PROJECT REPORT

PROJECT BUILD-A-THON

APPLIED DATA SCIENCE

Effective Heart Disease Prediction Using IBM Auto AI Service

Submitted By

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ABSTRACT

The objective of this study is to predict the presence of heart disease with reduced number of attributes using data mining techniques. The term heart disease is related to all diverse diseases affecting the heart. The exposure of heart disease from various factors is an issue which is not free from false presumptions often accompanied by unpredictable effects. Researchers have been using several machine learning techniques to help health care professionals in the diagnosis of heart disease. In this work, heart disease dataset with the following features have been used: average heart beats per min, palpitations per day, cholesterol, BMI, age, sex, family history, smoker last five years, and exercise min per week. The dataset consists of class label, heart failure which has two values, Y and N. The heart prediction system is constructed using IBM cloud services such as, Object Cloud Storage, Watson Studio, Auto AI, and Node-RED. Experiments revealed that snap boosting classifier is the best performing classifier for the given heart disease dataset.

Keywords: Heart disease, Artificial intelligence, Machine learning, IBM cloud.

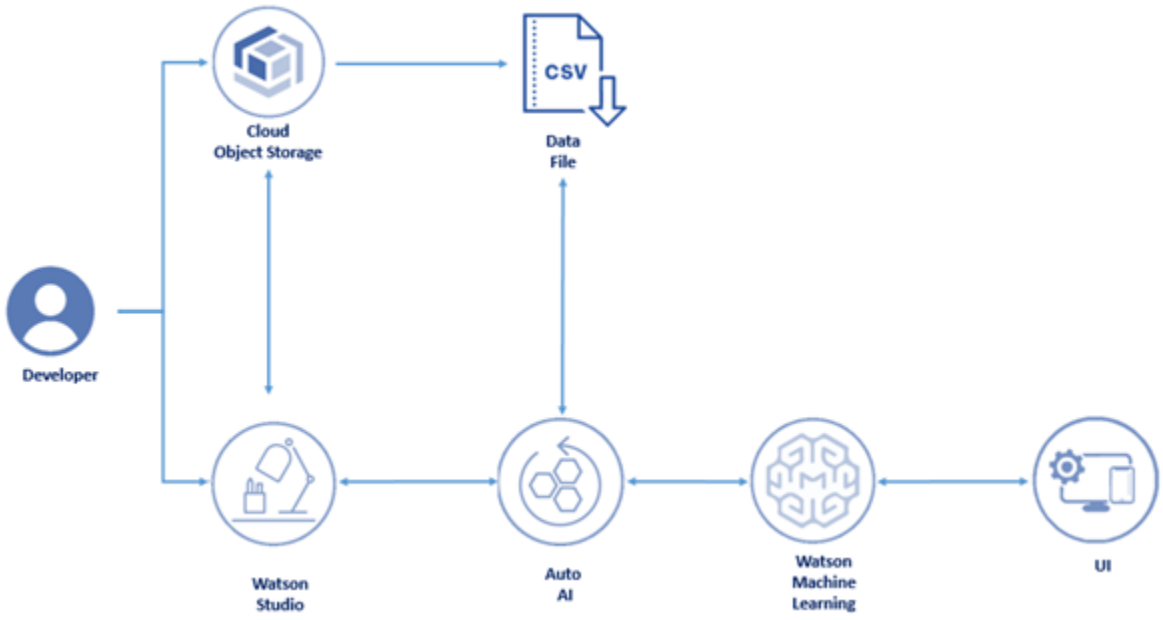
A. **Introduction**

Today, medical services have come a long way to treat patients with various diseases. Today, diagnosing patients correctly and administering effective treatments have become quite a challenge. Poor clinical decisions may end inpatient’s death which could not be tolerated by the hospital as it loses its reputation. The cost to treat a patient with a heart problem is quite high and

not affordable by every patient. To achieve a correct and cost- effective treatment, computer-based information and/or decision support systems can be developed to do the task. Most hospitals today use some sort of hospital information systems to manage their healthcare or patient data [1].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 and this dataset contains 9 features that can be used to predict mortality by heart failure.

In this project, a model is build using Auto AI and build a web application where we can showcase the prediction of heart failure.

B. Technical Architecture



1`Fig. 1: Technical Architecture of the Project

Fig. 1 depicts the technical architecture of this heart disease prediction system. The following are the project objectives:

- To work with Watson Studio

- To create a project in Watson Studio
- To use Auto Ai experiment to create a model
- To deploy the ML model as a webserver
- To integrate Model and Node-RED Service
- To build an application using Node-RED which takes inputs from the user and showcases the prediction on UI

The following are the flow of this project:

1. Log in to IBM account
2. Create IBM Watson Studio and Node-RED Service
3. Create a Watson studio project
4. ADD Auto AI Experiment
5. Run the Auto AI Experiment to build a Machine learning model on the desired dataset
6. Save the model
7. Deploy the model as a web server and generate scoring End Point
8. Create a WEB application Using Node-RED to take user input and show

The following are the services that have been created to complete this project:

- Watson studio
- Node-RED
- Cloud Object Storage service (COS)
- Machine Learning service (ML)

COS and ML services are created while creating a Watson Studio Project [2].

Building a machine learning model activity contains the following tasks:

- Collect the data set
- Create Watson Studio project
- Add Auto AI experiment
- Run AI Experiment
- Save the model
- Deploy the model

Node-RED application builds a user interface that takes inputs from the user. The model analyses the inputs and returns the prediction that is showcased on the user interface.

C. Results and Discussions

The heart disease dataset has been downloaded from [3]. The model is built and deployed in IBM cloud. In Model Viewer there are some more details about model features and evaluations. It also shows the relative importance of each feature in predicating the target, based on an averaging of different important measures or weight.

Progress Map : It shows progress when your model building in process.

Pipeline Comparison : It shows the matrix chart which compare the matrix from each pipeline and shows there score for each step of dragging prediction so you can change rank of it and change prediction by cross validation and holdout. The best classifier is SNAP boosting classifier. Fig. 2 depicts the IBM cloud services that are used to complete the project. Fig. 3 depicts the created assets. Fig. 4 depicts the API key created as the result of model creation.

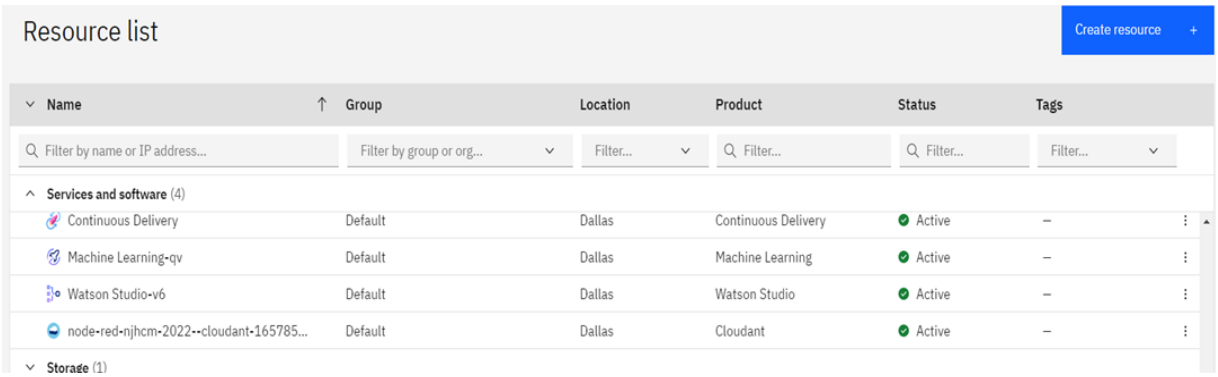


Fig. 2: IBM Cloud Services

Fig. 3: Created Assets

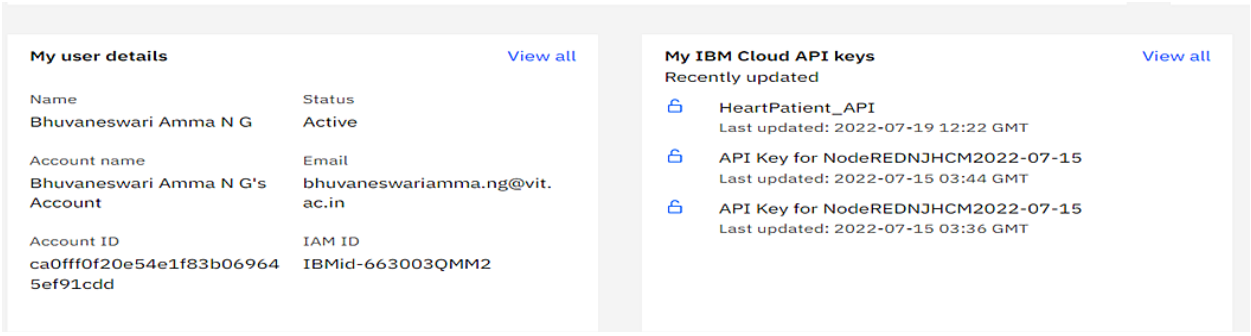


Fig. 4: API Keys

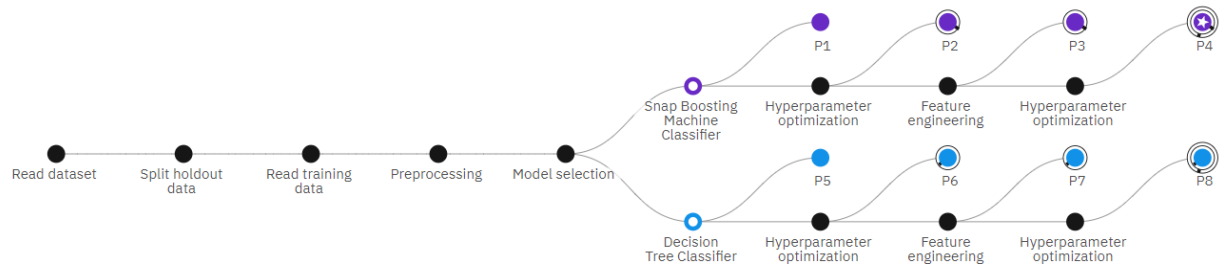


Fig. 5: Pipeline

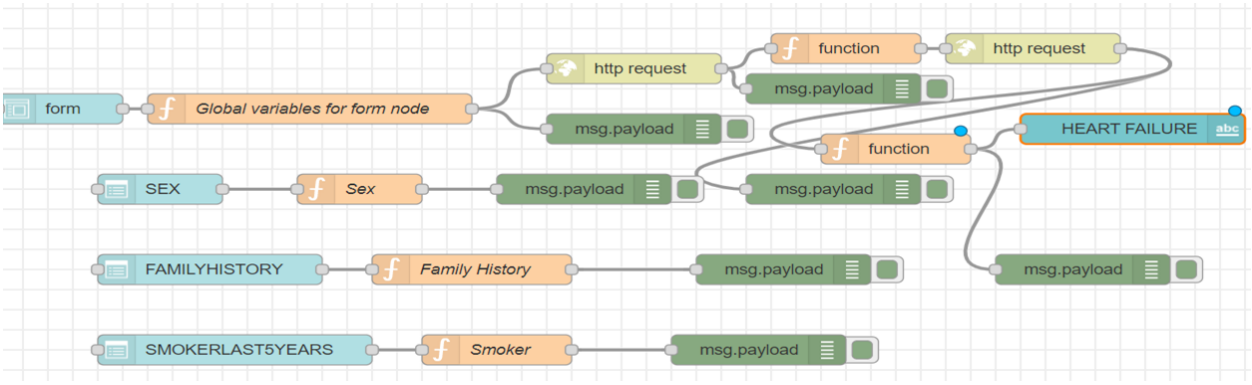


Fig. 6: JSON Flow

Fig. 5 depicts the pipeline created as the result of executing the auto-AI experiment. Fig. 6 depicts the JSON flow. Fig. 7 depicts the user interface of the heart disease prediction system.

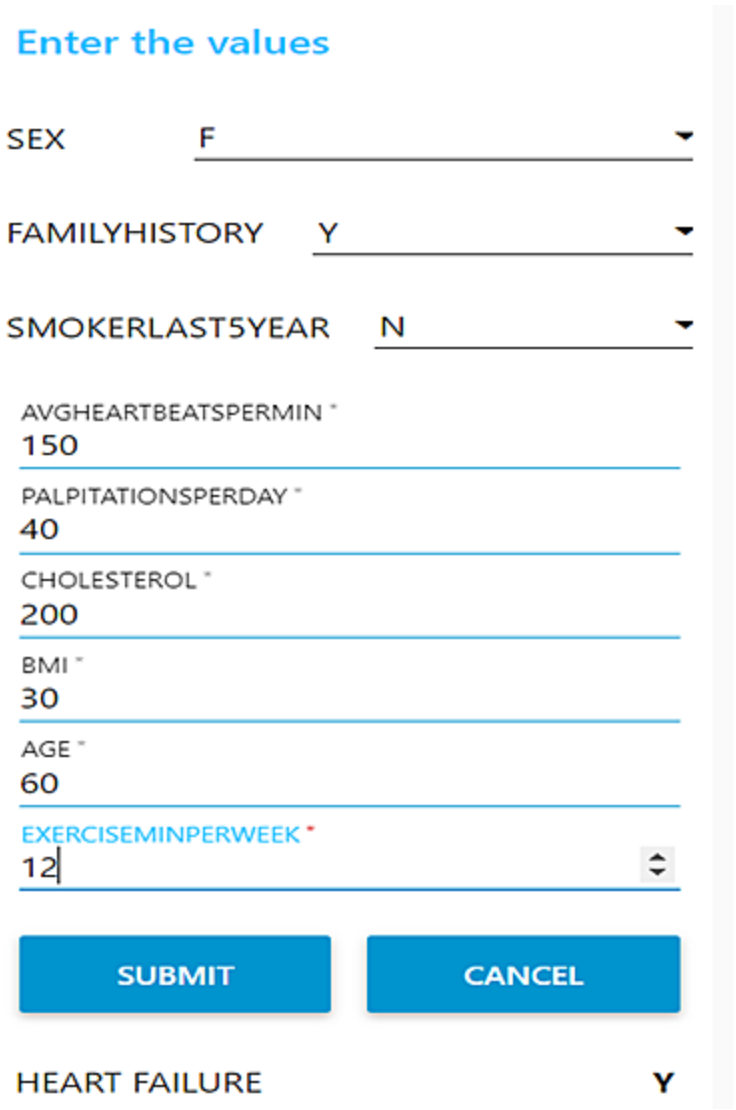


Fig. 7: Heart Disease Prediction User Interface

D. Conclusion

The prediction of heart failure is one of the mostly needed requirement in the medical field. Here, without any coding, automatically built IBM services are utilised and a Binary classification AutoAI model is executed successfully. The best performance measure which the model resulted is accuracy with the SNAP Boosting Algorithm with a best result of 0.874. The model is further tested and integrated with Node Red service for

interfacing and creating a web service. It is seen that the model exactly predicted the class Y/N representing the possibility of Heart Failure/No Heart Failure. Thus, the IBM Watson studio, AutoAI, NodeRED and Cloud services are utilised and a model is automatically deployed successfully.

References

[1] Krishna Priya G, Suganthi S T, Vijipriya G , and Nirmala Madian, “An approach for predicting heart failure rate using IBM Auto AI Service” 2021 International Conference on Computational Intelligence and Knowledge Economy (ICCIKE), 2021.

[2] ibm.cloud.com

[3]https://github.com/IBM/predictivemodelonwatsonml/blob/master/data/patientdataV6.csv