

# Effective Heart Disease Prediction using IBM

## Auto AI Services

### 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. Heart failure is a common event caused by CVDs. According to WHO data, heart disease is the leading cause of mortality globally, resulting in 17.9 million deaths annually [1]. The most behavioural risk factors for cardiovascular disease and stroke are unhealthy food, lack of physical activity, smoking, and alcohol drinking [1]. A heart attack occurs when the heart's blood circulation is obstructed by arteries plaque build-up. A thrombus in an artery causes a stroke by impeding blood flow to the brain [2]. The symptoms are common to other illnesses and might be confused with indicators of ageing, making diagnosis difficult for practitioners. Precision prediction and timely identification of cardiac disease are essential for improving patient survival rate. Because of the increased collection of medical data, practitioners now have a great opportunity to promote healthcare diagnosis. ML, which is a part of AI plays a vital role in many applications like text detection and recognition [3], early prediction [4], power quality disturbance detection [5], truck traffic classification [6], and agriculture [7]. ML has now become an essential tool in the healthcare sector to aid with patient diagnosis. The current methods for predicting and diagnosing cardiac disease are mostly dependent on practitioners' evaluation of a patient's medical history, signs, and physical assessment reports. Nowadays, information about patients with clinical reports is widely accessible in databases in the healthcare field, and it is rising rapidly day by day. In this article, the UCI ML repository's Cleveland HD dataset was utilized for developing the prediction model to heart disease. The machine is trained for learning patterns

based on the features that are already present in the dataset. Classification is an effective ML approach for prediction. When properly trained with adequate data, classification is an effective supervised ML method for identifying disease [8].

## Literature Survey

Naïve Bayes, random forest, PART, C4.5, and multilevel perceptron algorithm-based predictive model accuracy to HD dataset were determined to be in the range of 75.58%– 83.17% [9]. Moreover, Naïve Bayes algorithm has the highest accuracy as 83.17%, while other algorithms have less than 80% accuracy [9]. Kumar et al. discovered that the Random Woodland ML classifier had an 85 percent precision for cardiovascular disease [10]. Gudadhe *et al.* [11] described the framework for predicting the heart disease using SVM and obtained the accuracy as 80.41%. Kahramanli and Allahverdi [12] combined fuzzy and crisp values in health data and attained accuracy rates of 84.24% to Pima Indian diabetes dataset and 86.8% for the Cleveland HD dataset, respectively. Various ML classification models [13–17] could be used to improve intelligence. Kahramanli and Allahverdi [12] established the artificial and fuzzy-based model to the Pima Indian diabetes dataset and the Cleveland HD dataset and found 84.24% and 86.8% accuracy, respectively. Olaniyi *et al.* [18] established a prediction model and achieved an accuracy of 85% using feedforward multilayer perceptron (MLP) and 87.5% using SVM on the UCI ML datasets. Polat *et al.* [19] have employed k-nearest neighbour algorithm and an artificial immune recognition framework and achieved 87% accuracy on the Cleveland dataset. On a Cleveland dataset, Detrano et al. [20] achieved 77% using the logistic regression algorithm. Saw *et al.* [21] have implemented the improved logistic regression classification model for heart disease dataset. The fast decision tree and C4.5 tree have been employed for HD prediction [22]. As a result of the proposed model's initial phase, trees and features have been extracted. The genetic and fuzzy logic-based approach has been proposed [23] which is a hybrid model to instantly generate the rules using a fitness function, appropriate genetic operators, and a rule encoding method. Teekaraman *et al.*, employed contemporary ML techniques to construct healthcare heart disease predictive model. The Cleveland HD dataset was subjected to SVM with radial basis function (RBF) kernel, Gaussian Naive Bayes, logistic regression, Light GBM, XG Boost, and random forest algorithm, and the best performing prediction model for early diagnosis of heart disease was found by Teekaraman *et al.* , [24]

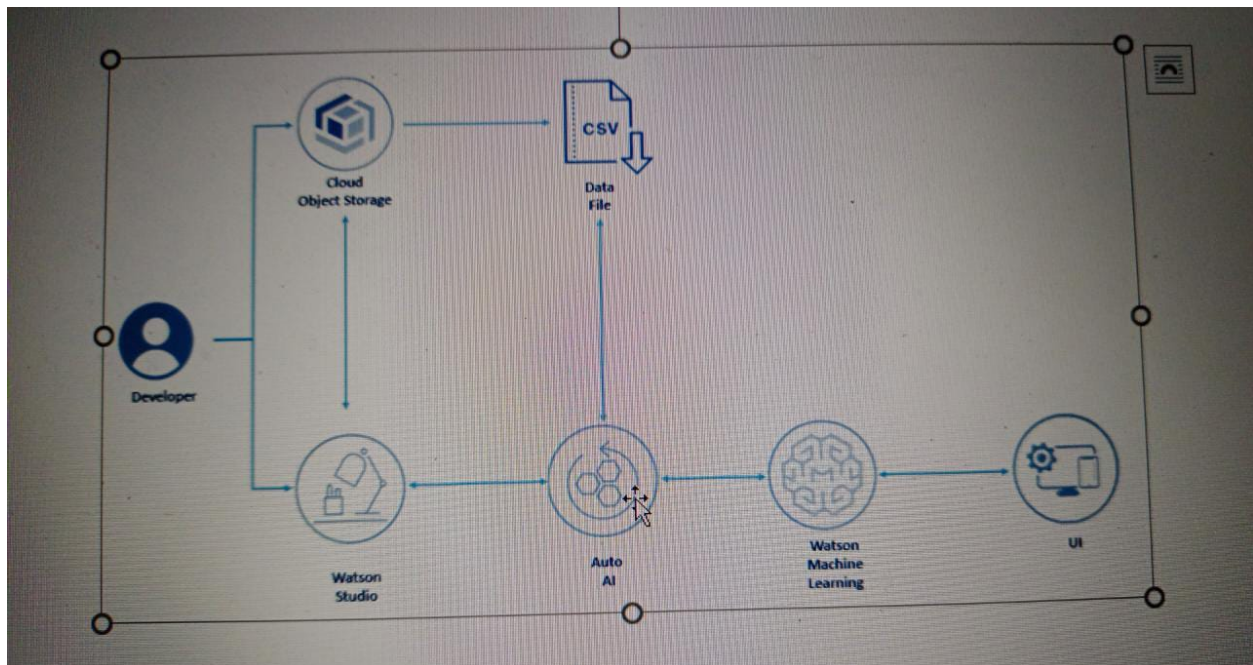
In this Project I have built a model using Auto AI and build a webpage application where we can showcase the prediction of Heart failure.

## Services Used:

IBM Watson Studio

- IBM Watson Machine Learning
- Node-RED
- IBM Cloud Object Storage

## Technical Architecture:



# Effective Heart disease Prediction using Auto AI

The screenshot displays the IBM Watson Studio interface for a machine learning model. The top navigation bar shows the project name 'Human Heart Decease Prediction using IBM Auto AI - P4 Snap Boosting Machine Classifier' and a 'Promote to deployment space' button. The main content area features an 'Input Schema' table with columns for 'Column' and 'Type'. The table lists various input features and their data types. A right-hand sidebar provides details about the model, including its description, creation date, type, model ID, software specification, and tags.

**Input Schema**

Column	Type
AGE	"integer"
AVGHEARTBEATSPERMIN	"integer"
BMI	"integer"
CHOLESTEROL	"integer"
EXERCISEMINPERWEEK	"integer"
FAMILYHISTORY	"other"
PALPITATIONSPERDAY	"integer"
SEX	"other"
SMOKERLAST5YRS	"other"

**Promote to space**

Use a deployment space to organize supporting resources such as input data and environments; deploy models or functions to generate predictions or solutions; and view or edit deployment details.

Target space: HEARTSPACE

Tags (optional): Start typing to add tags

☐ Go to the model in the space after promoting it

**Selected assets (1)**

Asset name	Format
Human Heart Decease Prediction using IBM Auto AI - P4 Snap Boosting Machine Classifier	Model

Select version

**Current**

Description (optional)

**Promote**

# Effective Heart disease Prediction using Auto AI

The screenshot displays the IBM Cloud Pak for Data interface, specifically the 'Human Heart Disease Prediction' project. The top section shows a table of experiment results, ranked by accuracy. The bottom section shows the 'Input Schema' for the selected model, 'P3 XGB Classifier'.

**Experiment summary**

Rank	Name	Algorithm	Accuracy (Optimized) Cross Validation	Enhancements	Build time
1	Pipeline 3	XGB Classifier	0.873	HPO-1 FE	00:00:35
2	Pipeline 4	XGB Classifier	0.873	HPO-1 FE HPO-2	00:01:16
3	Pipeline 1	XGB Classifier	0.869	None	00:00:01
4	Pipeline 2	XGB Classifier	0.869	HPO-1	00:00:10
5	Pipeline 7	Random Forest Classifier	0.862	HPO-1 FE	00:00:37
6	Pipeline 8	Random Forest Classifier	0.862	HPO-1 FE HPO-2	00:01:14
7	Pipeline 5	Random Forest Classifier	0.858	None	00:00:01
8	Pipeline 6	Random Forest Classifier	0.858	HPO-1	00:00:10

**Human Heart Disease Prediction using IBM Auto AI - P3 XGB Classifier**

**Input Schema**

Column	Type
AGE	integer
AVGHEARTBEATSPERMIN	integer
BMI	integer
CHOLESTEROL	integer
EXERCISEMINPERWEEK	integer
FAMILYHISTORY	other
PALPITATIONSPERDAY	integer
SEX	other
SMOKERLAST5YRS	other

**Model Details:**

- Name:** Human Heart Disease Prediction using IBM Auto AI - P3 XGB Classifier
- Last modified:** Jul 17, 2022 2:30 PM
- Description:** No description provided.
- Created:** Jul 17, 2022 2:30 PM
- Type:** wml-hybrid\_0.1
- Model ID:** 906d3d40-6a8e-438f-80ff-25fb3a1557ab
- Software specification:** hybrid\_0.1
- Hybrid pipeline software specifications:** autoai-kb\_r122.1-py3.9
- Tags:** Add tags to make assets easier to find.

# Effective Heart disease Prediction using Auto AI

The image displays a web browser window showing the Node-RED introduction page. The page has a red header with the text "Node-RED" and "Flow-based programming for the Internet of Things". Below the header, there is a section titled "Node-RED is a programming tool for wiring together hardware devices, APIs and online services in new and interesting ways." followed by a button "Go to your Node-RED flow editor". To the right, a "Downloads" sidebar lists various files like "SIMON HEART TODAY\_test\_result (2).json", "Heart patient's data.csv", and "pay slip.pdf".

Below the introduction page, there is a section titled "Customising your instance of Node-RED" with text explaining that the instance is running as an IBM Cloud application and providing a link to "Learn how to customise Node-RED".

The bottom part of the image shows the Node-RED editor interface. The left sidebar contains a "dashboard" palette with various widgets like "button", "dropdown", "slider", "switch", "numeric", "text input", "date picker", "colour picker", "form", "text", "chart", "gauge", "audio out", "notification", and "ui control". The main workspace shows a flow titled "HFPM DASHBAORD" (sic) with the following components:

- Flow 1:** A "timestamp" node connected to a "pre-token" node, which is then connected to an "http request" node.
- Flow 2:** An "http request" node connected to a "Pre Prediction" function node.
- Flow 3:** A "Pre Prediction" function node connected to a "Parsing" function node.
- Flow 4:** A "Parsing" function node connected to a "function" node.
- Flow 5:** A "function" node connected to a "Score" node.
- Flow 6:** A "Score" node connected to a "msg.payload" node.

The flow is titled "HFPM DASHBAORD" and includes a "Deploy" button in the top right corner.



## OUTPUT

Human Heart Disease Prediction

ENTER THE DATA

AVERAGE HEART BEATS ( Per Minute ) \*

PALPITATIONS PER DAY \*

CHOLESTEROL \*

BMI \*

AGE \*

SEX ( M or F ) \*

FAMILY HISTORY ( Y or N ) \*

SMOKER ( In Last 5 Years : Y or N ) \*

EXERCISE ( Minutes Per Week ) \*

SUBMIT CANCEL

Prediction Not at Risk

Score 0.5805345773696899

## Conclusion

In this project we have made webpage application model for predicting Human Heart decease prediction using IBM cloud-based Auto AI Techniques. Using such model and using huge collection of medical data, we can give warning or alert for patient using their medical record.

## References:

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