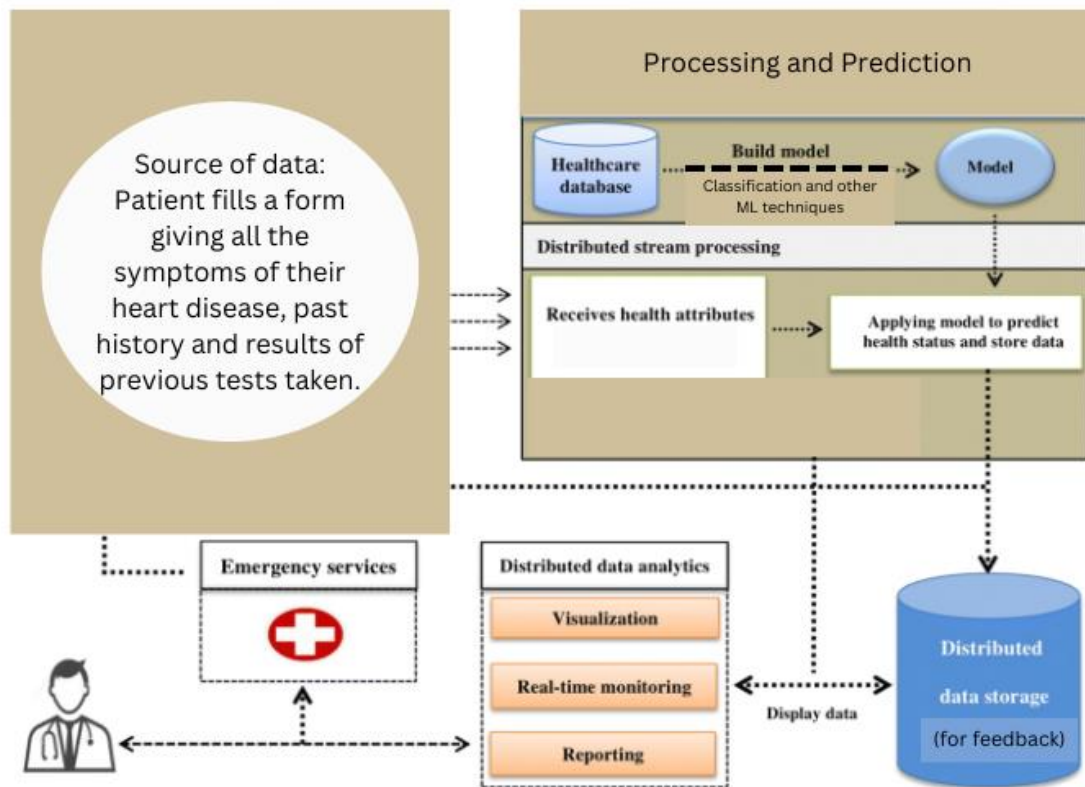


Project Design Phase-I Solution Architecture

Date	19 September 2022
Team ID	PNT2022TMID53144
Project Name	Project - Visualizing and Predicting Heart Diseases with an Interactive Dashboard
Maximum Marks	4 Marks

Solution Architecture:



Heart Disease is a major cause of mortality in modern society. Medical diagnosis is extremely important but it is a complicated task that should be performed accurately and efficiently. Cardiovascular diseases are difficult to detect due to several risk factors including blood pressure, cholesterol, and an abnormal pulse rate. Although there are many systems that can detect heart diseases and other related issues, a system that can monitor heart diseases accurately and gives user-friendly, understandable inferences is a need of the hour.

We use data cleaning techniques to cleanse the data collected, design a model that can accurately categorise and predict results using data mining techniques.

With the model, users can now interact, input their symptoms and get an accurate result of their disease. The results are displayed and visualised using an interactive dashboard and steps to cure and treat the disease is also given.

Dataset used and Parameters involved:

The dataset consists of 303 individuals' data. There are 14 columns in the dataset, which are described below.

- 1.Age
- 2.Sex
- 3.Chest pain type
- 4.BP
- 5.Cholesterol
- 6.FBS over 120
- 7.EKG results
- 8.Max HR
- 9.Exercise angina
- 10.ST depression
- 11.Slope of ST
- 12.Number of vessels fluro
- 13.Thallium
- 14.Heart Disease

Age: Age is the most important risk factor in developing cardiovascular or heart diseases, with approximately a tripling of risk with each decade of life. Coronary fatty streaks can begin to form in adolescence. It is estimated that 82 percent of people who die of coronary heart disease are 65 and older. Simultaneously, the risk of stroke doubles every decade after age 55.

Sex:Men are at greater risk of heart disease than pre-menopausal women. Once past menopause, it has been argued that a woman's risk is similar to a man's although more recent data from the WHO and UN disputes this. If a female has diabetes, she is more likely to develop heart disease than a male with diabetes.

Chest Pain:Angina is chest pain or discomfort caused when your heart muscle doesn't get enough oxygen-rich blood. It may feel like pressure or squeezing in your chest. The discomfort also can occur in your shoulders, arms, neck, jaw, or back. Angina pain may even feel like indigestion.

Blood Pressure: Over time, high blood pressure can damage arteries that feed your heart. High blood pressure that occurs with other conditions, such as obesity, high cholesterol or diabetes, increases your risk even more.

Cholesterol: A high level of low-density lipoprotein (LDL) cholesterol (the “bad” cholesterol) is most likely to narrow arteries. A high level of triglycerides, a type of blood fat related to your diet, also ups your risk of a heart attack. However, a high level of high-density lipoprotein (HDL) cholesterol (the “good” cholesterol) lowers your risk of a heart attack.

Fasting Blood Sugar: Not producing enough of a hormone secreted by your pancreas (insulin) or not responding to insulin properly causes your body’s blood sugar levels to rise, increasing your risk of a heart attack

Resting ECG: For people at low risk of cardiovascular disease, the USPSTF concludes with moderate certainty that the potential harms of screening with resting or exercise ECG equal or exceed the potential benefits. For people at intermediate to high risk, current evidence is insufficient to assess the balance of benefits and harms of screening

Max heart rate achieved: The increase in cardiovascular risk, associated with the acceleration of heart rate, was comparable to the increase in risk observed with high blood pressure. It has been shown that an increase in heart rate by 10 beats per minute was associated with an increase in the risk of cardiac death by at least 20%, and this increase in the risk is similar to the one observed with an increase in systolic blood pressure by 10 mm Hg.

Exercise induced angina: The pain or discomfort associated with angina usually feels tight, gripping or squeezing, and can vary from mild to severe. Angina is usually felt in the centre of your chest but may spread to either or both of your shoulders, or your back, neck, jaw or arm. It can even be felt in your hands.

o Types of Angina

a. Stable Angina / Angina Pectoris

b. Unstable Angina

c. Variant (Prinz metal) Angina

d. Microvascular Angina.

Peak exercise ST segment: A treadmill ECG stress test is considered abnormal when there is a horizontal or down-sloping ST-segment depression ≥ 1 mm at 60–80 ms after the J point. Exercise ECGs with up-sloping ST-segment depressions are typically reported as an ‘equivocal’ test. In general, the occurrence of horizontal or down-sloping ST-segment depression at a lower workload (calculated in METs) or heart rate indicates a worse prognosis and higher likelihood of multi-vessel disease. The duration of ST-segment depression is also important, as prolonged recovery after peak stress is consistent with a positive treadmill ECG stress test. Another finding that is highly indicative of significant CAD is the occurrence of ST-segment elevation > 1 mm (often suggesting transmural ischemia); these patients are frequently referred urgently for coronary angiography.

Notes about the dataset:

Patients from age 29 to 79 have been selected in this dataset. Male patients are denoted by a gender value 1 and female patients are denoted by gender value 0. Four types of chest pain can be considered as indicative of heart disease. Type 1 angina is caused by reduced blood flow to the heart muscles because of narrowed coronary arteries. Type 1 Angina is a chest pain that occurs during mental or emotional stress. Non-angina chest pain may be caused due to various reasons and may not often be due to actual heart disease. The fourth type, Asymptomatic, may not be a symptom of heart disease. The next attribute trestbps is the reading of the resting blood pressure. Chol is the cholesterol level. Fbs is the fasting blood

sugar level; the value is assigned as 1 if the fasting blood sugar is below 120 mg/dl and 0 if it is above. Restecg is the resting electrocardiographic result, thalach is the maximum heart rate, exang is the exercise induced angina which is recorded as 1 if there is pain and 0 if there is no pain, oldpeak is the ST depression induced by exercise, slope is the slope of the peak exercise ST segment, ca is the number of major vessels colored by fluoroscopy, thal is the duration of the exercise test in minutes, and num is the class attribute. The class attribute has a value of 0 for normal and 1 for patients diagnosed with heart disease.