Effective Heart Disease Prediction Using IBM Auto AI Service

1. INTRODUCTION

1.1 Overview

Human heart is an important organ in the human body that is responsible for blood circulation i.e, for oxygen and energy supply to all organs of the body. Heart disease leads to abnormal blood circulation in the body that might be fatal for human life. Heart disease is the main cause of death according to the Centers for Disease Control (CDC) in the entire universe. There are two categories of risk factors for heart diseases. Alterable risk factors, e.g., cigarette usage and workouts, and non-alterable risk factors, e.g., gender, age factor and generation history. By using conventional medical methods, it is much difficult to determine the symptoms of heart failure and also complex, costly and time consuming. Angiography is one of the best method of medical tests for the diagnosis of heart failure. But it has other effects as well as costlier and demands extraordinary technical expertise. However, accuracy of prediction is a sustaining problem in these systems.Therefore, to overcome the angiography issues, data mining and ML techniques are much helpful.Machine learning may be used to diagnose, detect, and forecast many disorders in the medical industry.

1.2 Purpose

The primary purpose of this study is to give clinicians/individuals a tool to detect cardiac problems at an early stage. As a result, it will be easier to deliver appropriate treatment to patients while avoiding serious effects.

2. LITERATURE SURVEY

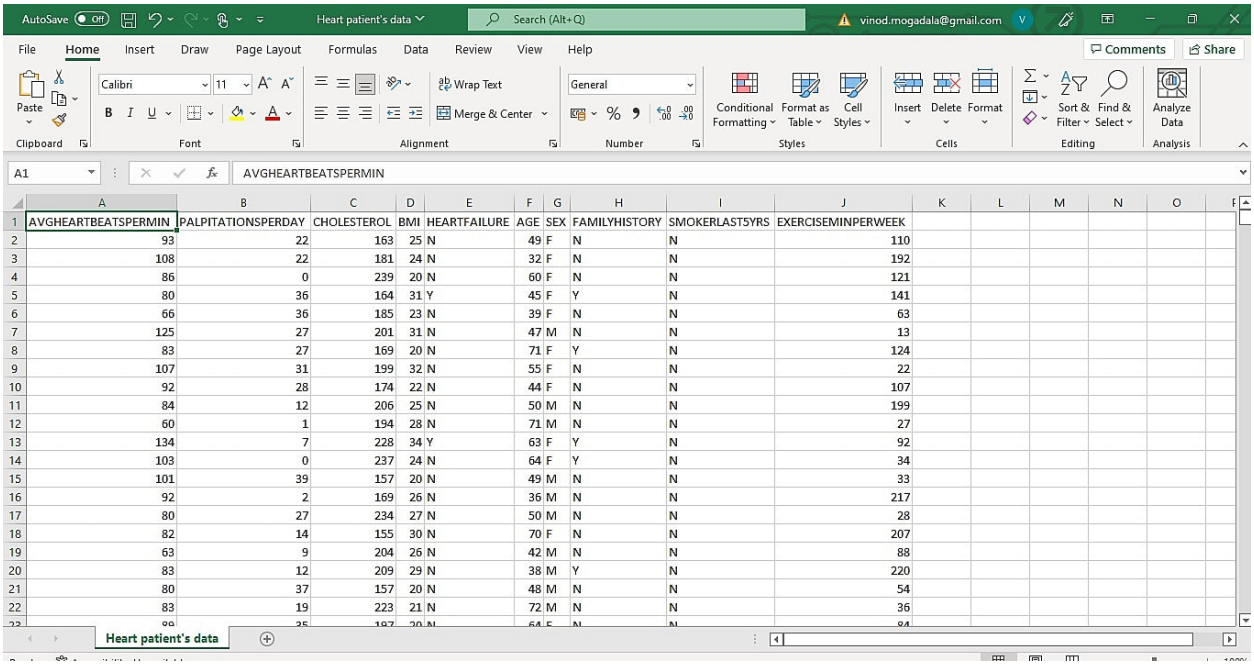
2.1 Existing problem

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. Various studies are reporting that the heart disease diagnosis development based on models of ML can provide the objective of heart disease prediction model (HDPM) with improved performance.

2.2 Proposed solution

IBM Cloud Provide Watson Studio, a data science platform which help Artificial intelligent and Machine Learning far easier and faster. I have used Watson Studio to analyze & predication of heart attack risk. For analysis the sample dataset which I have used stored in csv file format. The dataset used consists of ten attributes were involved (age, sex, average heart beat per minute, palpitations per day, cholestrol, body mass index, family history, smoker or not, excercise in minutes per week).The following figure shows the uploaded data set format.



	A	B	C	D	E	F	G	H	I	J
1	AVGHEARTBEATSPERMIN	PALPITATIONSPERDAY	CHOLESTEROL	BMI	HEARTFAILURE	AGE	SEX	FAMILYHISTORY	SMOKERLAST5YRS	EXERCISEMINPERWEEK
2	93	22	163	25	N	49	F	N	N	110
3	108	22	181	24	N	32	F	N	N	192
4	86	0	239	20	N	60	F	N	N	121
5	80	36	164	31	Y	45	F	Y	N	141
6	66	36	185	23	N	39	F	N	N	63
7	125	27	201	31	N	47	M	N	N	13
8	83	27	169	20	N	71	F	Y	N	124
9	107	31	199	32	N	55	F	N	N	22
10	92	28	174	22	N	44	F	N	N	107
11	84	12	206	25	N	50	M	N	N	199
12	60	1	194	28	N	71	M	N	N	27
13	134	7	228	34	Y	63	F	Y	N	92
14	103	0	237	24	N	64	F	Y	N	34
15	101	39	157	20	N	49	M	N	N	33
16	92	2	169	26	N	36	M	N	N	217
17	80	27	234	27	N	50	M	N	N	28
18	82	14	155	30	N	70	F	N	N	207
19	63	9	204	26	N	42	M	N	N	88
20	83	12	209	29	N	38	M	Y	N	220
21	80	37	157	20	N	48	M	N	N	54
22	83	19	223	21	N	72	M	N	N	36

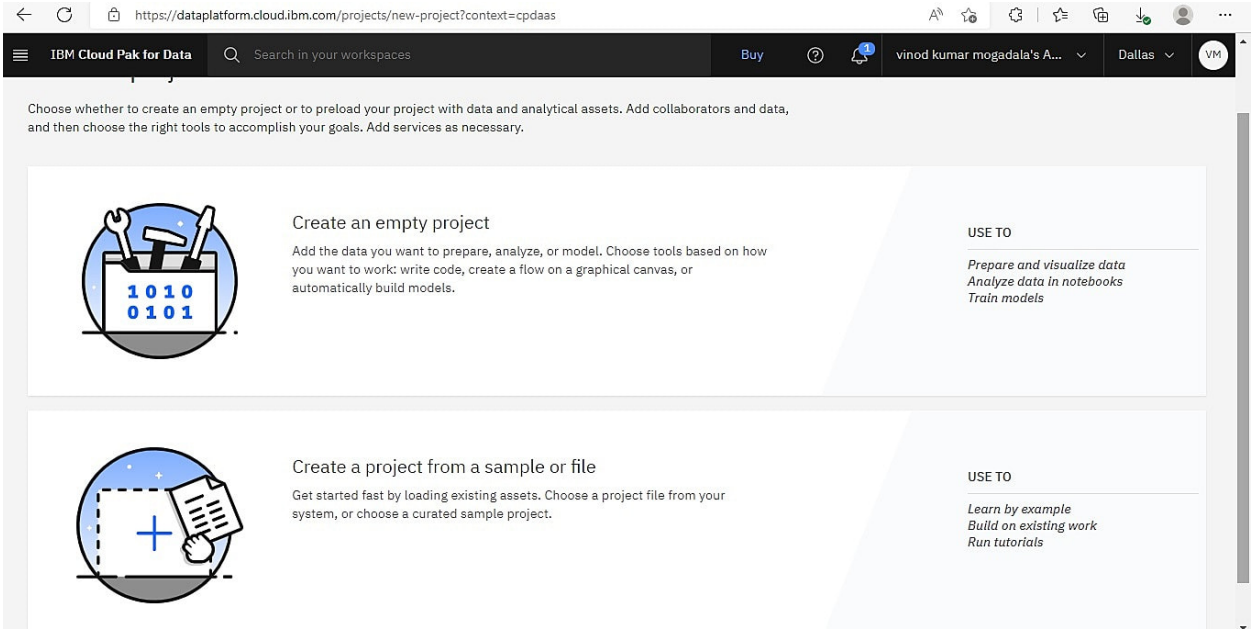
Effective Heart Disease Prediction Using IBM Auto AI Service

3. FLOWCHART

The following steps are followed in implementing the project.

3.1 Creating a project

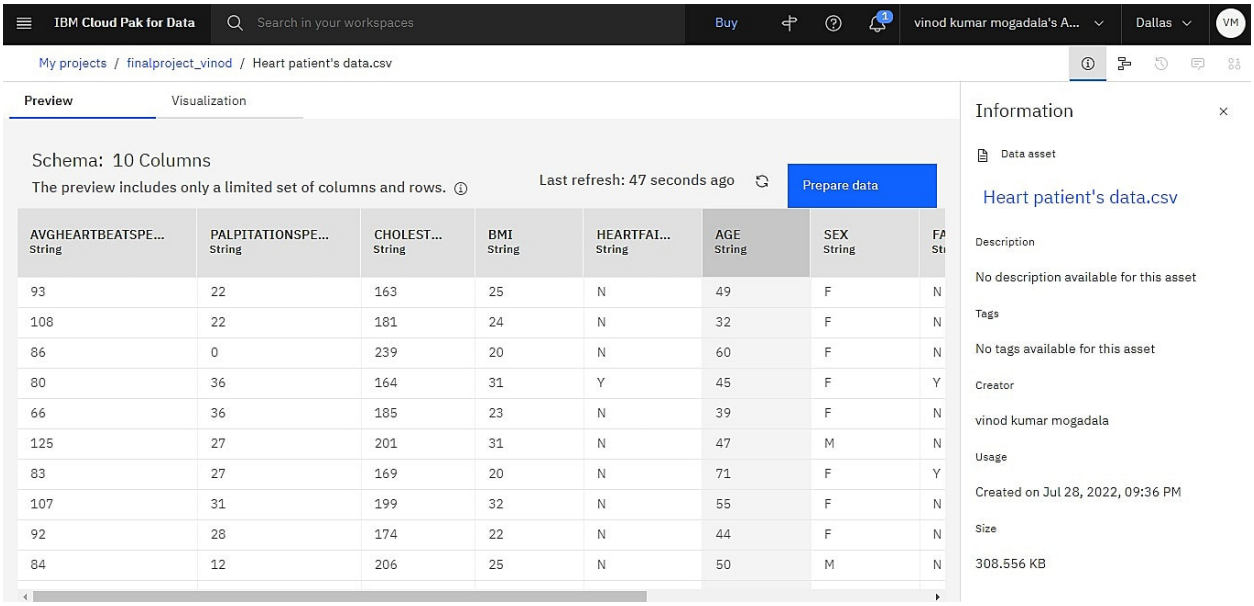
Log on to IBM Cloud Waston Studio and create new Project by clicking on create a project and then click on create an empty project as shown below. Enter a Name and associate the project with a Cloud Object Storage service.



3.2. Uploading the Dataset

At the project dashboard click on the Assets tab and upload the data set associated with the project in csv format. And after sucessful loading and the uploaded data will appear like shown below.

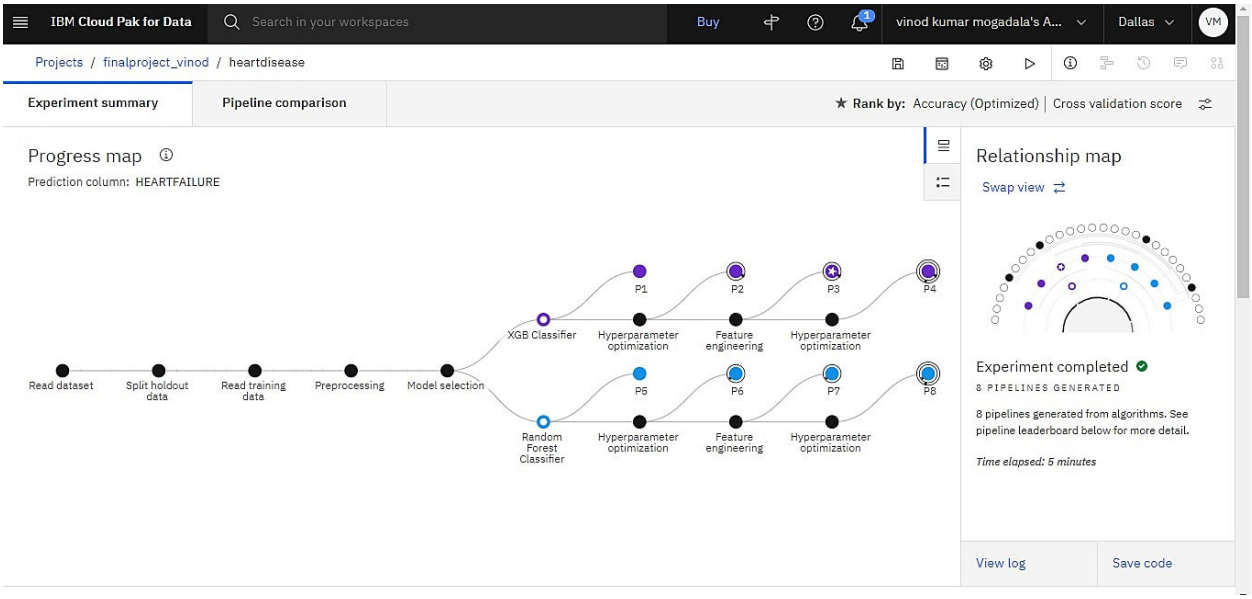
Effective Heart Disease Prediction Using IBM Auto AI Service



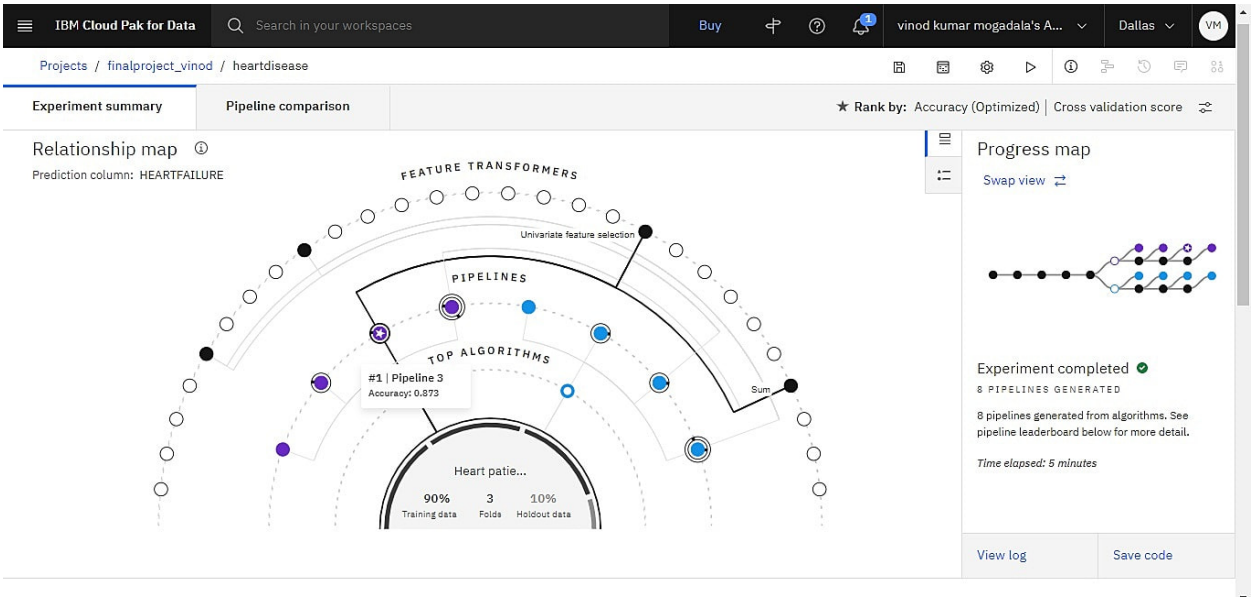
3.3 Build a model with AutoAI

Next step is to build a model from the data using IBM's AutoAI. A tool that will automatically create multiple models and test them, giving us the best result. Start by clicking on Add to project and choose AutoAI experiment. And then assocaite it with Watson Machine learning instance. And then in predict column choose Heartfailure and then click on run experiment button which will build your model.The experiment will take a few minutes to run. Auto AI build your model with details step and different algorithm. It also shows there different accuracies and categories. It also ranking best suitable algorithm for model. so its far easy to analysis data model using pipelines generated by AutoAI. Next level shows some pipelines with their accuracy and best suggested model as star marked.When you 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. The below figure shows the experiment summary after completion of the experiment.

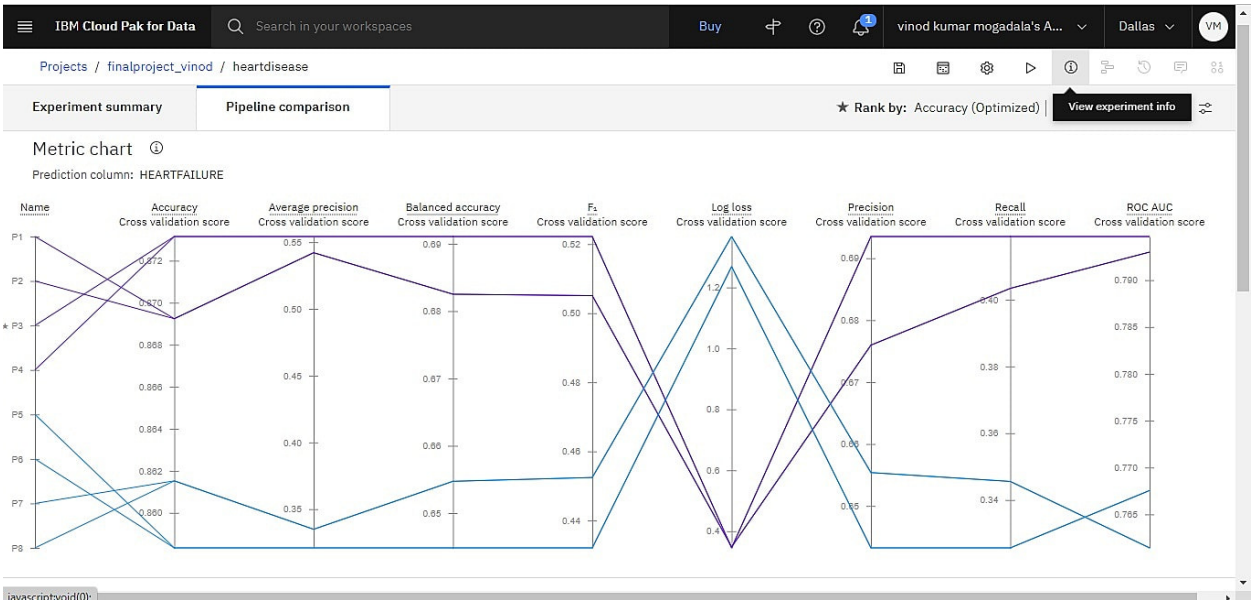
Effective Heart Disease Prediction Using IBM Auto AI Service



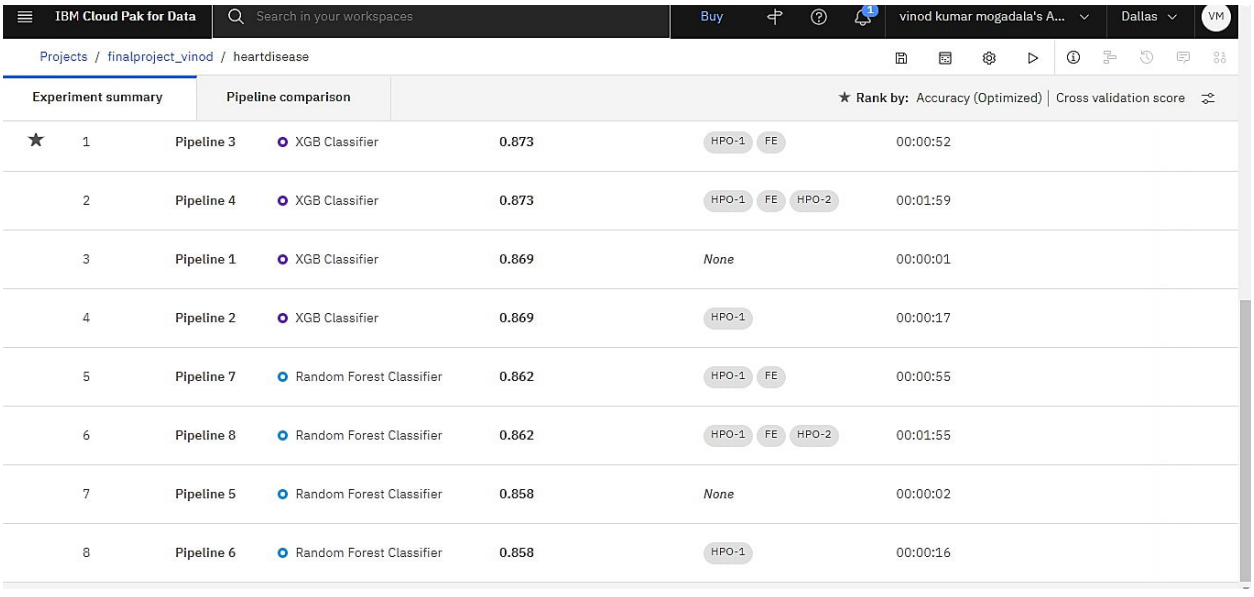
The below figure shows the top algorithm and its accuracy.



Effective Heart Disease Prediction Using IBM Auto AI Service



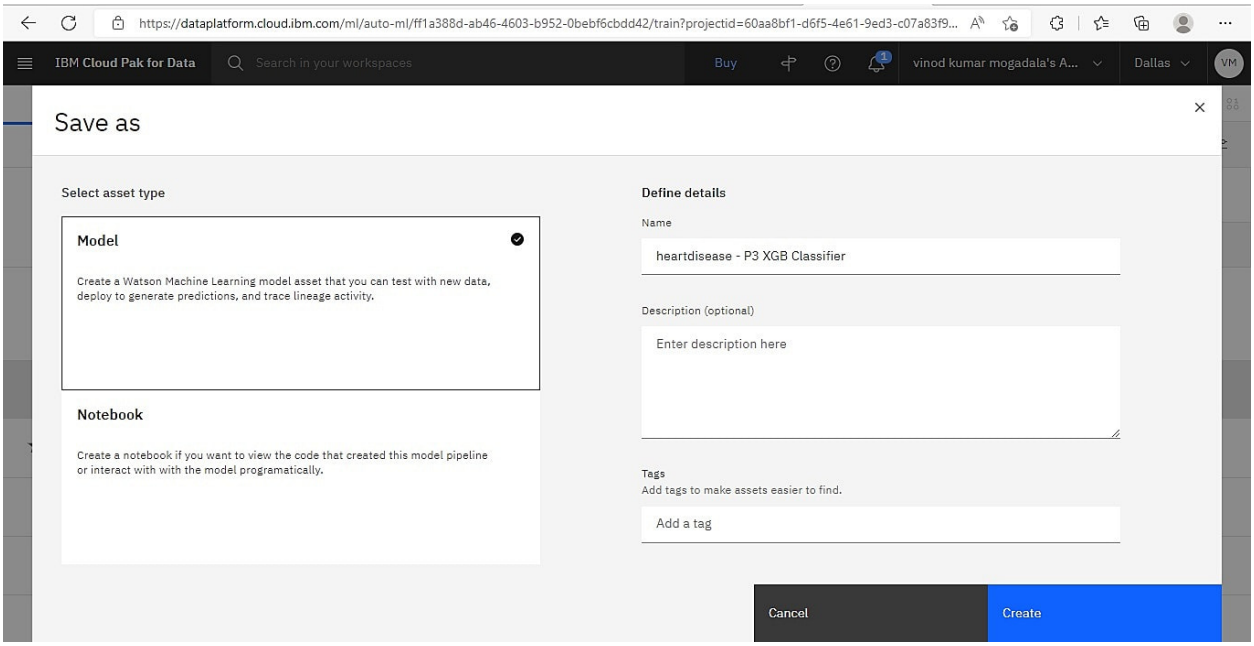
The above figure shows the perfomance metrics of the various algorithms.



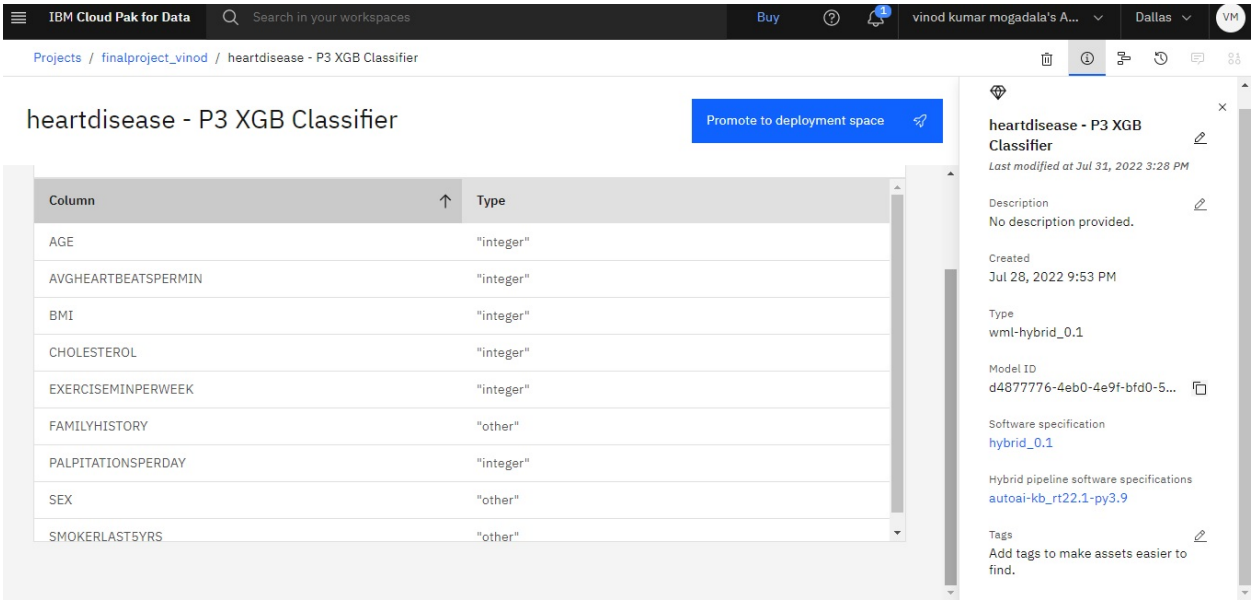
The above figure shows the performance comparison in terms of their accuracies.

Effective Heart Disease Prediction Using IBM Auto AI Service

The next step is to save the model. Choose to save the experiment as a Model. You can optionally download a generated Jupyter Notebook that can be used to re-create the steps that were taken to create the model.



Once you're at the model overview choose the button Promote to deployment space.



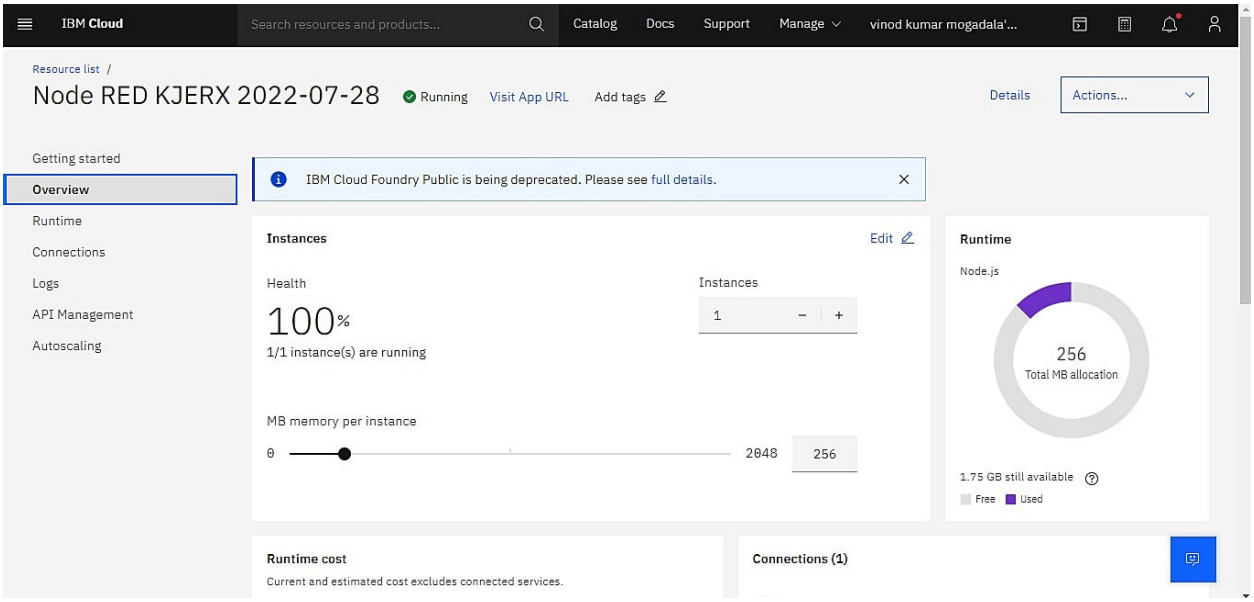
Effective Heart Disease Prediction Using IBM Auto AI Service

3.4 Deploy the model

To promote the model to deployment you must specify a deployment space. If no space is created choose the New space + option to create one. This action will associate the model with the space.Choose the deploy the model by clicking the rocket ship icon.Choose the Online deployment option and give it a name and then our deployment will appear.Once updated your application will restart and you can visit the application by clicking on Visit App URL.

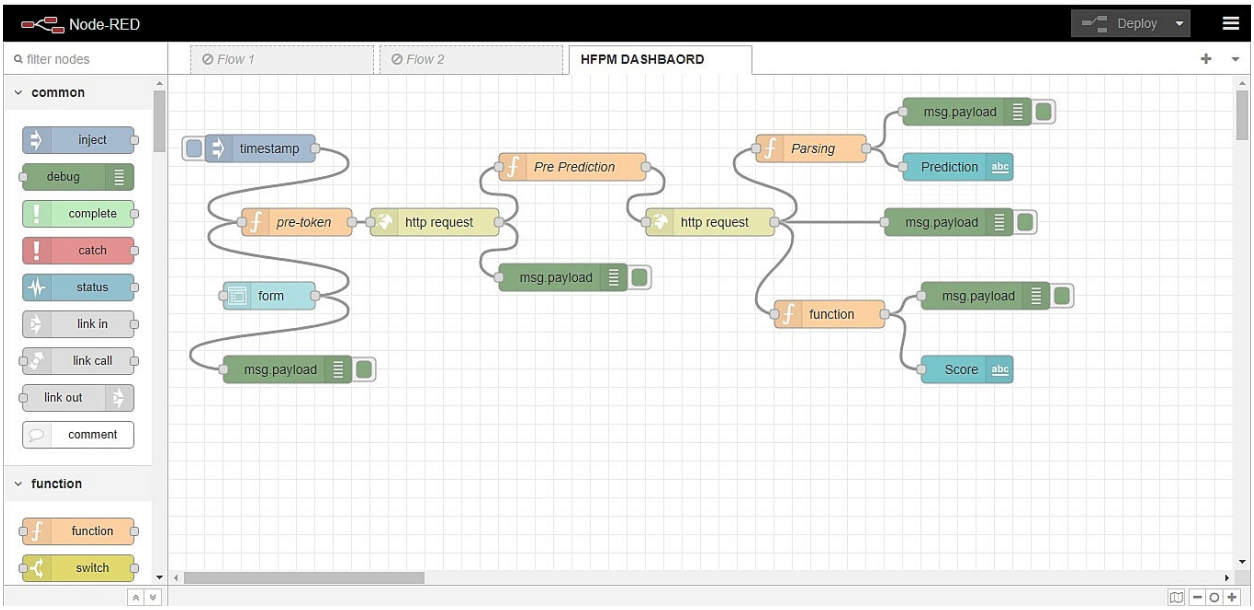
3.5. Node Red Service

We have to create the Node Red service as shown below.



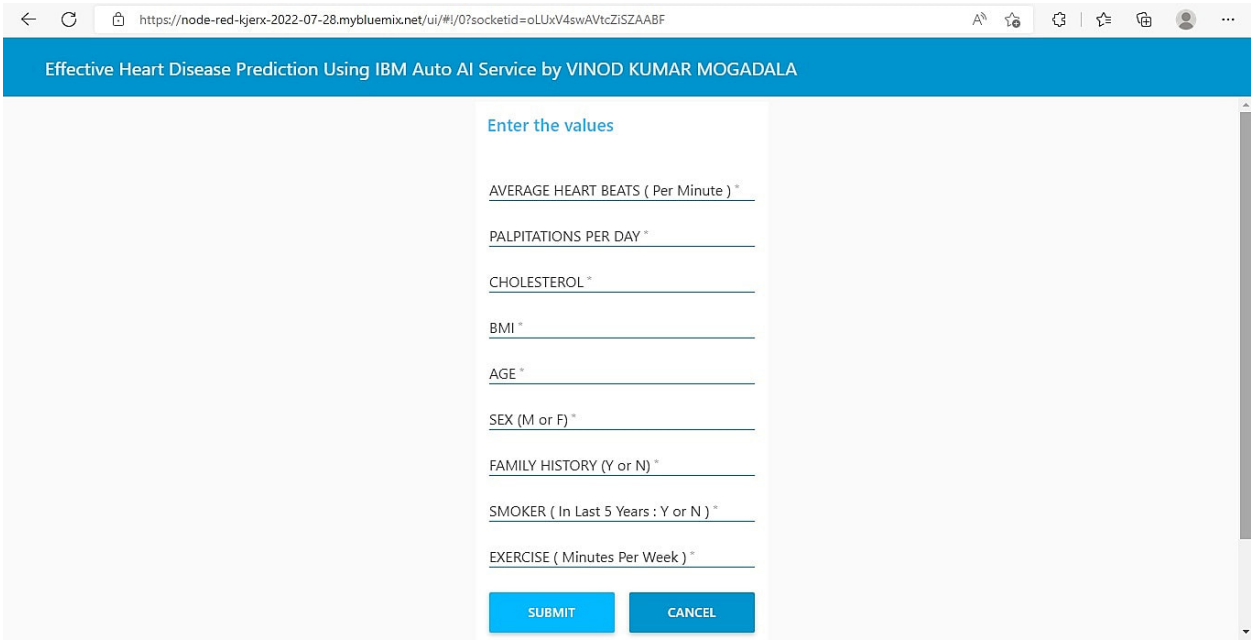
After this we have to click on visit app url. The front end is created using NodeRED User Interface. In NodeRED flow editor the flow diagram is constructed as depicted in the below figure. The flow diagram is created using forms with the pre-prediction, http request and pre-token options. The properties are edited accordingly to link the model. The JSON file is imported and proceeded for deployement. The JSON code is imported and the parameters for form, functions and HTTP are edited according to the dataset. Inorder to deploy, the model ID and the URL and the API key of the model built in the auto AI is specified here in the NodeRED app and linked and proceeded for execution. The HTTP request service is utilised to execute the auto AI model.

Effective Heart Disease Prediction Using IBM Auto AI Service



4. RESULT

After deploying the app , if we click on dashboard the follwing web app page will be displayed where we can enter the values and the model predicts the risk of heart failure.



Effective Heart Disease Prediction Using IBM Auto AI Service

5 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 XGB with a best result of 0.873The build time 00:00:33 seconds, which is saved as model and deployed. 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 and 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.