# Diagnosing Cardiovascular Disease

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Cardiovascular diseases have always been one of the most common causes of death globally. According to the World Health Organization (An estimated 17.9 million people died from CVDs in 2019, representing 32% of all global deaths. ).

# Project Goal

**Diagnosing the cardiovascular disease based on several features and symptoms given by the client I will use the features to determine if the disease exists or not in order to be able to warn the client and notify him either way.**

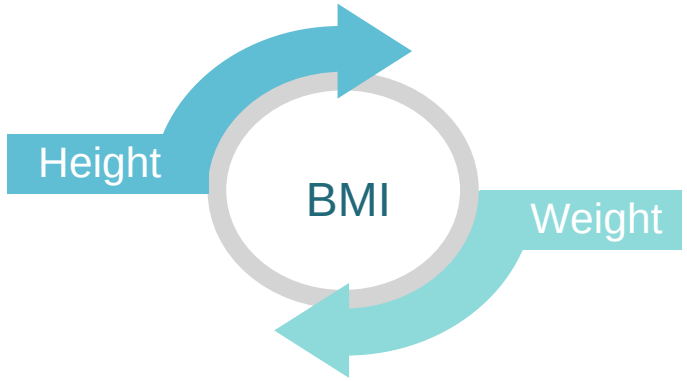
# Project Dataset

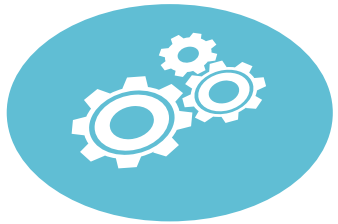
| Feature | Type of Feature | name for Feature in data | Data type |
|---|---|---|---|
| **ID** | Objective | Id | **int** |
| **Age** | Objective | age | **int (days)** |
| **Height** | Objective | height | **int (cm)** |
| **Weight** | Objective | weight | **float (kg)** |
| **Gender** | Objective | gender | **categorical** |
| **Systolic blood pressure** | Examination | ap_hi | **int** |
| **Diastolic blood pressure** | Examination | ap_lo | **int** |
| **Cholesterol** | Examination | cholesterol | **1: normal, 2: above normal, 3: well above normal** |
| **Glucose** | Examination | gluc | **1: normal, 2: above normal, 3: well above normal** |
| **Smoking** | Subjective | smoke | **binary** |
| **Alcohol intake** | Subjective | alco | **binary** |
| **Physical activity** | Subjective | active | **binary** |
| **Presence or absence of cardiovascular disease** | Target | cardio | **binary** |

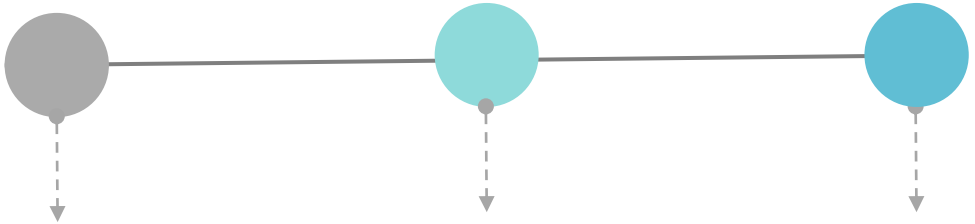
-The dataset from medical examination which were collected at the moment of medical examination.

-Dataset consists of 70000 records of patients data, 12 features + target link

# Data Cleaning





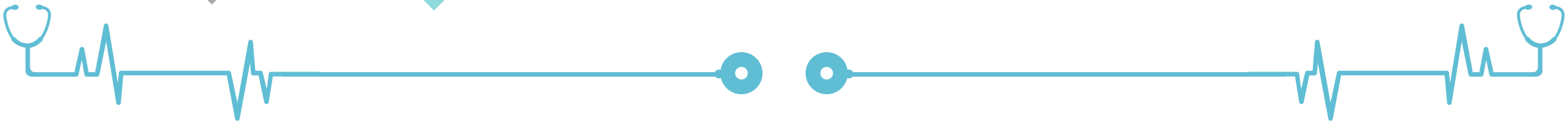
Change age from days to years

Check duplicate

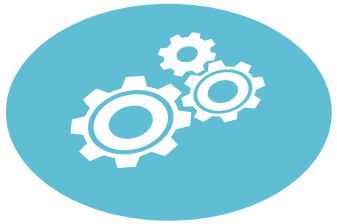
Check missing







# TOOLS:

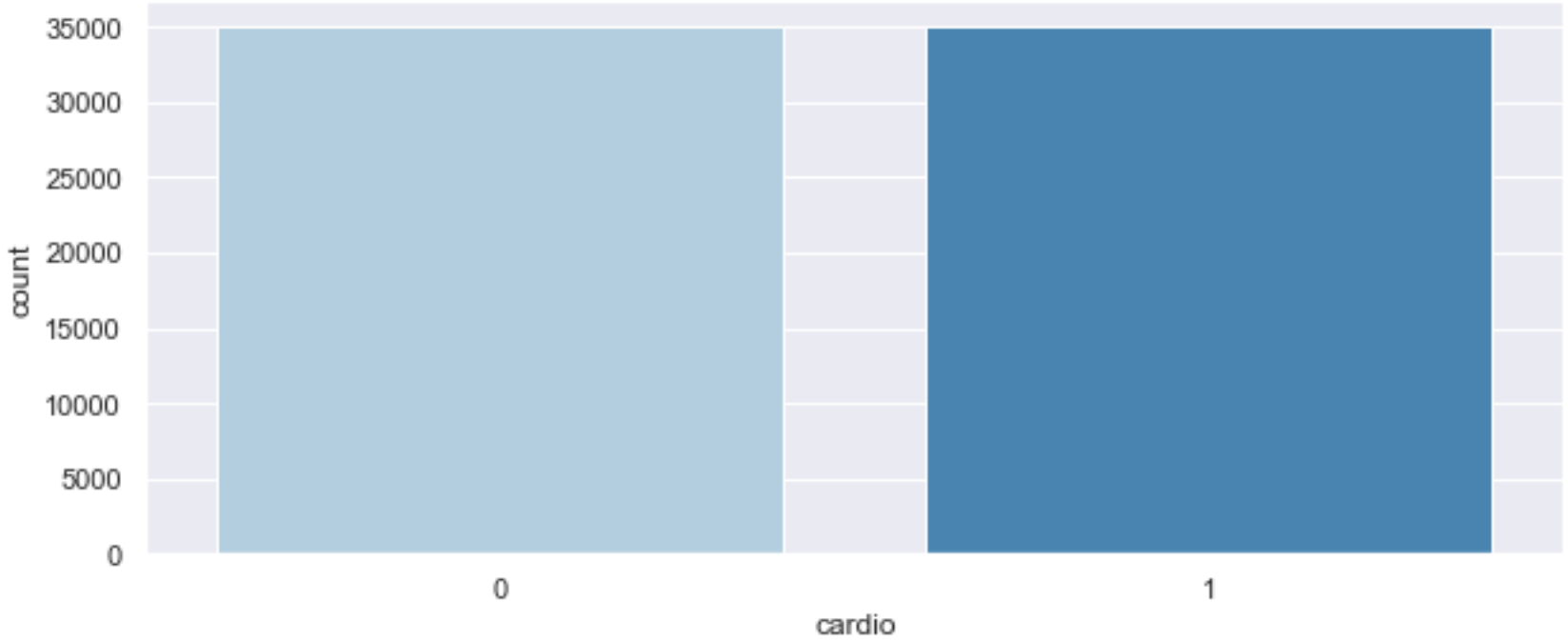


- Programming Language: Python
- Environment: Jupyter notebook
- I used different types of Python libraries for data science :

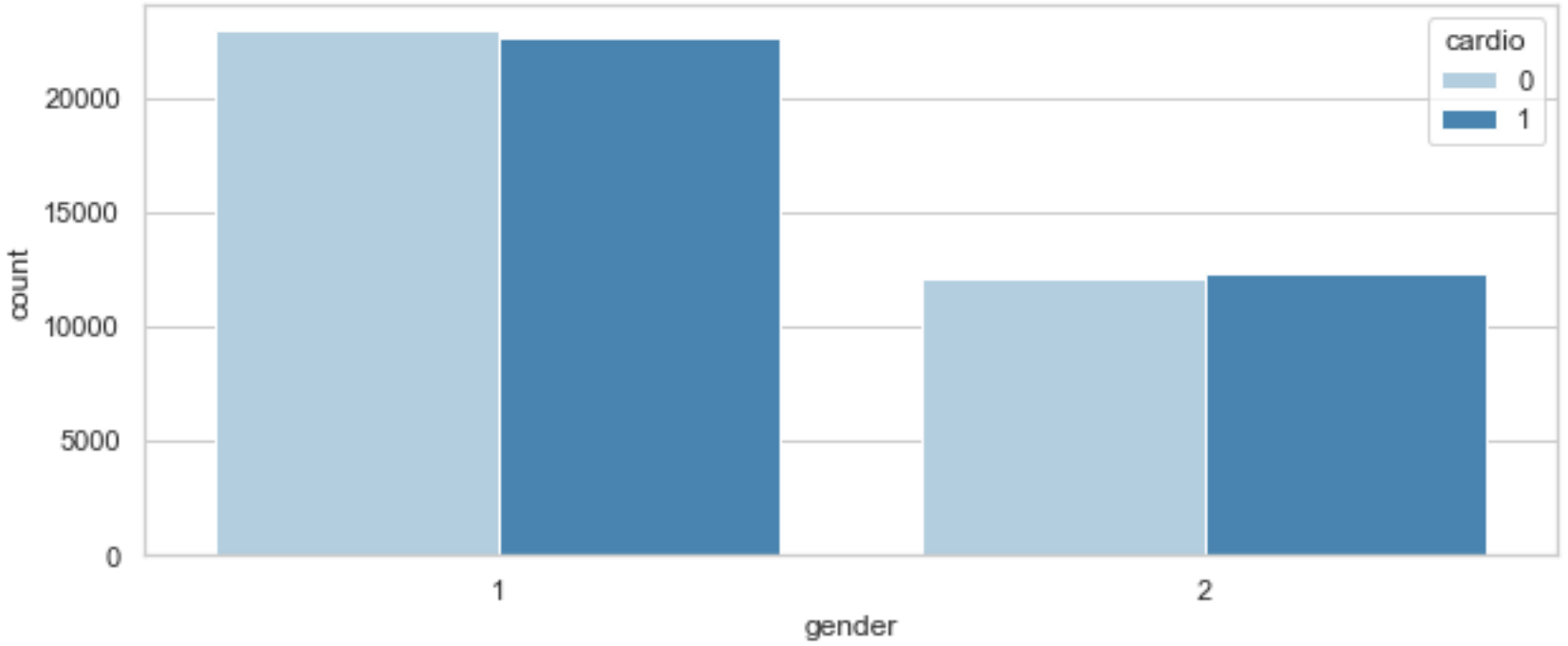
• NumPy
• Seaborn
• Pandas
• Matplotlib
• SciKit-Learn
• Xgboost

# EDA

# Cardiovascular  Disease Cases count

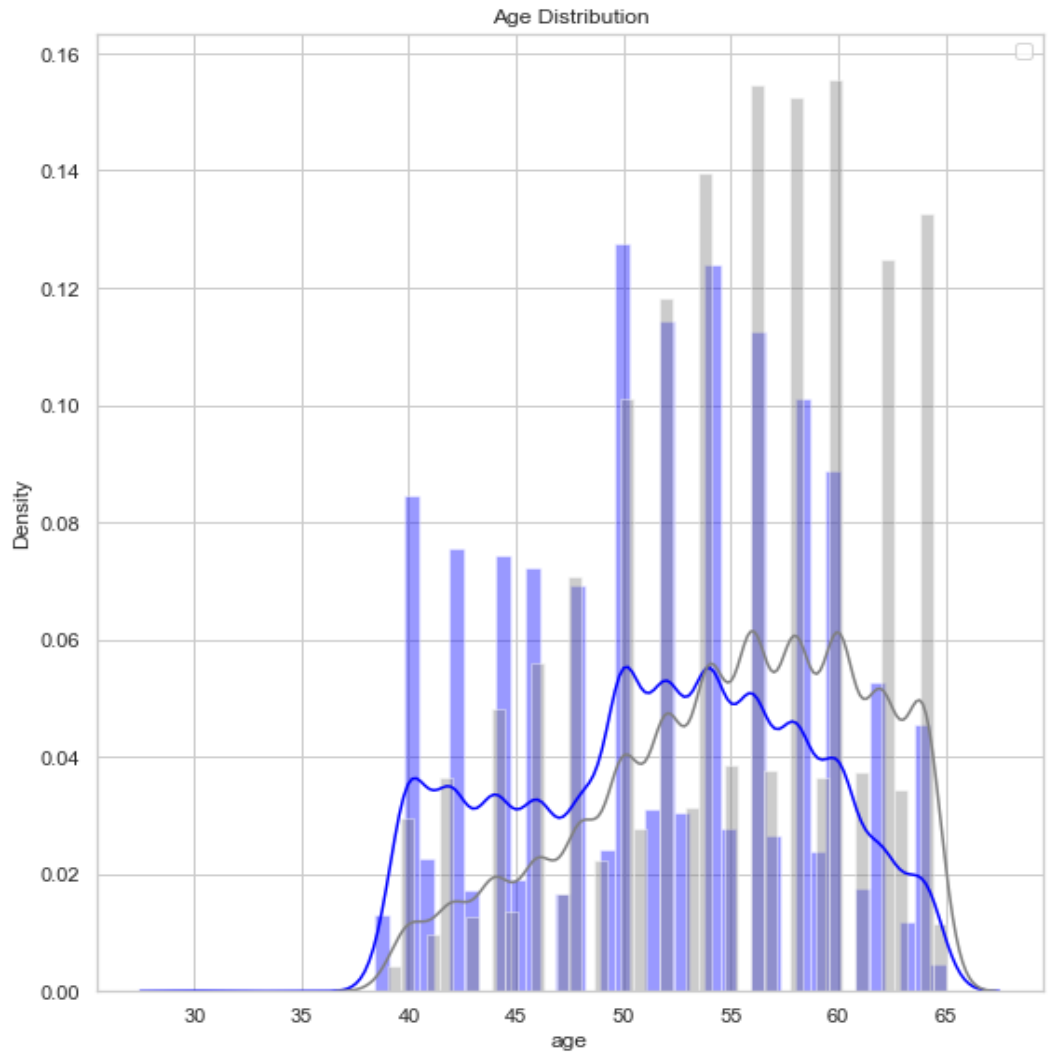


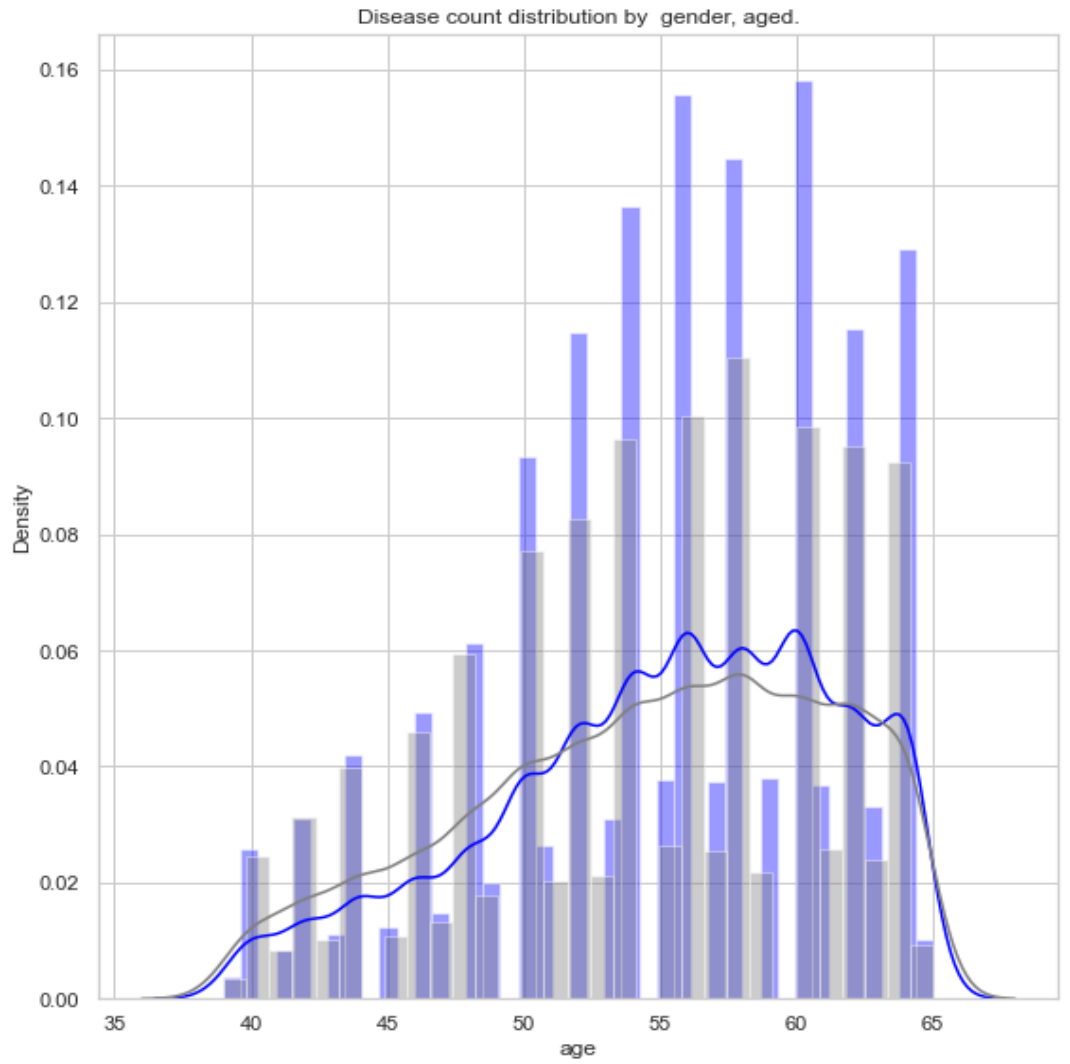
# Cardiovascular  Disease Cases count

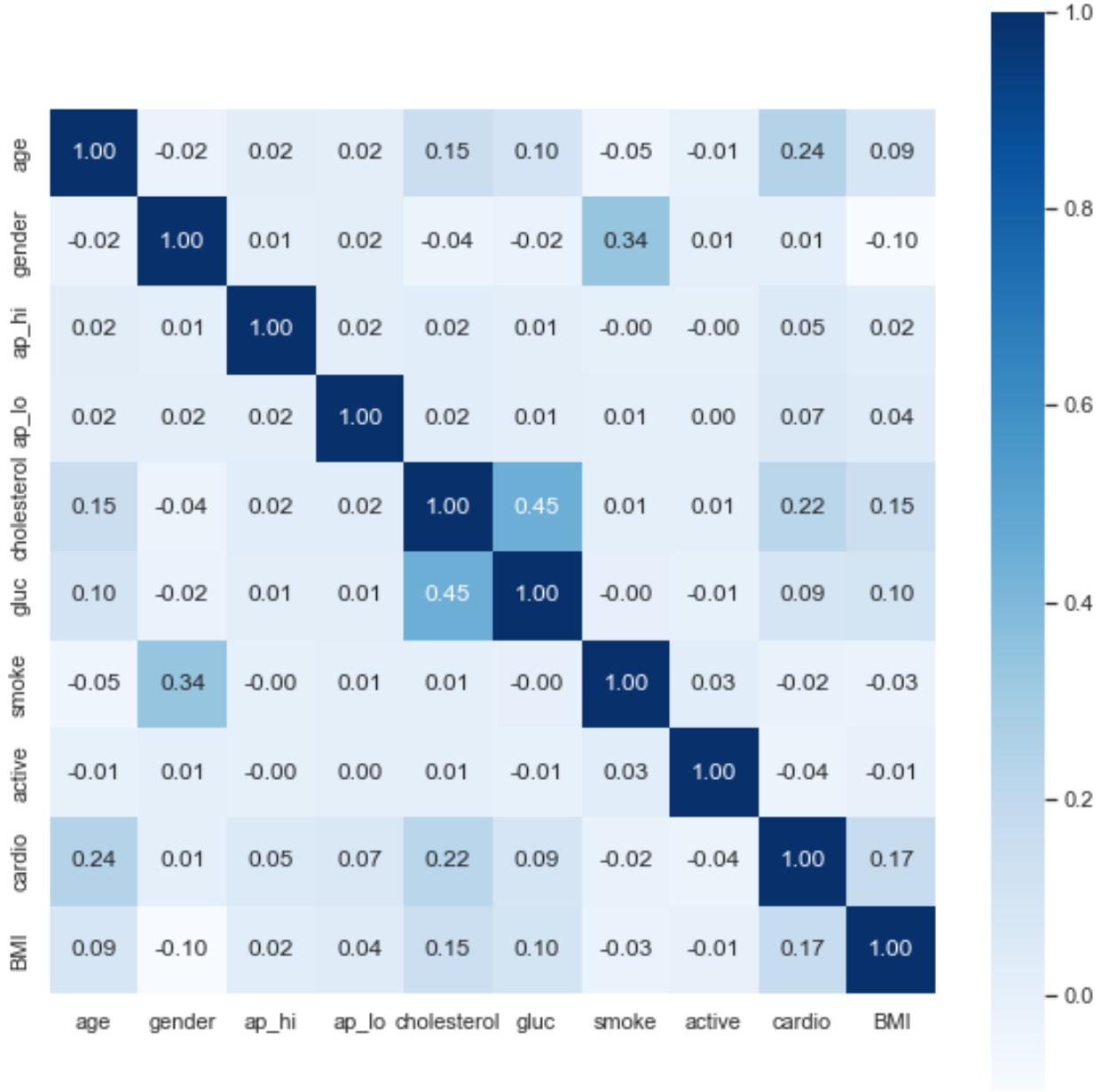



1 for (Female)

2 for (male)


Age Distribution
Density
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
30
35
40
45
50
55
60
65
age


Disease count distribution by gender, aged.
Density
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
35
40
45
50
55
60
65
age

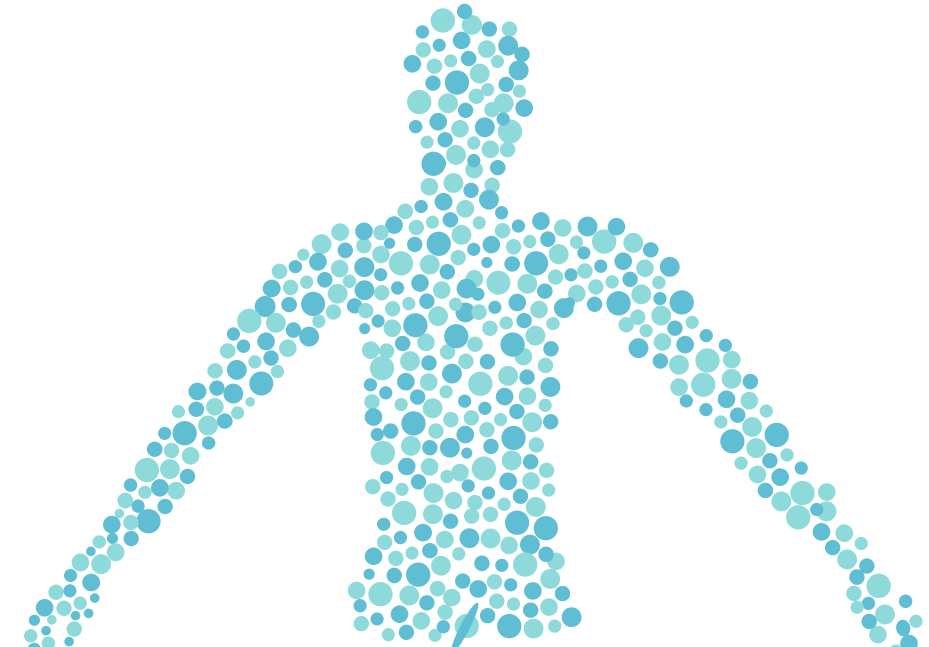

age 1.00 -0.02 0.02 0.02 0.15 0.10 -0.05 -0.01 0.24 0.09
gender -0.02 1.00 0.01 0.02 -0.04 -0.02 0.34 0.01 0.01 -0.10
ap_hi 0.02 0.01 1.00 0.02 0.02 0.01 -0.00 -0.00 0.05 0.02
ap_lo 0.02 0.02 0.02 1.00 0.02 0.01 0.01 0.00 0.07 0.04
cholesterol 0.15 -0.04 0.02 0.02 1.00 0.45 0.01 0.01 0.22 0.15
gluc 0.10 -0.02 0.01 0.01 0.45 1.00 -0.00 -0.01 0.09 0.10
smoke -0.05 0.34 -0.00 0.01 0.01 -0.00 1.00 0.03 -0.02 -0.03
active -0.01 0.01 -0.00 0.00 0.01 -0.01 0.03 1.00 -0.04 -0.01
cardio 0.24 0.01 0.05 0.07 0.22 0.09 -0.02 -0.04 1.00 0.17
BMI 0.09 -0.10 0.02 0.04 0.15 0.10 -0.03 -0.01 0.17 1.00
age gender ap_hi ap_lo cholesterol gluc smoke active cardio BMI
1.0
0.8
0.6
0.4
0.2
0.0

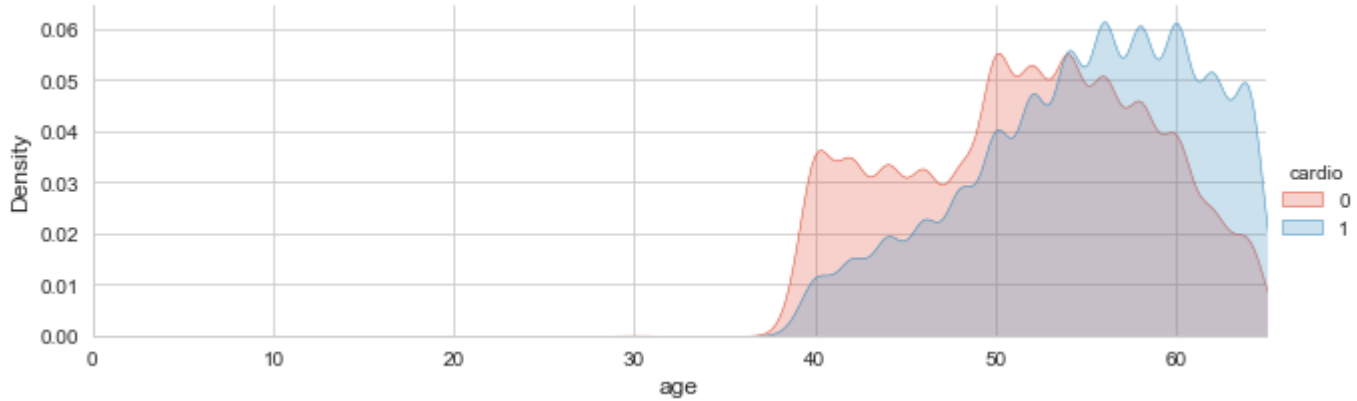
# MODELLING

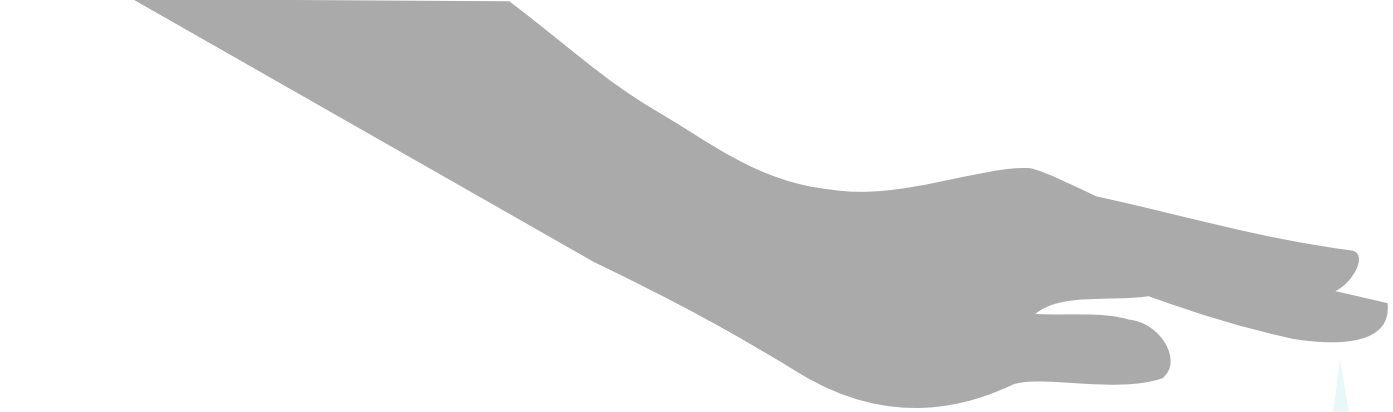
| Model | Accuracy |
| --- | --- |
| Decision Tree | 64% |
| Bagging | 68% |
| Random Forest | 72% |
| Logistic Regression | 72% |
| XGBoost | 74% |

# CONCLUSION

- The beast model was XGBoost
- Knowing the features that cause the disease helps reduce the injury by treating these features.
- In the future, all age groups should be added because of the recent spread of Cardiovascular Disease in age groups under 39.







# Thank You