

Effective Heart Disease Prediction Using IBM Auto AI Service

1. Introduction

According to the World Health Organization, every year 12 million deaths occur worldwide due to Heart Disease. Heart disease is one of the biggest causes of morbidity and mortality among the population of the world. Prediction of cardiovascular disease is regarded as one of the most important subjects in the section of data analysis. The load of cardiovascular disease is rapidly increasing all over the world from the past few years. The early diagnosis of heart disease plays a vital role in making decisions on lifestyle changes in high-risk patients and in turn reduces the complications.

Machine learning proves to be effective in assisting in making decisions and predictions from the large quantity of data produced by the health care industry. This project aims to predict future Heart Disease by analyzing data of patients which classifies whether they have heart disease or not using machine-learning algorithm.

2. Therotical Analysis

The entire project is designed and delopved on IBM Cloud Service. IBM Cloud Provide Watson Studio, a data science platform which help Artificial intelligent and Machine Learning far easier and faster. for that need to create following services on Cloud.

1. IBM Cloud Object Storage.
2. IBM Watson Studio
3. IBM Machine Learning Service
4. IBM Node Red Editor

3. Flowchart

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 showcase Prediction on UI

4. Experimental Investigation

Auto AI build your model with details step and different algorithm. it also shows there different accuracy and categories. it also ranking best suitable algorithm for model. so its far easy to analysis data model using pipelines generated by AutoAI. In Relationship map shows all analysis from your data to feature transformers stepwise. You need to hover on using mouse it will show which algorithms used for build pipeline(model)

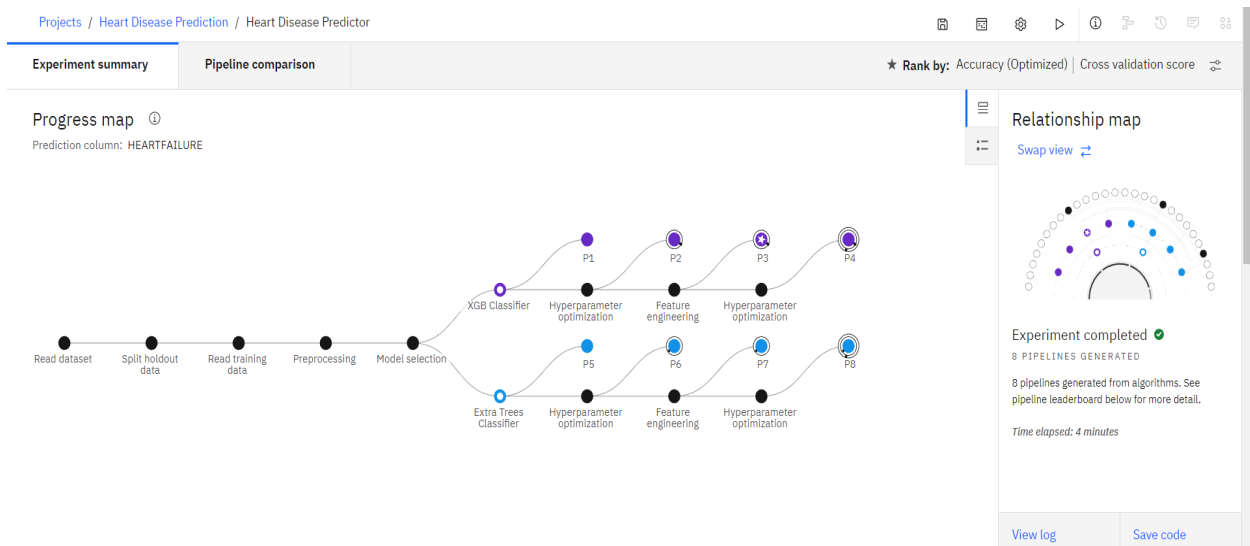
Next level shows some pipelines with their accuracy and best suggested model as star marked. After pipelines next level shows used feature transformation to build pipeline. for my case the best suggested algorithm is Binary Classification. When we click any of pipeline its will shows details analysis of how your model is build and evaluate. E.g Model Evaluation , Confusion Matrix , Precision Recall Curve.

5.Result

The Dataset that is used here to build the machine Learning Model.

| AVGHEARTBEATSPERM... String | PALPITATIONSPERD... String | CHOLESTEROL String | BMI String | HEARTFAILURE String | AGE String | SEX String | FAMILYHISTORY String | SMOKERLAST5YRS String | EXERCISEMINPERWE... String |
|--------------------------------|-------------------------------|-----------------------|---------------|------------------------|---------------|---------------|-------------------------|--------------------------|-------------------------------|
| 93 | 22 | 163 | 25 | N | 49 | F | N | N | 110 |
| 108 | 22 | 181 | 24 | N | 32 | F | N | N | 192 |
| 86 | 0 | 239 | 20 | N | 60 | F | N | N | 121 |
| 80 | 36 | 164 | 31 | Y | 45 | F | Y | N | 141 |
| 66 | 36 | 185 | 23 | N | 39 | F | N | N | 63 |
| 125 | 27 | 201 | 31 | N | 47 | M | N | N | 13 |
| 83 | 27 | 169 | 20 | N | 71 | F | Y | N | 124 |
| 107 | 31 | 199 | 32 | N | 55 | F | N | N | 22 |
| 92 | 28 | 174 | 22 | N | 44 | F | N | N | 107 |
| 84 | 12 | 206 | 25 | N | 50 | M | N | N | 199 |
| 60 | 1 | 194 | 28 | N | 71 | M | N | N | 27 |
| 134 | 7 | 228 | 34 | Y | 63 | F | Y | N | 92 |
| 103 | 0 | 237 | 24 | N | 64 | F | Y | N | 34 |








Auto-AI Builder will Build the Pipelines and will suggest a best algorithm to use to build the efficient model.



Projects

/ Heart Disease Prediction

/ Heart Disease Predictor

| Experiment summary | | Pipeline comparison | | ★ Rank by: Accuracy (Optimized) Cross validation score | | | |
|--------------------|------|---------------------|----------------------------|--|--|---|-----------------------------|
| | Rank | ↑ | Name | Algorithm | Accuracy (Optimized) Cross Validation | Enhancements | Build time |
| ★ | 1 | | Pipeline 3 |  XGB Classifier | 0.873 | <div>HPO-1</div> <div>FE</div> | 00:00:49 <div>Save as</div> |
| | 2 | | Pipeline 4 |  XGB Classifier | 0.873 | <div>HPO-1</div> <div>FE</div> <div>HPO-2</div> | 00:01:43 |
| | 3 | | Pipeline 1 |  XGB Classifier | 0.869 | None | 00:00:01 |
| | 4 | | Pipeline 2 |  XGB Classifier | 0.869 | <div>HPO-1</div> | 00:00:15 |
| | 5 | | Pipeline 7 |  Extra Trees Classifier | 0.858 | <div>HPO-1</div> <div>FE</div> | 00:00:38 |
| | 6 | | Pipeline 8 |  Extra Trees Classifier | 0.858 | <div>HPO-1</div> <div>FE</div> <div>HPO-2</div> | 00:01:02 |
| | 7 | | Pipeline 5 |  Extra Trees Classifier | 0.857 | None | 00:00:01 |

Once the model will build have to deploy it at deployment space.

Deployments / Heart Disease Predictor / Heart Disease Predictor - P3 XGB... /

Heart Disease Model

Deployed

Online

Heart Disease Model

API reference

Test

Direct link

Endpoint

Bearer <token>

https://us-south.ml.cloud.ibm.com/ml/v4/deployments/15b9d22c-11b9-48cd-8105-cb2967d463ee/predictions?version=2022-07-15
IAM

Code snippets

cURL

Java

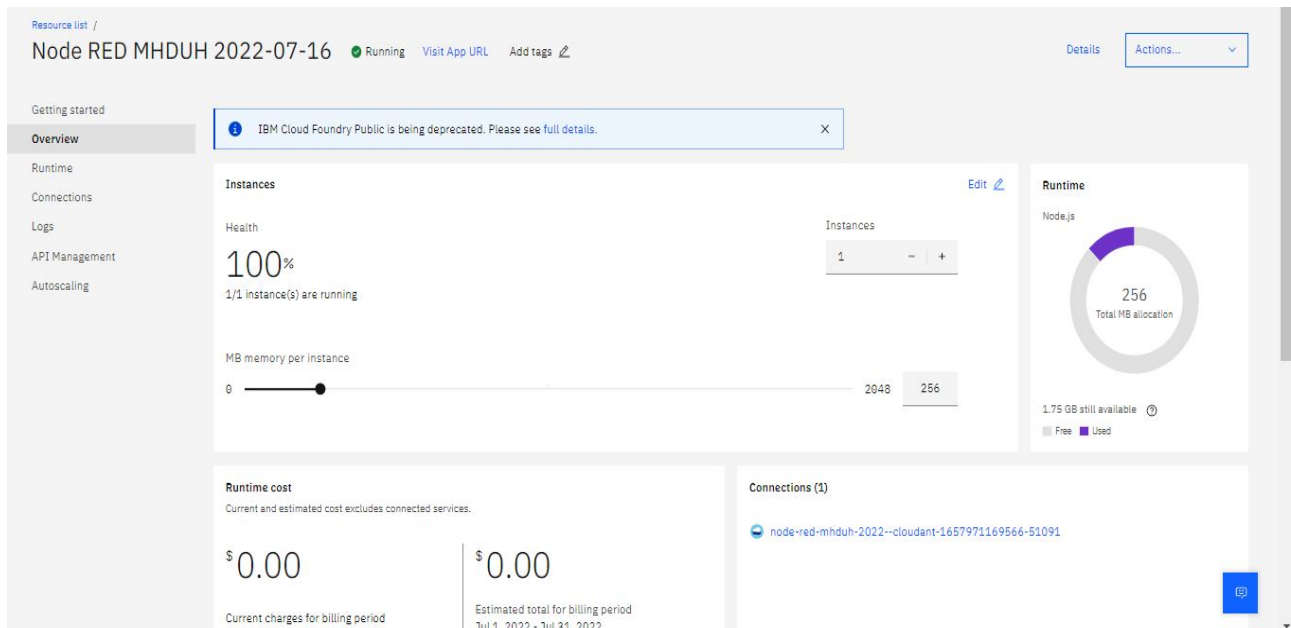
JavaScript

Python

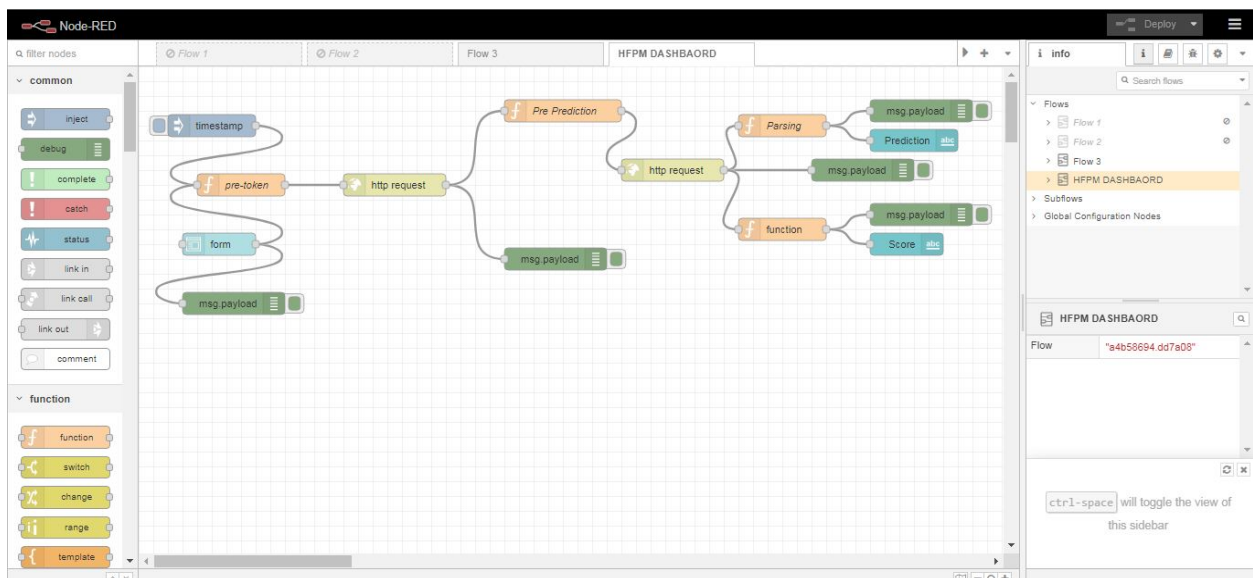
Scala

NOTE: you must set \$API_KEY below using information retrieved from your IBM Cloud account.
curl --insecure -X POST --header "Content-Type: application/x-www-form-urlencoded" --header "Accept: application/json" --data-urlencode "grant_type=urn:ibm:params:oauth:grant-type:apikey" --data-urlencode "apikey=\$API_KEY" "https://iam.cloud.ibm.com/identity/token"
the above CURL request will return an auth token that you will use as \$IAM_TOKEN in the scoring request below
TODO: manually define and pass values to be scored below
curl -X POST --header "Content-Type: application/json" --header "Accept: application/json" --header "Authorization: Bearer \$IAM_TOKEN" -d '{"input_data": {"fields": [ARRAY_OF_INPUT_FIELDS], "values": [ARRAY_OF_VALUES_TO_BE_SCORED,

Create a Node-Red Service. once the cloud foundry app will be create have to click on it. and go to visit APP URL.



Once will click on APP URL will redirected to NodeRed Service. There we have to create new JSON Flows.



Once will Deploy the flows will be redirected to final Output Page(URL of Project).

Default

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

0.9405890703201294

6.Conclusion

Heart diseases are a major killer in India and throughout the world, application of promising technology like machine learning to the initial prediction of heart diseases will have a profound impact on society. The early prognosis of heart disease can aid in making decisions on lifestyle changes in high-risk patients and in turn reduce the complications, which can be a great milestone in the field of medicine. The number of people facing heart diseases is on a raise each year. This prompts for its early diagnosis and treatment. The utilization of suitable technology support in this regard can prove to be highly beneficial to the medical fraternity and patients. hence we have build machine learning model using IBM cloud services and deployed the Application using Node Red editor which is giving a accurate Prediction and Score according to the input we give.