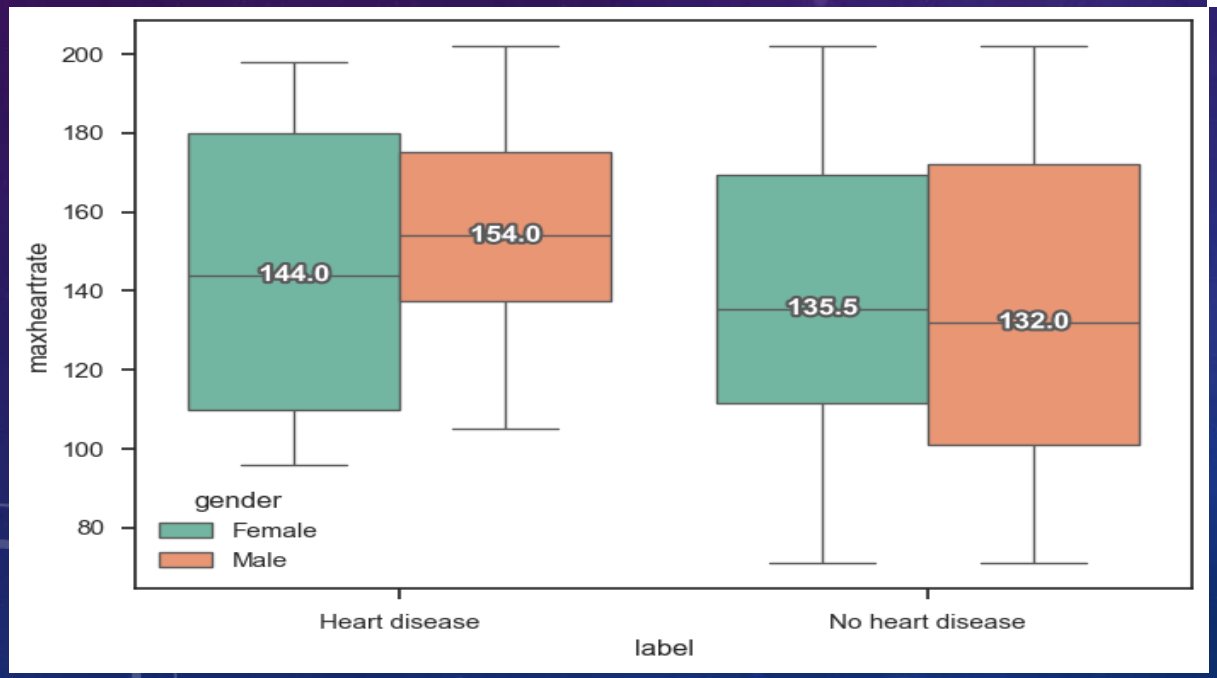
Serum cholesterol detected in blood sample (mg/dl).
In range 126-564 mg/dl.

Oldpeak: measurement of the ST depression (in ECG) induced by exercise compared to at rest.
In range 0-6.2.

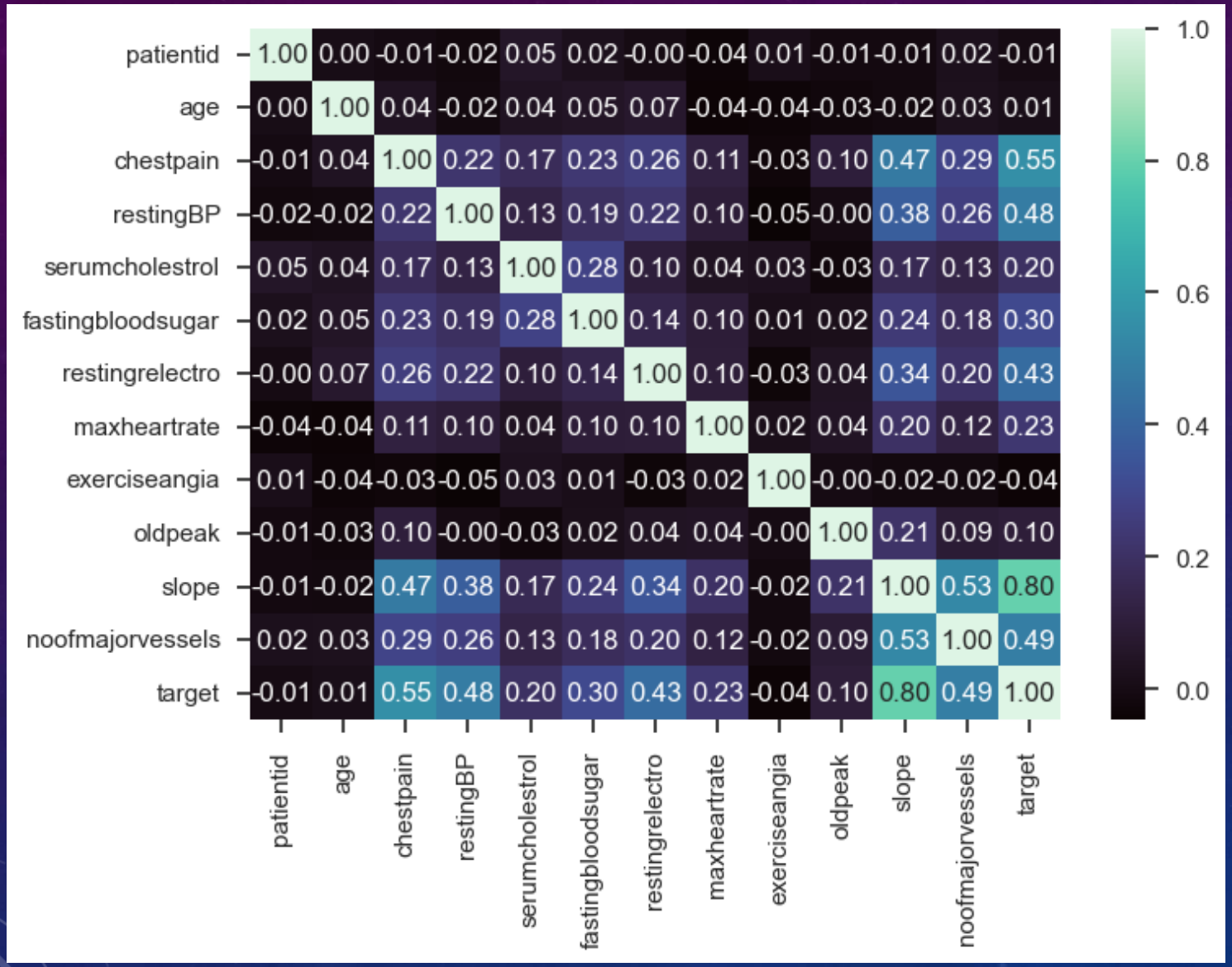


Resting blood pressure (mm/HG)
In range 94-200 mm/HG





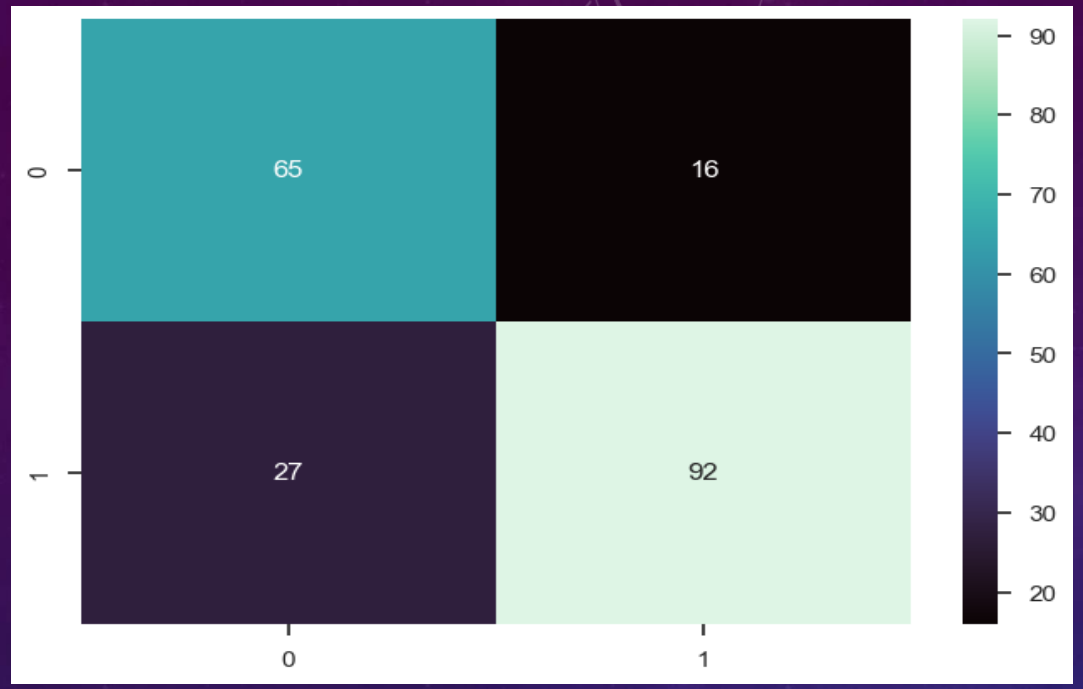
Maximum heart rate achieved during exercise (bpm).
In range 71-202 bpm.



Highest calculated correlation:
Target and Oldpeak

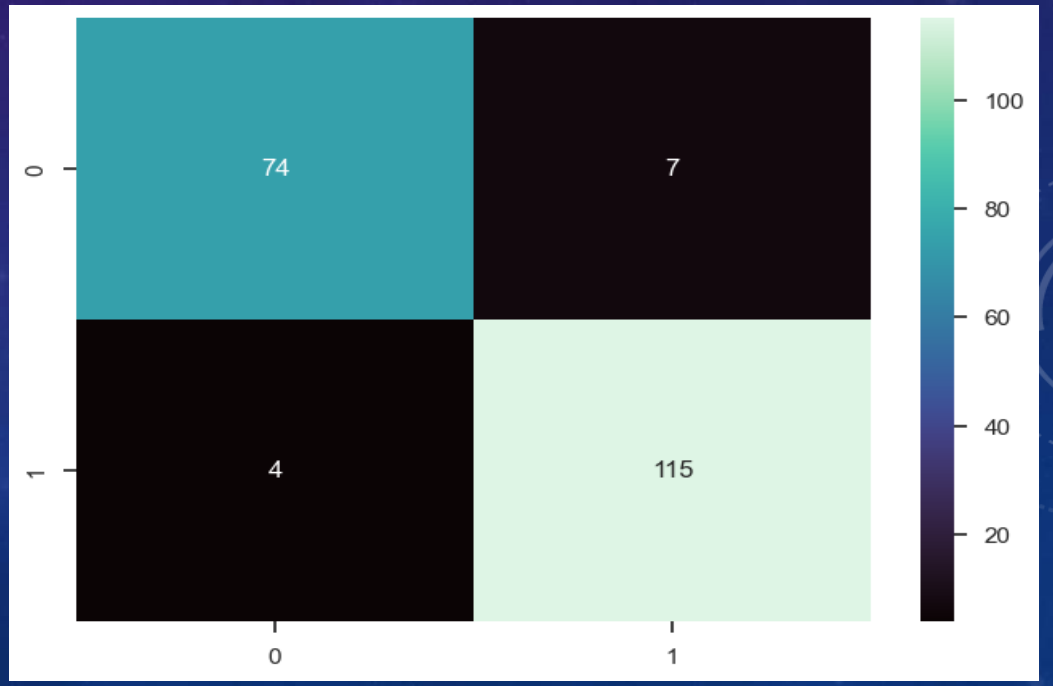
Correlation Matrix

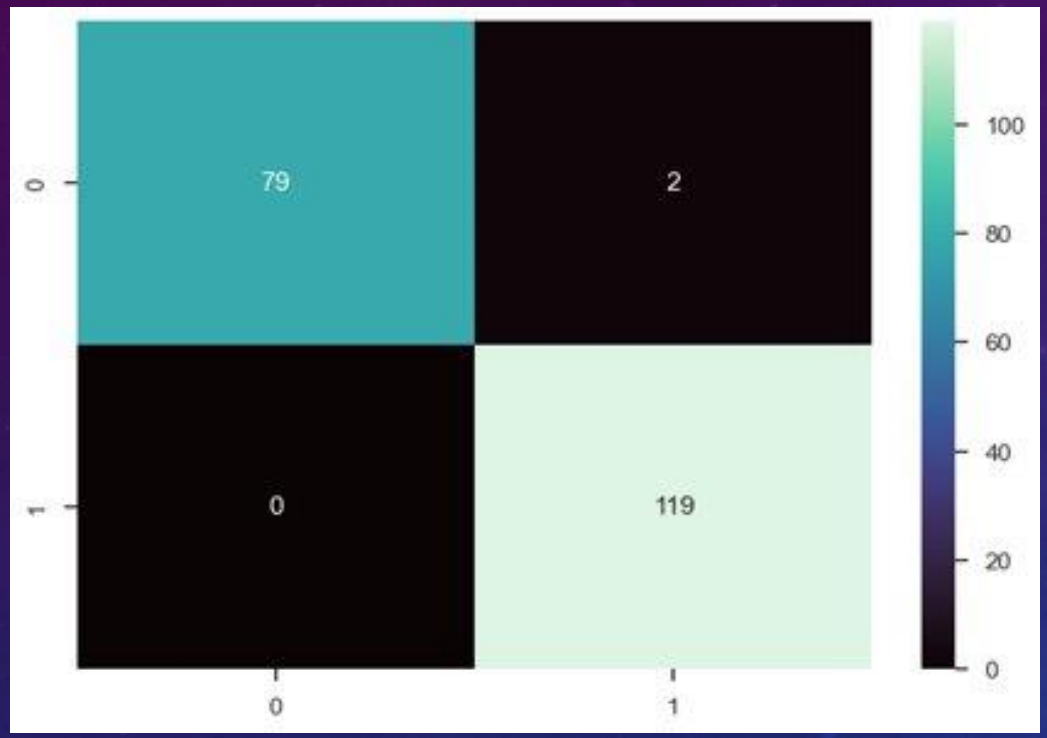
ANALYSIS RESULTS
PREDICTION MODELS



K-Nearest Neighbours.
Avg. Accuracy < 78%.

Decision Trees.
Avg. Accuracy ~ 97%.





Random Forests.
Avg. Accuracy 97-99%

	precision	recall	f1-score	support
0	1.00	0.98	0.99	81
1	0.98	1.00	0.99	119
accuracy			0.99	200
macro avg	0.99	0.99	0.99	200
weighted avg	0.99	0.99	0.99	200

CONCLUSIONS

- Main objective – Generate a prediction model
  - Both Random Forest and Decision Trees classificators could be used.
  - These algorithms could be used in automated assisted diagnosis.
- Gender bias
  - There is a need for more female patients.
  - Numerical data highlighs the differences.
- Categorial features collected show clear indication of correlation.
- Numerical features collected show indications of correlation.

THANK YOU!

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