Effective Heart Disease Prediction Using IBM Auto AI Service

1. Introduction

Cardiovascular diseases (CVDs) are the number 1 cause of death globally, taking an estimated 17.9 million lives each year, which accounts for 31% of all deaths worldwide. People with cardiovascular disease or who are at high cardiovascular need early detection and management wherein a machine learning model can be of great help. Healthcare industries generate enormous amount of data on CVDs that accommodates hidden knowledge or pattern for decision making. The huge volume of such data may be used by supervised learning methods to make decision which is more accurate than intuition.

In this project, we train most sophisticated binary classification algorithms using Auto AI and choose the best performing method. We also build a web application where we can showcase the prediction of heart failure using the selected best performing method.

2. Proposed Solution:

The code pattern of the project can be thought of as two distinct parts:

i) A predictive model is built using AutoAI on IBM Cloud Pak for Data. The model is then deployed to the Watson Machine Learning service.

ii) An application is built using Node-RED which takes inputs from the user and showcases the prediction of heart failure on UI, via an API call to the Watson Machine Learning service.

2.1 Prerequisites

* An IBM Cloud Account (https://cloud.ibm.com)

* An account on IBM Cloud Pak for Data (https://dataplatform.cloud.ibm.com/).

2.2 Architecture

The project is created using Watson Studio (https://www.ibm.com/cloud/watson-studio). A model is created with AutoAI by uploading data. The data is backed up and stored on Cloud Object Storage. The model is deployed using the Watson Machine Learning service. A [Node.js](https://nodejs.org/) web app is deployed on IBM Cloud. It calls the predictive model hosted on the Watson Machine Learning service. A user visits the web app, enters their information, and the predictive model returns a response. Figure 1 depicts the whole

process. The project flow is shown step by step with screen shots. The dataset used to train the model, contains 9 features, that is used to predict mortality by heart failure.

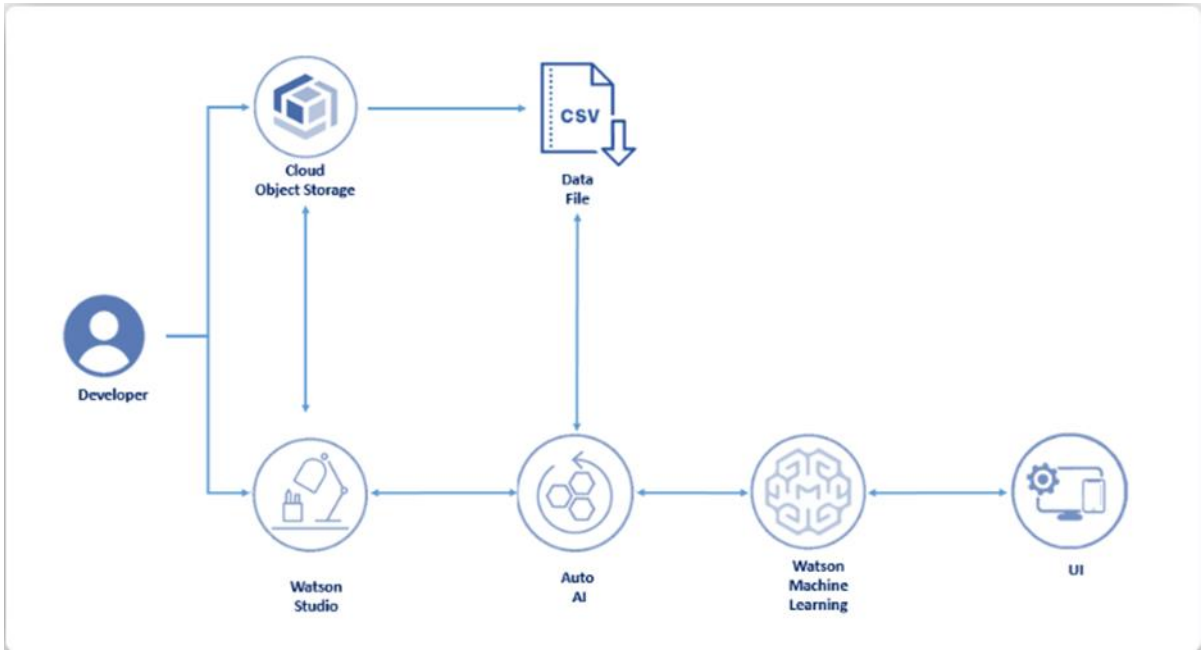

Fig 1: Architecture of the Model

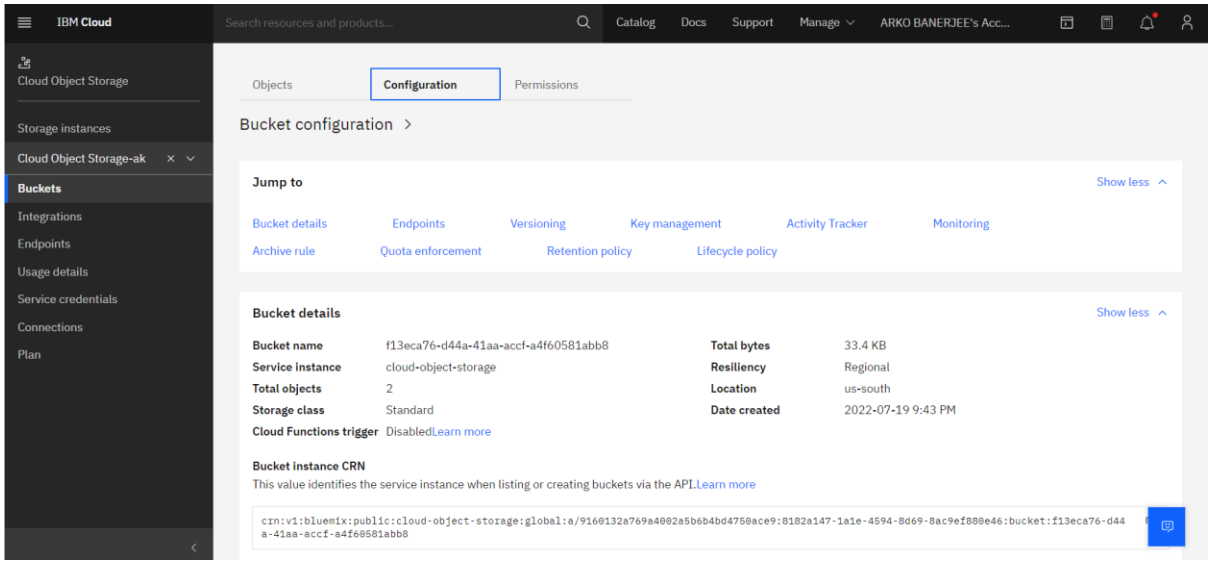

Fig 2: The data is backed up and stored on Cloud Object Storage.

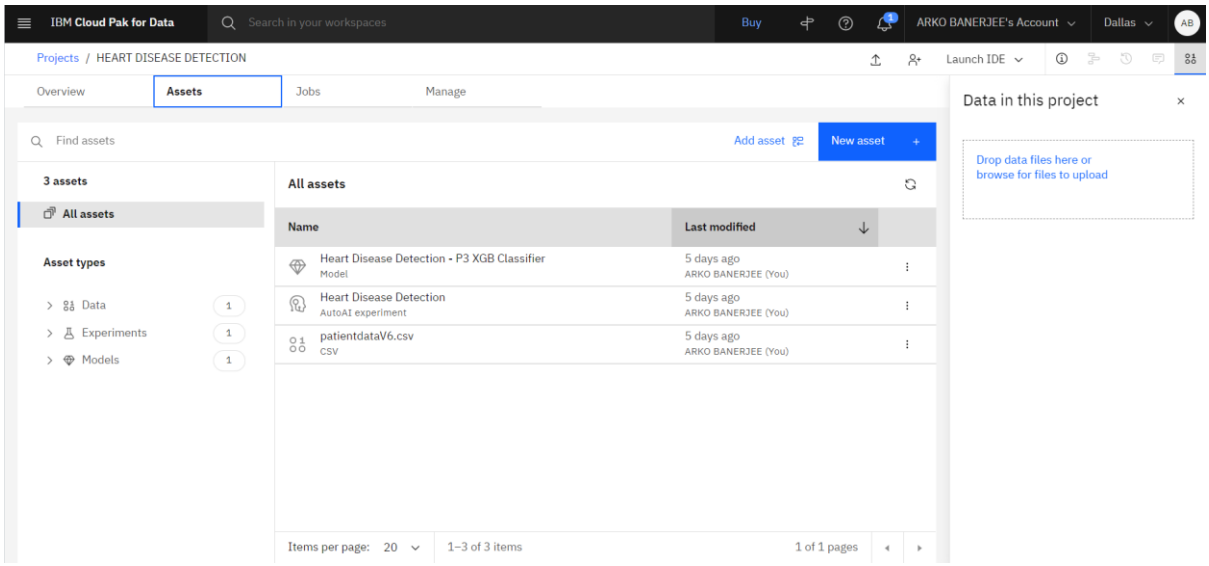

Fig 3: A model is created with AutoAI by uploading data.

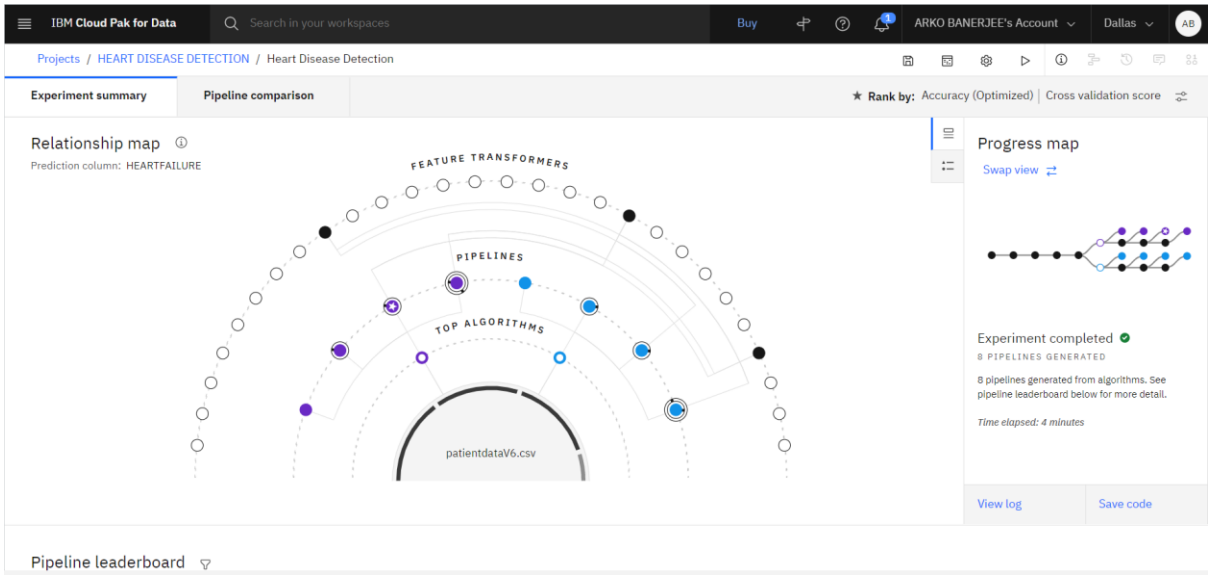

Fig 4: Binary Classification algorithms are applied by Auto AI

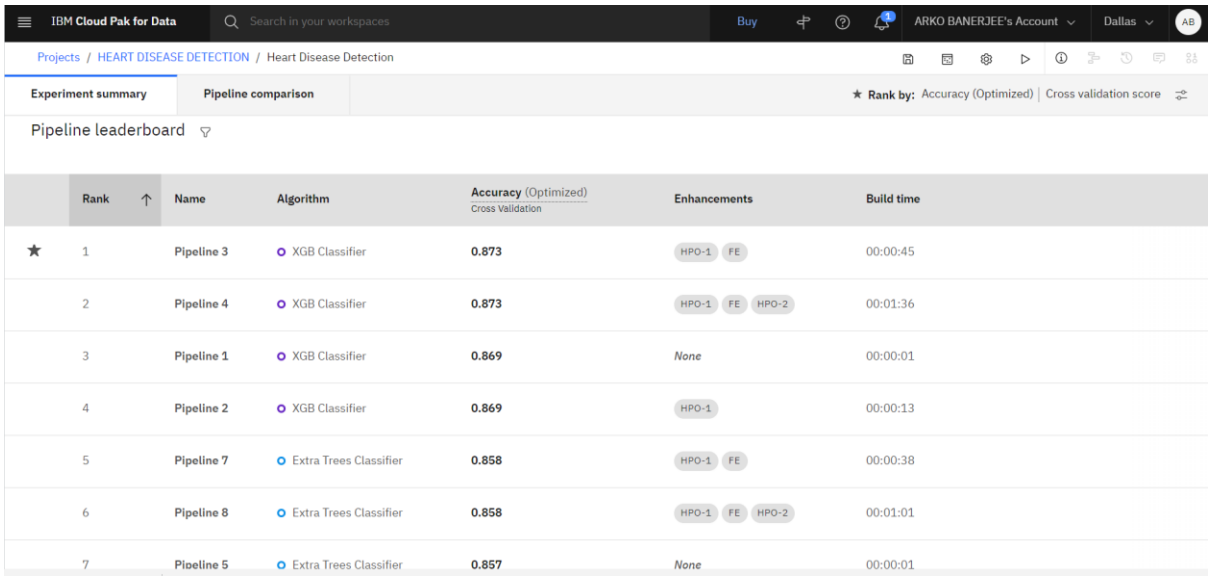

Fig 5: Binary Classification methods are sorted according to their performances.

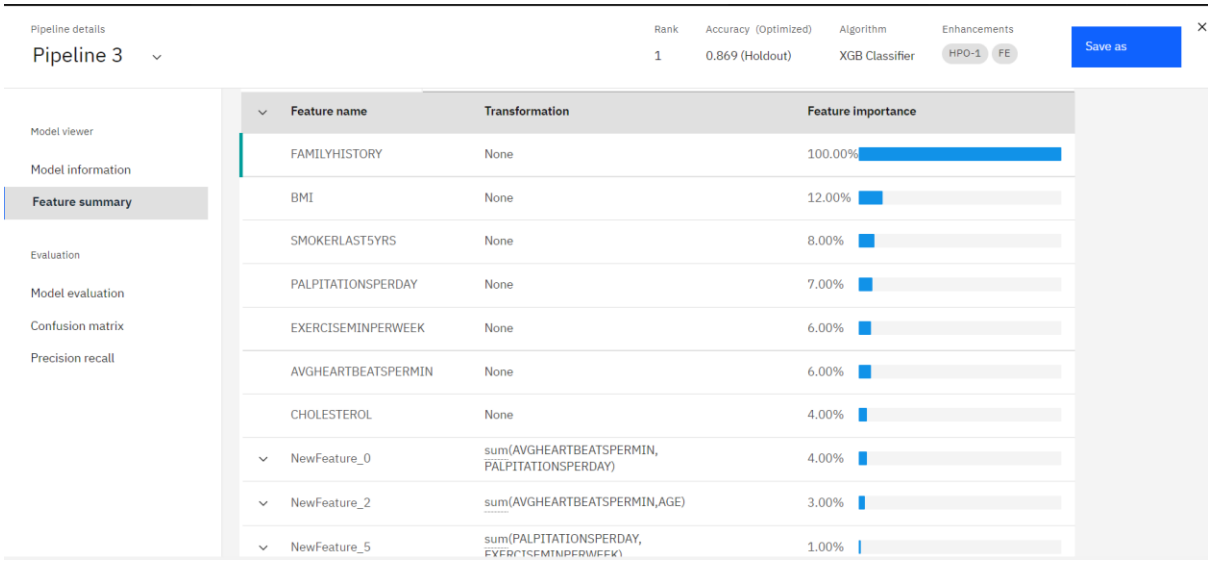

Fig 6: Importance of features in the data is evaluated by the model

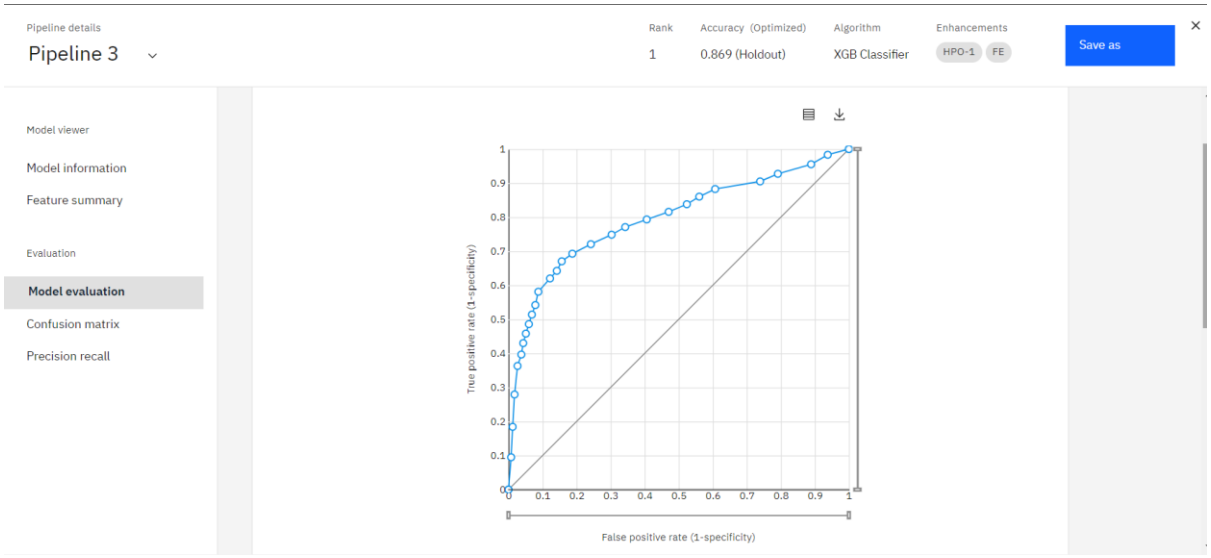

Fig 7: ROC

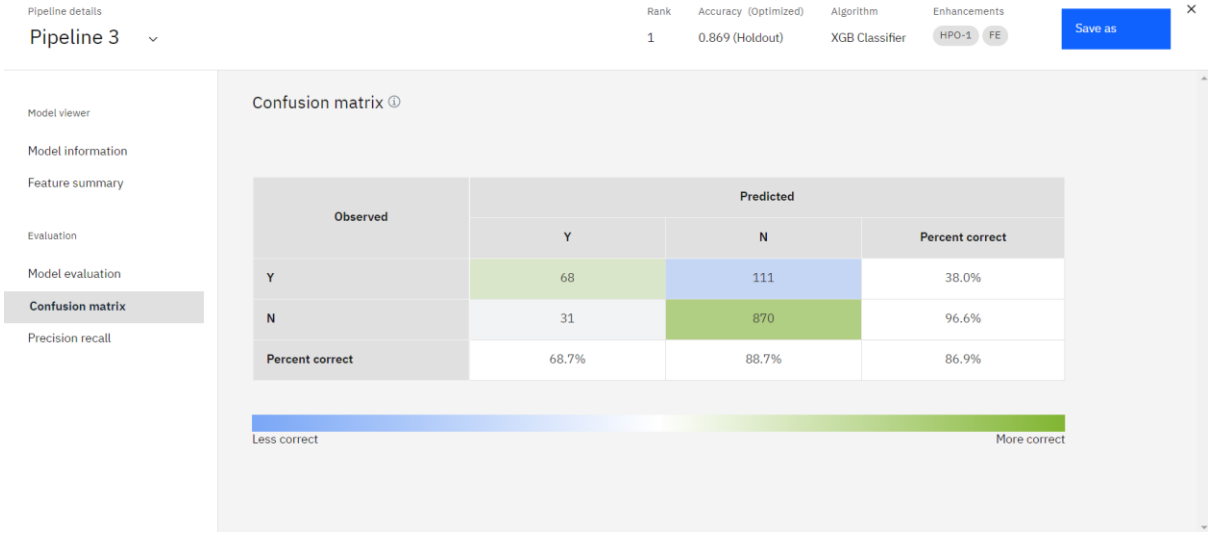

Fig 8: Confusion Matrix

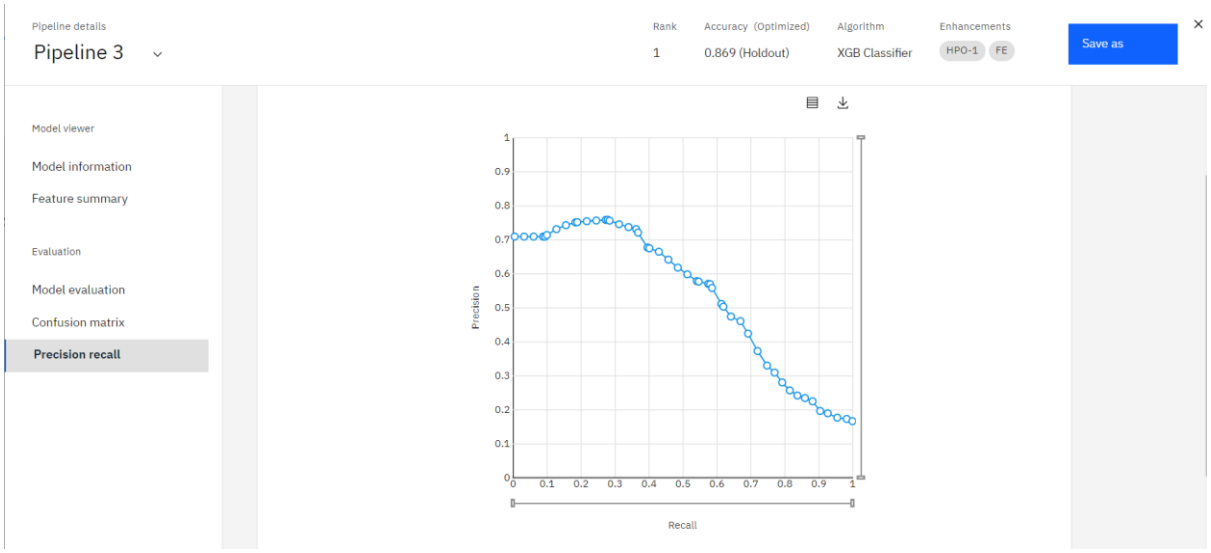

Fig 9: Precision Recall

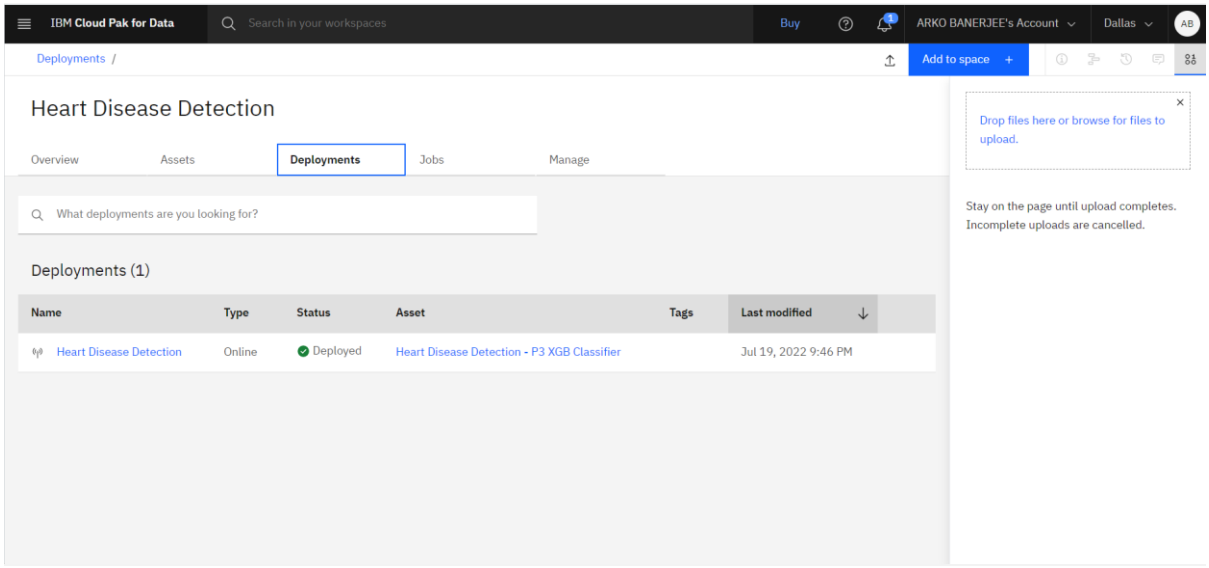

Fig 10: Deployment of Model

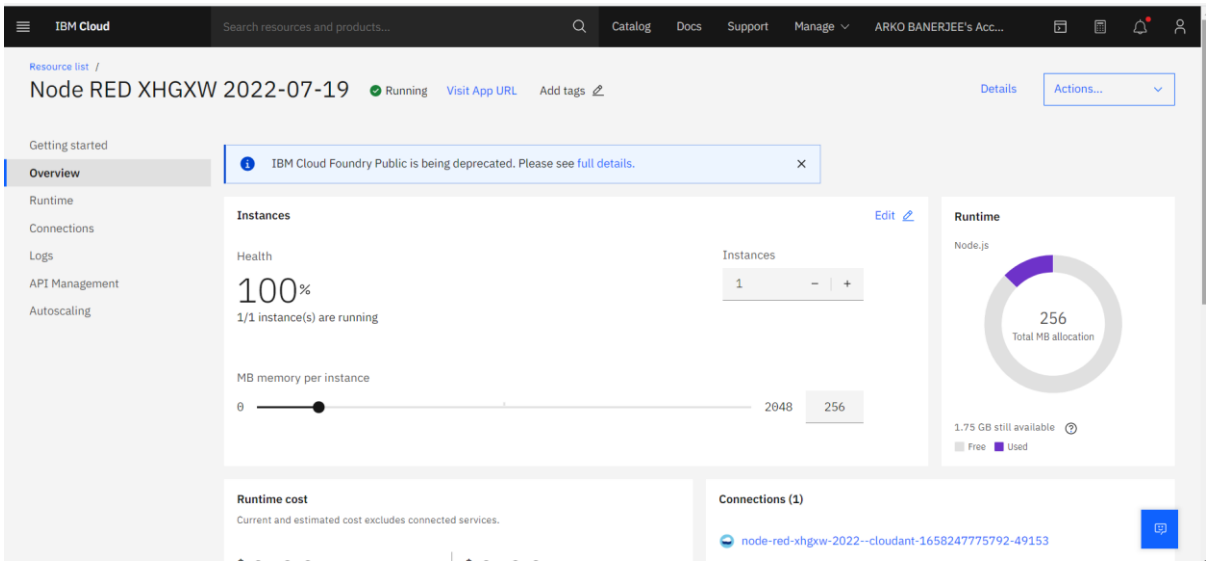

Fig 11: Node RED app creation

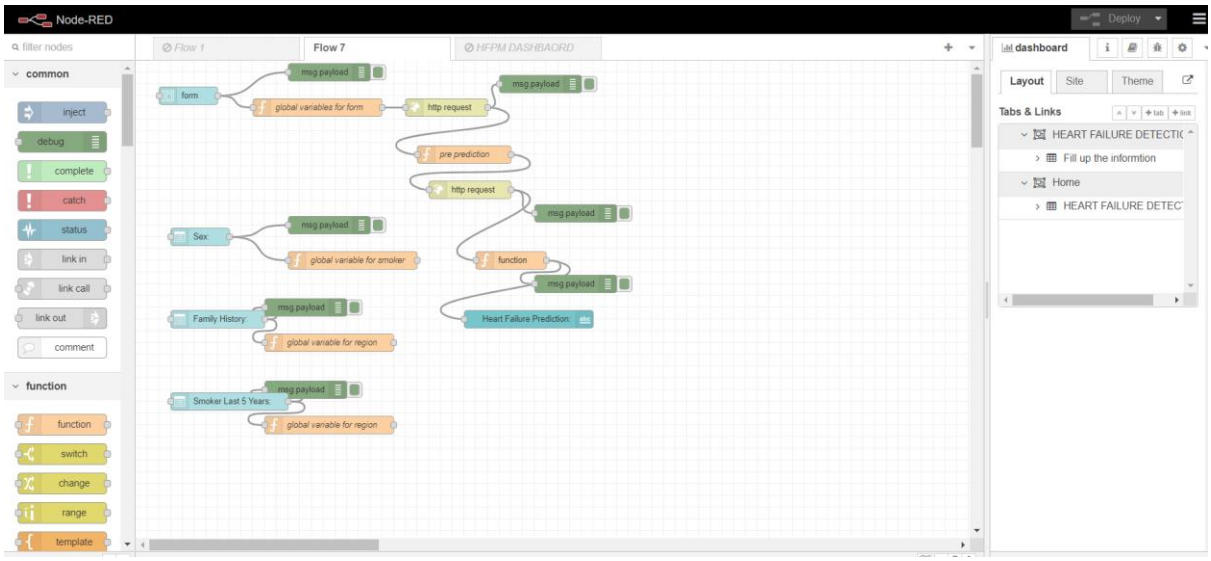

Fig 12: Node RED dashboard

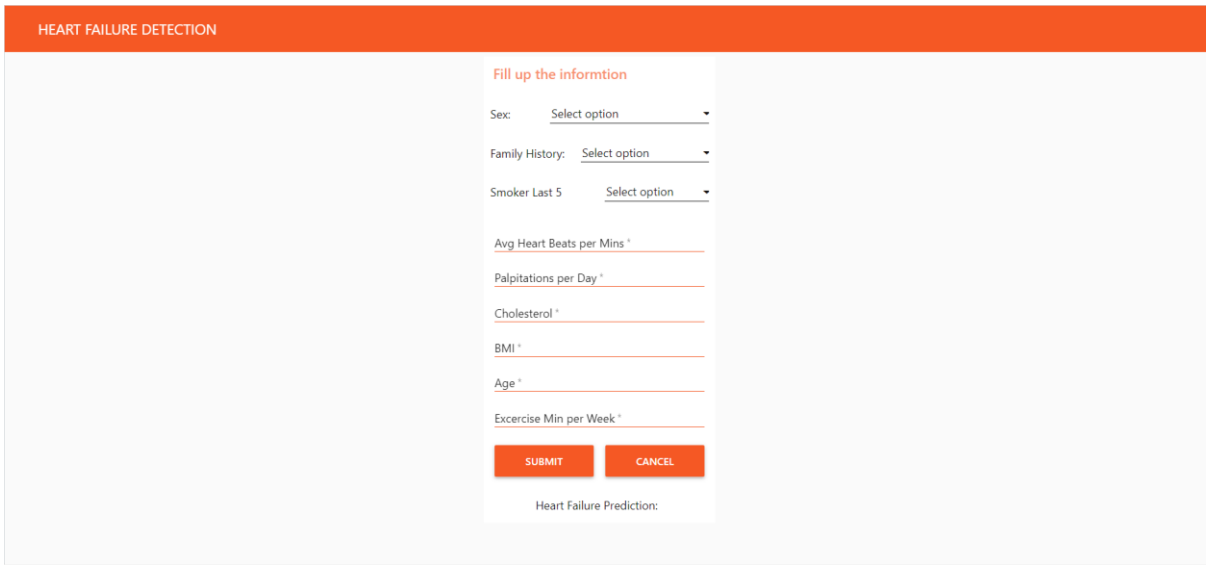

Fig 13: Node RED UI

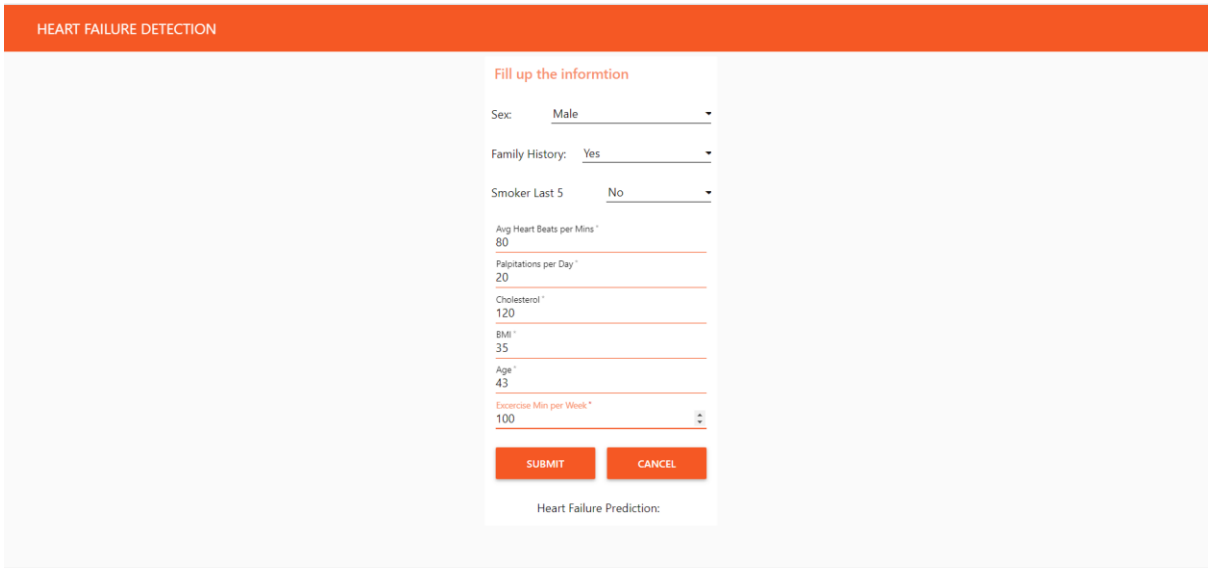

Fig 14: User Input values into Node RED UI

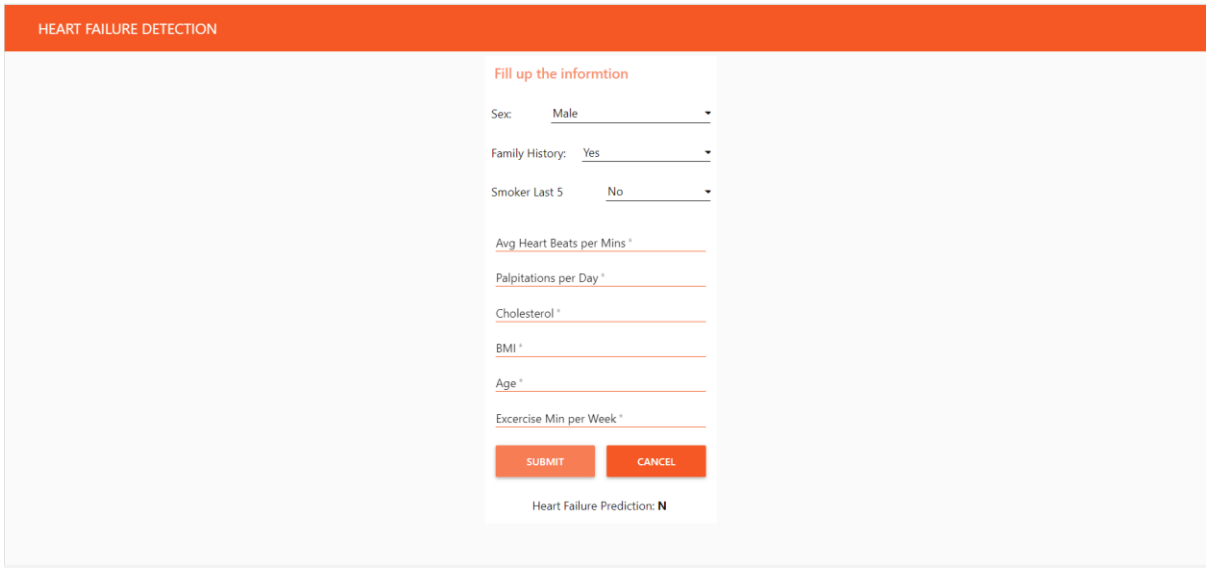

Fig 15: Heart Failure Prediction in Node RED UI against user's provided input