VIT BUILD-A-THON

BY:
UPADHYAYULA SARADA MANASWIN 19BLC1138
GAYATHRI G 19BLC1099

Email id: sarada.manaswini2019@vitstudent.ac.in
gayathri.g2019@vitstudent.ac.in

Github username: sarada-manaswini
G-GAYATHRI-26

Project Title: Predict heart failure using IBM auto AI service

1. INTRODUCTION

1.1 Overview

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, I built a model using Auto AI and built a web application where we can showcase the prediction of heart failure.
Services Used are:

1. IBM Watson Studio
2. IBM Watson Machine Learning
3. Node-RED
4. IBM Cloud Object Storage

1.2 Purpose

As we train the existing dataset using our created Auto AI experiment in Watson Studio we will be able to predict the values if a person has or will have a heart failure or not depending upon the features used and given as input . The webpage developed will help us get the prediction as Yes(Y) or No(N) according to the input given in that so that people can use this webpage and check their heart health status.It is very useful for elderly as well as mid age group people as now a days they are also prone to heart failure due to habits and other health circumstances like less amount of sleep, obesity etc.

2. LITERATURE SURVEY

2.1 Existing problem

This problem can be solved in python or jupyter notebook by providing inputs in the programming environment.
We can model any algorithm in the above mentioned ways and get output there.
We can also develop a webpage using HTML and CSS and link it to the model output obtained from jupyter notebook or python.

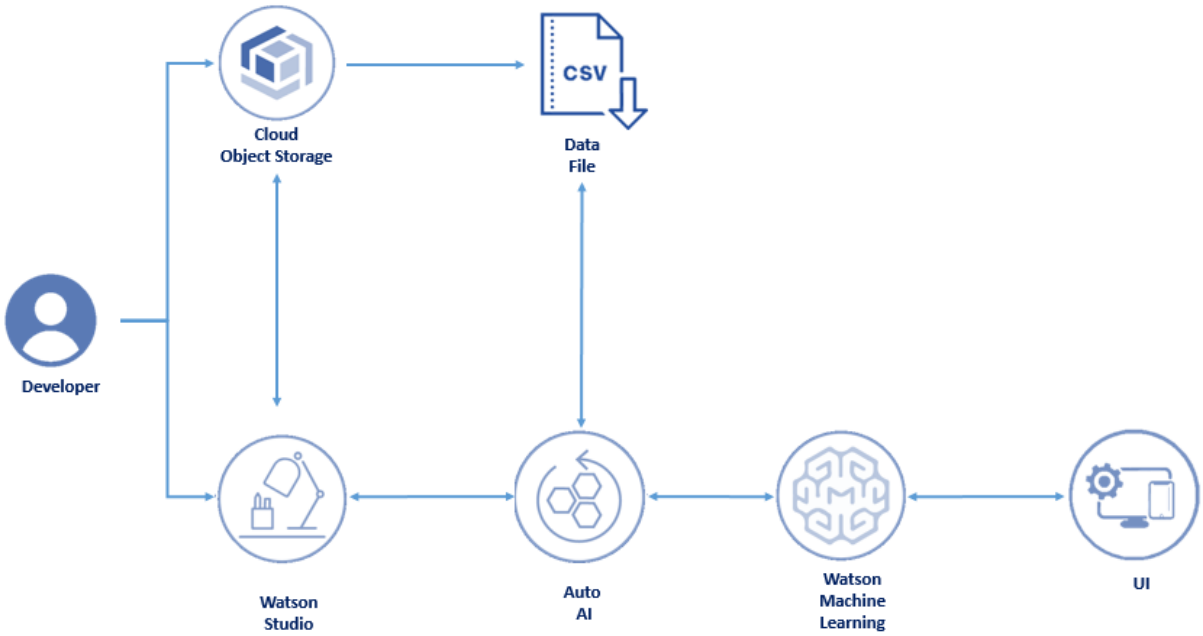
2.2 Proposed solution

First we build an AutoAI experiment using watson studio by IBM and create a machine learning service which can be linked with auto ai .We can then load the dataset , obtain the algorithm wise pipeline analysis and get the best model or algorithm suited for the dataset which is major plus with respect to machine learning.
This makes our job easier compared to traditional coding methods.
Then we can create a web page using node red application in IBM and link the endpoint generated by the ai model to this code and get a prediction output in the web page displayed.We can modify the color and other graphic design parameter of our created website form using node red which can enhance the visual parameter for the user.

3 . THEORETICAL ANALYSIS

3.1 Block diagram

Diagrammatic overview of the project



3.2 Hardware / Software designing

Hardware requirements: None

Software requirements: IBM cloud account,IBM Cloud,IBM Watson,Node- RED,IBM Machine Learning,IBM Cloud Object Storage.

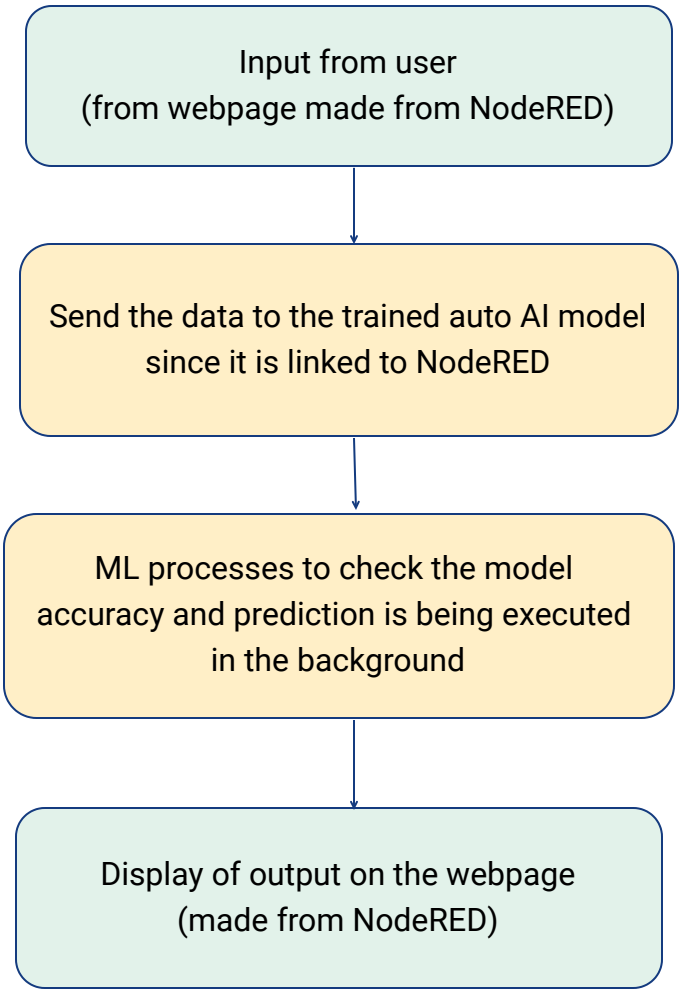
4 . EXPERIMENTAL INVESTIGATIONS

Analysis or the investigation made while working on the solution.

1. According to the dataset , the model is trained and the input values from the user are used for testing and getting the predicted value.
2. The model best suited for the dataset taken was gradient boosting classifier. As it gave more accuracy compared to other classification algorithms.
3. Node red helps us integrate to the dashboard and help us create forms or webpages where we can get input from the user and display their respective outputs.

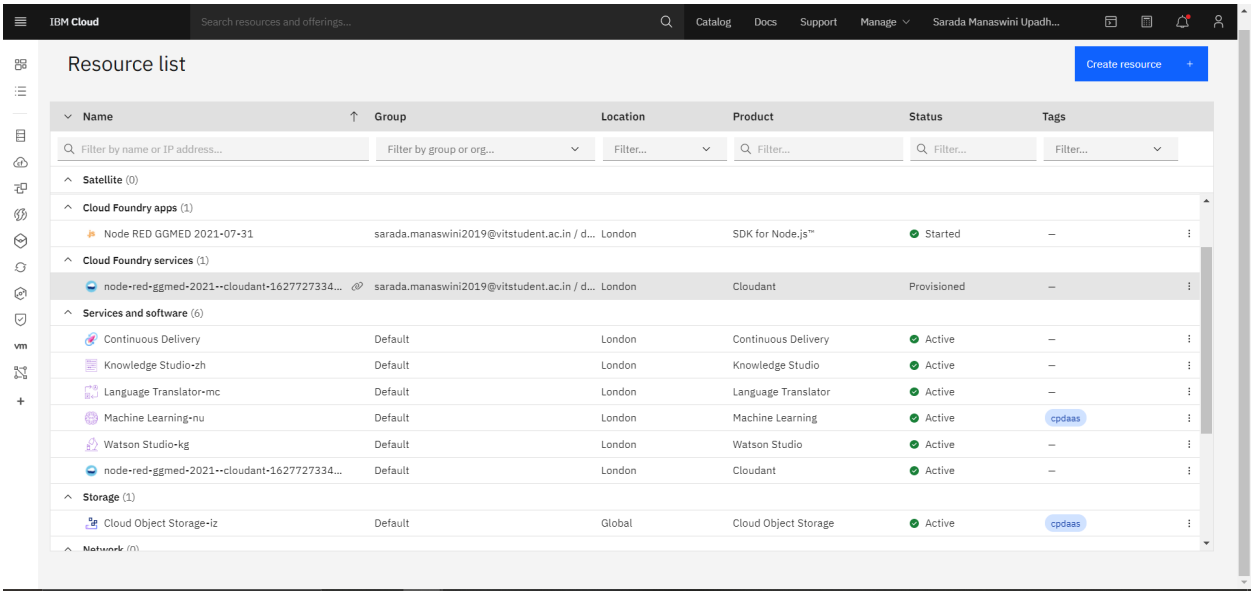
5. FLOWCHART

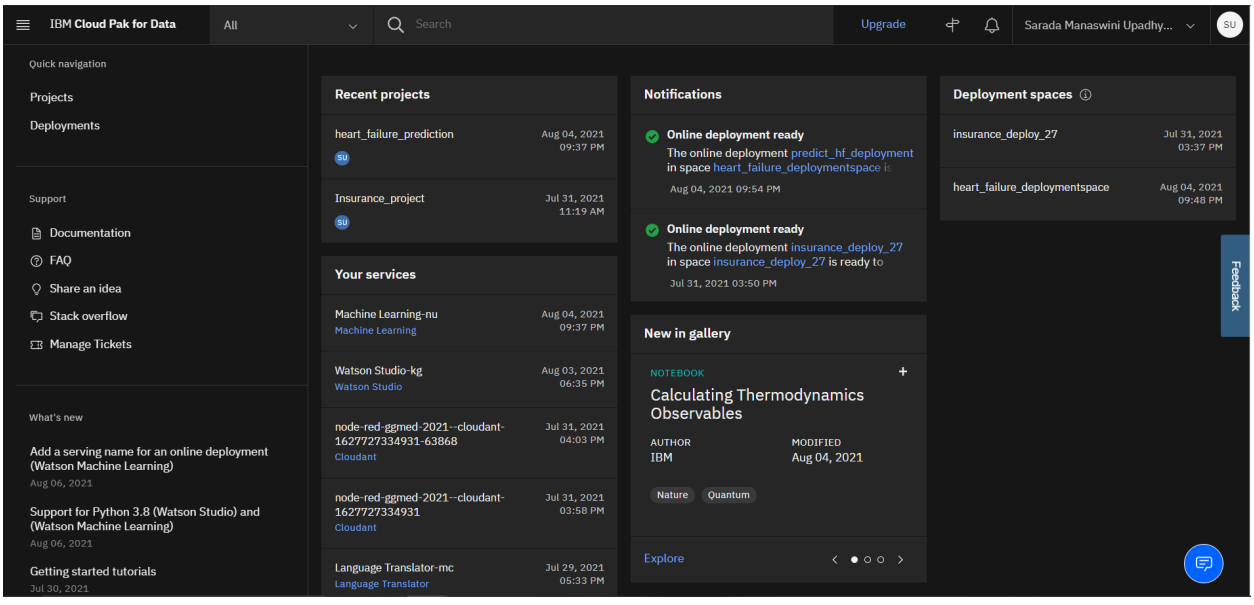
Diagram showing the control flow of the solution

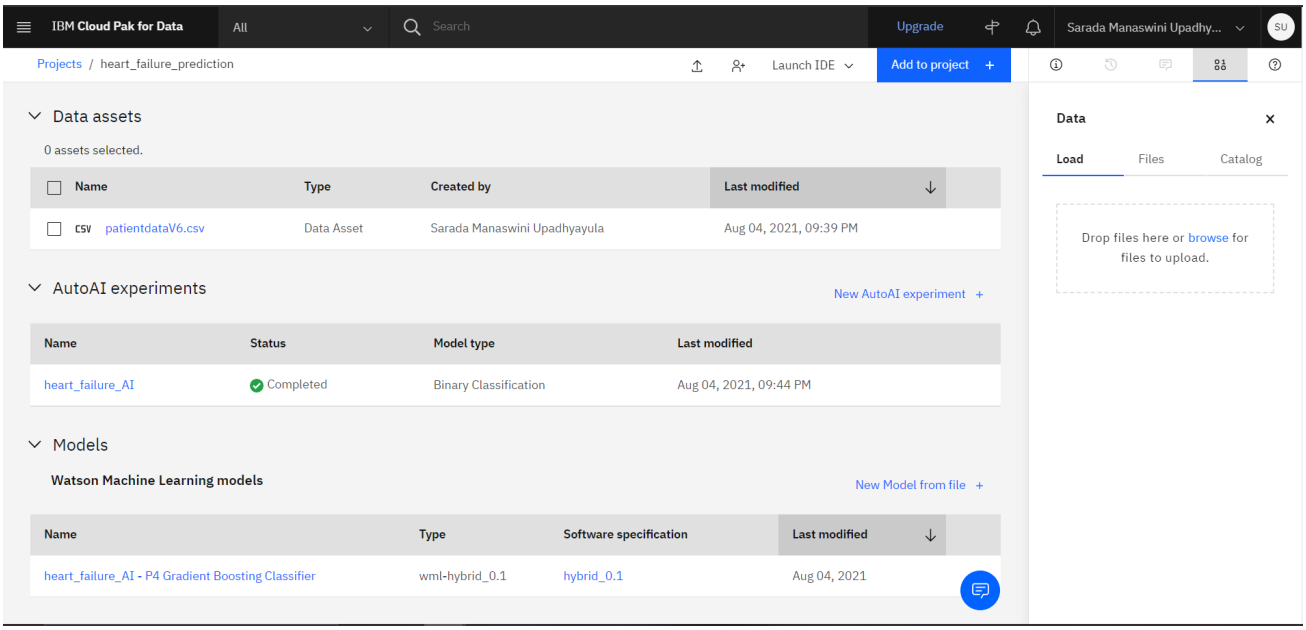


6. RESULT

Final findings (Output) of the project along with screenshots of the created services.
IBM AutoAI and watson studio for heart failure prediction Services created screen shots and output predicted values for test values.



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Upgrade
Sarada Manaswini Upadhy...
SU
Projects / heart_failure_prediction
Launch IDE
Add to project +
Data assets
0 assets selected.
Name
Type
Created by
Last modified
CSV patientdataV6.csv
Data Asset
Sarada Manaswini Upadhyayula
Aug 04, 2021, 09:39 PM
AutoAI experiments
New AutoAI experiment +
Name
Status
Model type
Last modified
heart_failure_AI
Completed
Binary Classification
Aug 04, 2021, 09:44 PM
Models
Watson Machine Learning models
New Model from file +
Name
Type
Software specification
Last modified
heart_failure_AI - P4 Gradient Boosting Classifier
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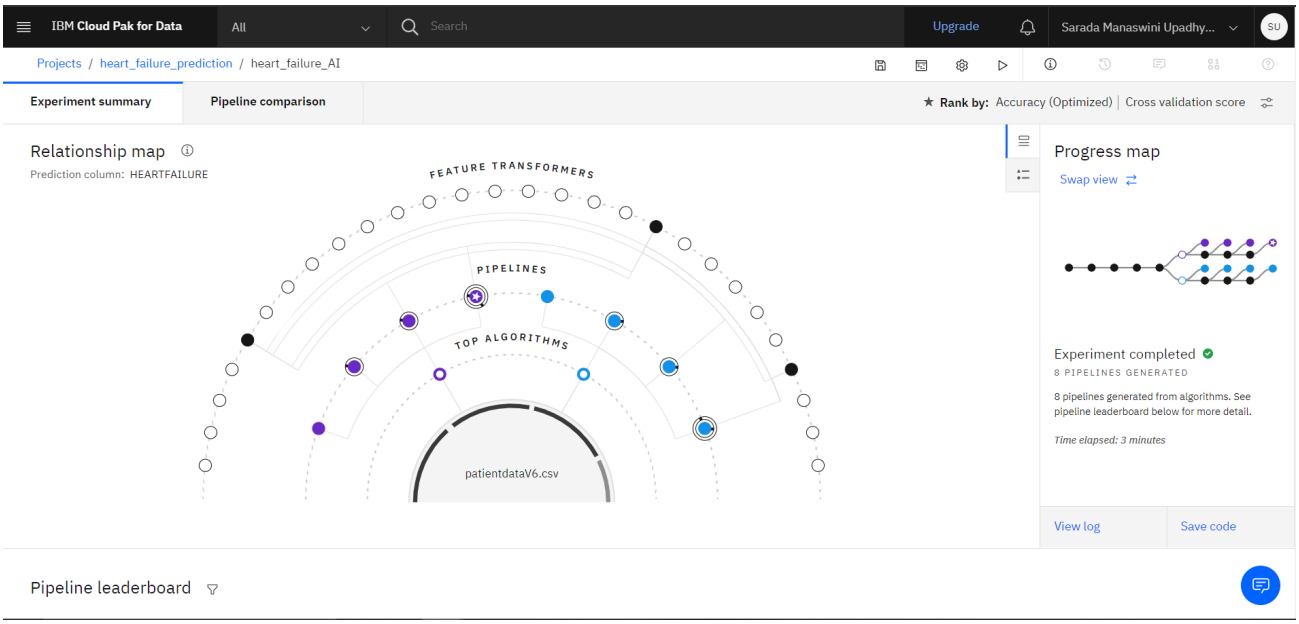
Aug 04, 2021
Data
Load
Files
Catalog
Drop files here or browse for files to upload.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Projects / heart_failure_prediction / heart_failure_AI
Experiment summary
Pipeline comparison
Rank by: Accuracy (Optimized) | Cross validation score
Relationship map
Prediction column: HEARTFAILURE
FEATURE TRANSFORMERS
PIPELINES
TOP ALGORITHMS
patientdataV6.csv
Progress map
Swap view
Experiment completed
8 PIPELINES GENERATED
8 pipelines generated from algorithms. See pipeline leaderboard below for more detail.
Time elapsed: 3 minutes
View log
Save code
Pipeline leaderboard

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Experiment summary | Pipeline comparison

★ Rank by: Accuracy (Optimized) | Cross validation score

	Rank	Name	Algorithm	Accuracy (Optimized) Cross Validation	Enhancements	Build time
★	1	Pipeline 4	Gradient Boosting Classifier	0.872	HPO-1 FE HPO-2	00:00:23
	2	Pipeline 3	Gradient Boosting Classifier	0.872	HPO-1 FE	00:00:55
	3	Pipeline 2	Gradient Boosting Classifier	0.870	HPO-1	00:00:11
	4	Pipeline 1	Gradient Boosting Classifier	0.864	*None*	00:00:02
	5	Pipeline 7	Decision Tree Classifier	0.863	HPO-1 FE	00:00:22
	6	Pipeline 8	Decision Tree Classifier	0.863	HPO-1 FE HPO-2	00:00:10
	7	Pipeline 6	Decision Tree Classifier	0.856	HPO-1	00:00:03
	8	Pipeline 5	Decision Tree Classifier	0.793	*None*	00:00:01

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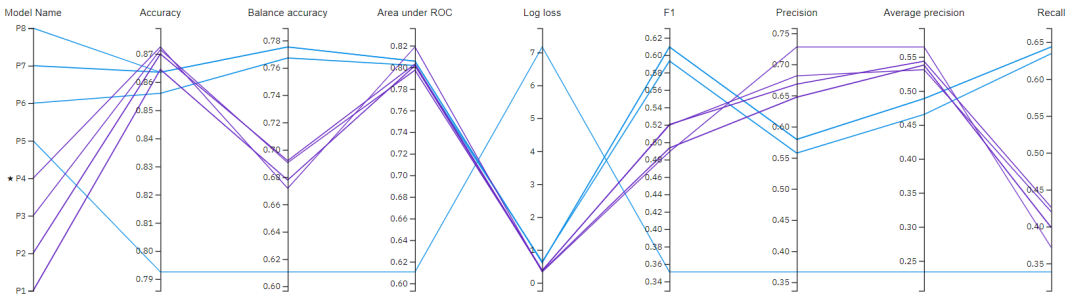
Projects / heart_failure_prediction / heart_failure_AI

Experiment summary | Pipeline comparison

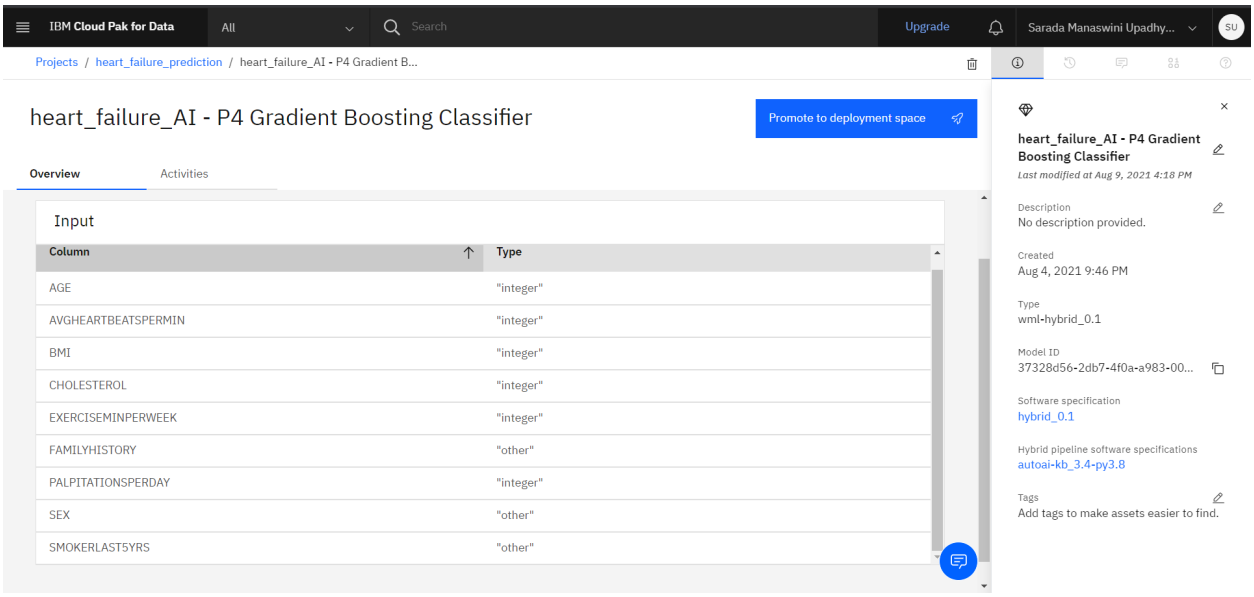
★ Rank by: Accuracy (Optimized) | Cross validation score

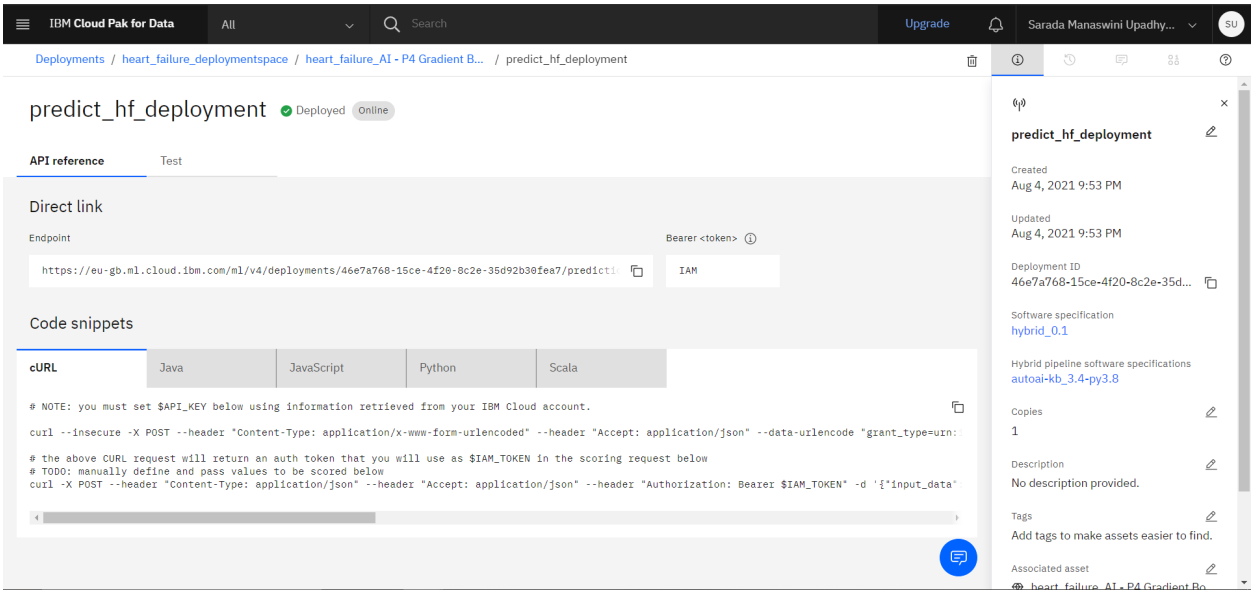
Metric chart

Prediction column: HEARTFAILURE



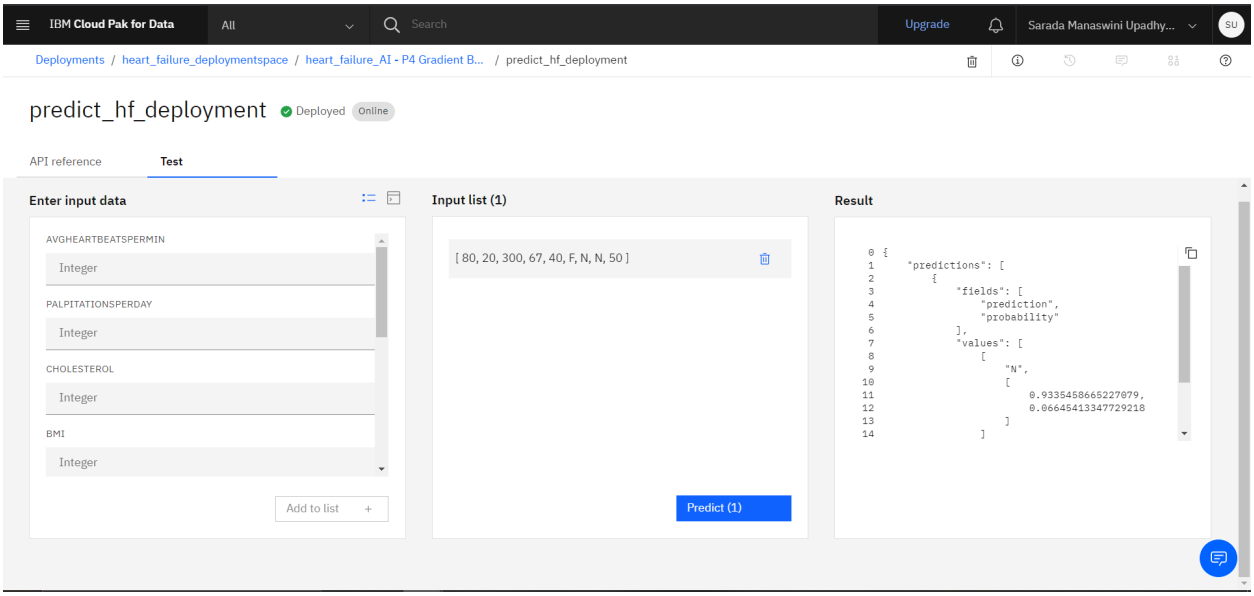
Pipeline leaderboard

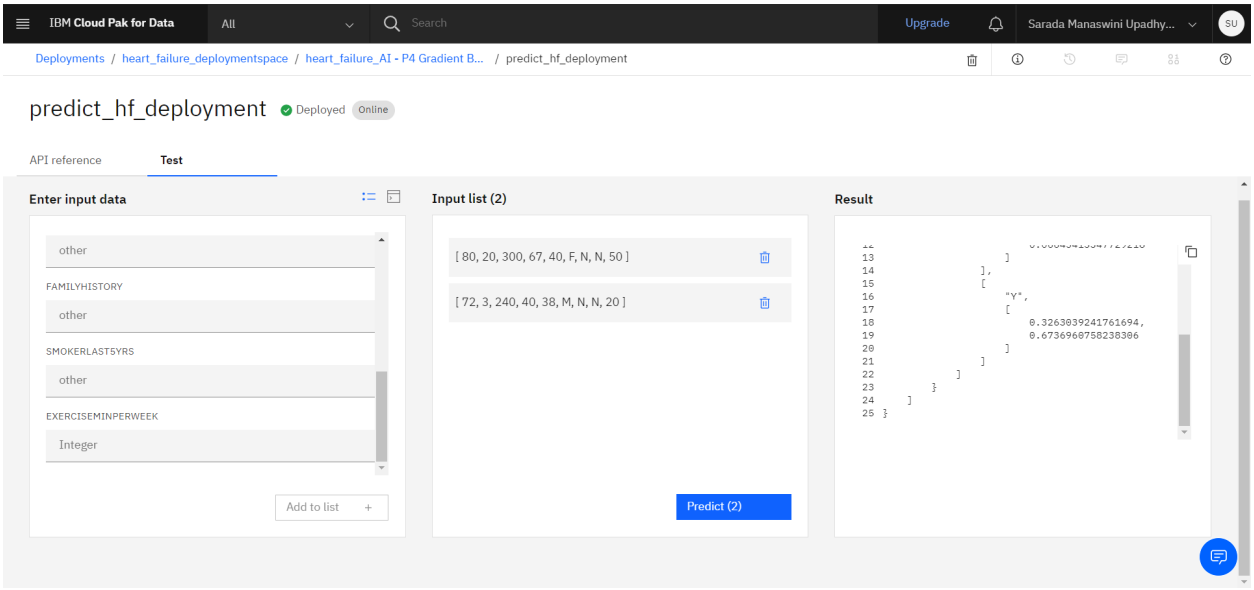




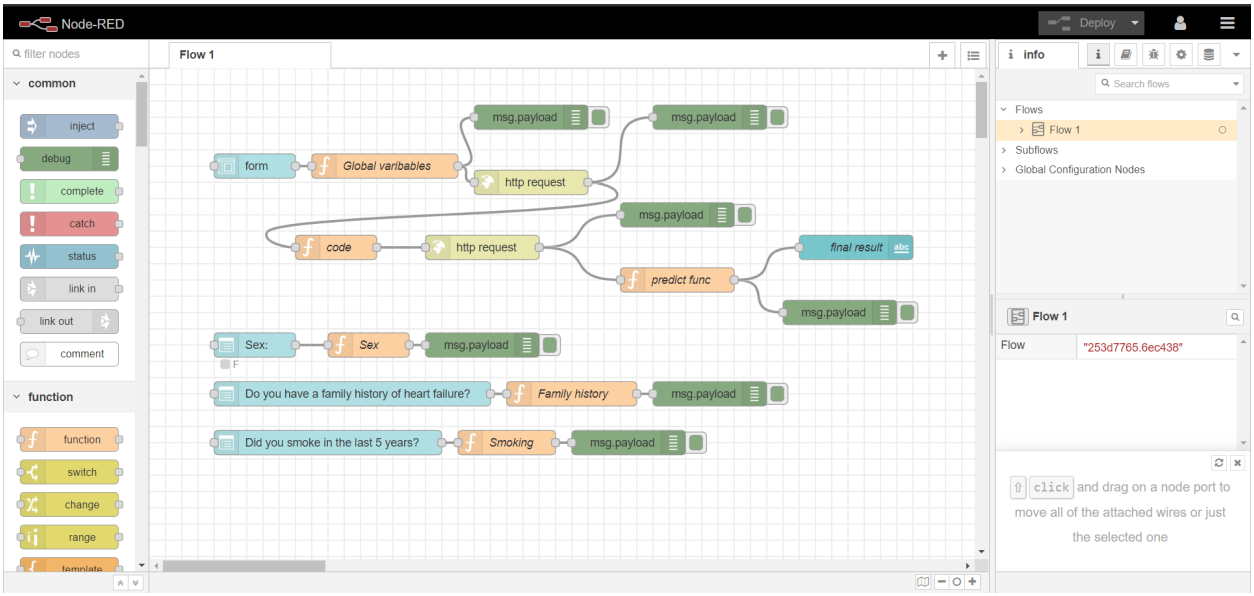
End point :
https://eu-gb.ml.cloud.ibm.com/ml/v4/deployments/46e7a768-15ce-4f20-8c2e-35d92b30fea7/predictions?version=2021-08-04

Test values Along with predicted output for - heart failure prediction



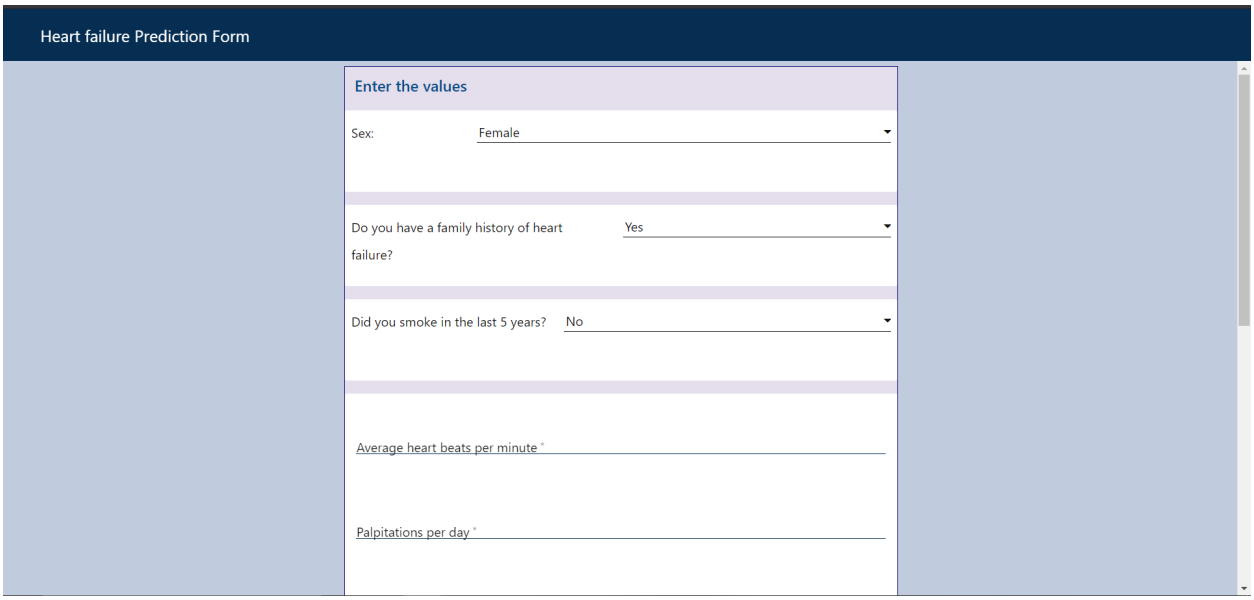


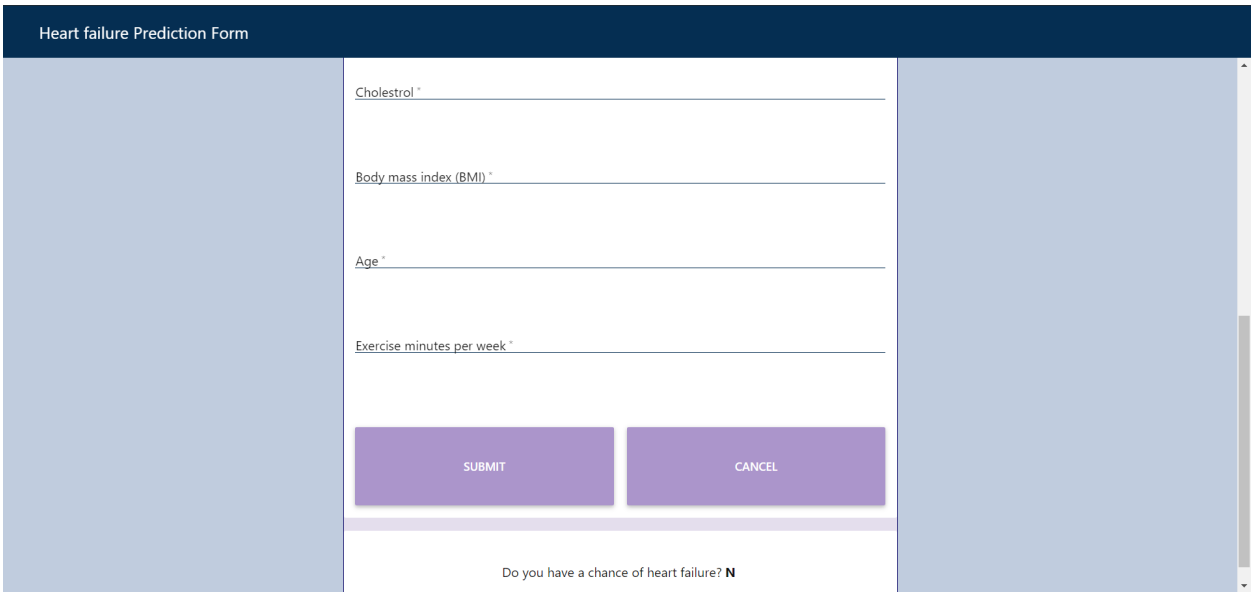
NodeRED flow and output screenshots:



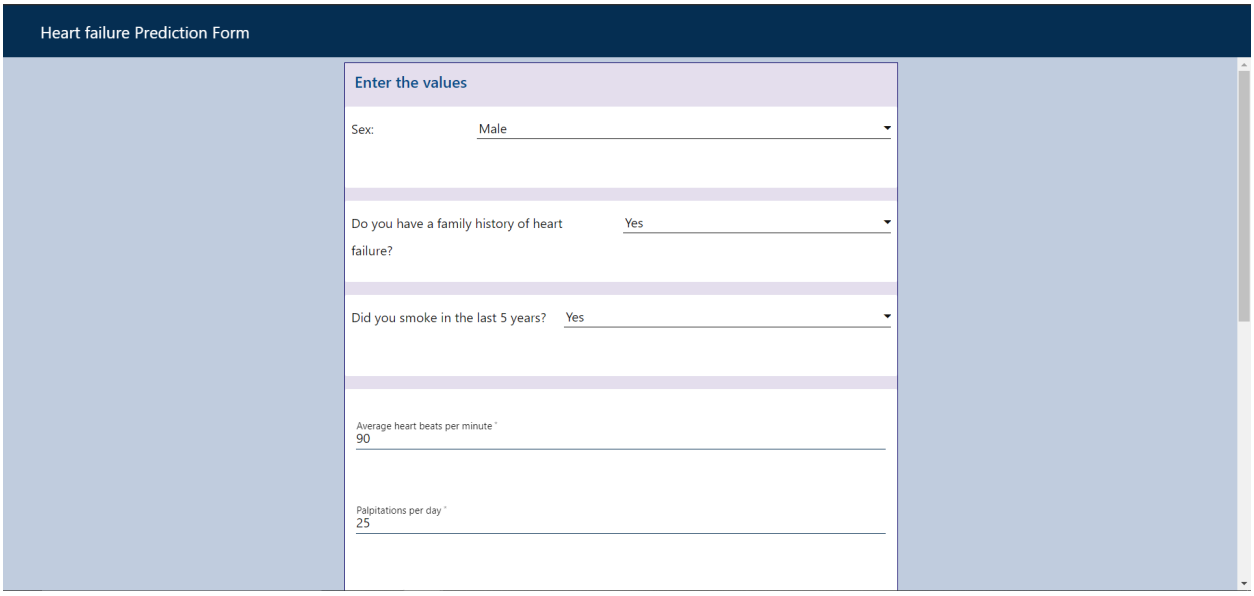
Link to NodeRED:

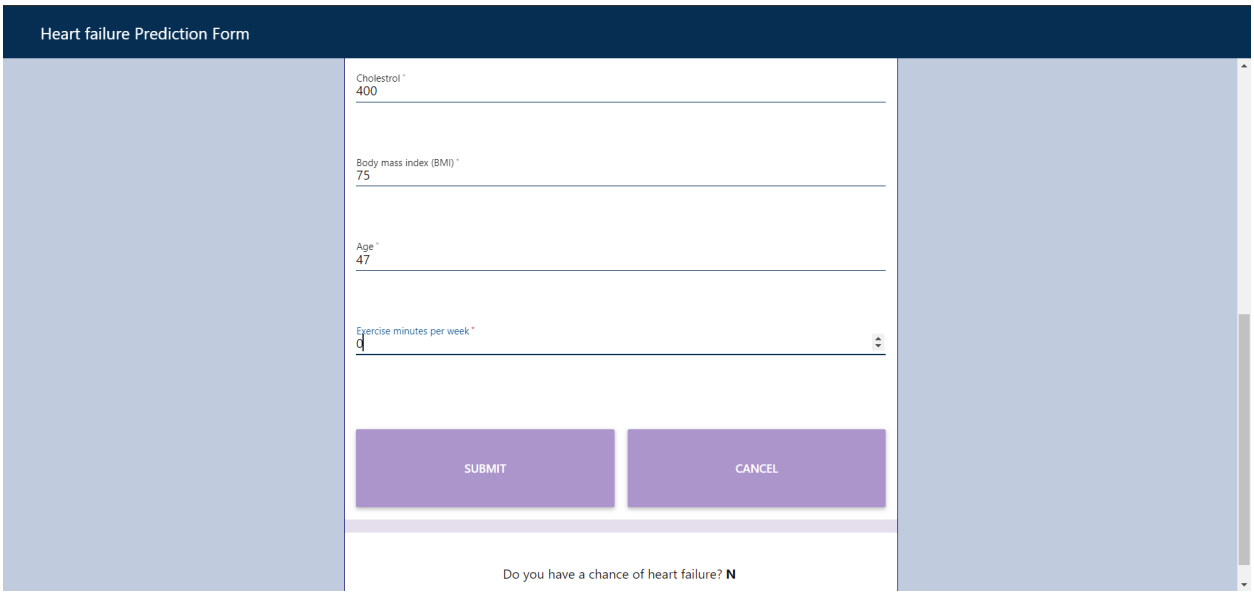
https://node-red-ggmed-2021-07-31.eu-gb.mybluemix.net/ui/#!/0?socketid=RpSkWcAJ5nkK34jPAAAK





Testing values of NodeRED:





7. ADVANTAGES & DISADVANTAGES

Advantages:

With this prediction, users can approach a doctor to get themselves checked at the early stages.
In case of emergencies, it can predict heart failure and the user would make necessary arrangements in advance.
At hospitals, it could be of great help to identify heart failure patients and reduce doctors time complexity.
This prediction method is cost effective for the patients.

Disadvantages:

The prediction generated by an automated system alone does not assure accuracy.
The prediction is only as perfect as the data that is provided in the dataset.
The system is not fully automated as it needs an user to feed the diagnosis.

8. APPLICATIONS

It allows users to get instant predictions on their heart well being status.
This model can be used to predict future heart failure medical data for people of all ages.
People who need immediate medical attention could use this prediction to check out if it might be a heart failure.
It will be helpful for people with heart related disease in predicting heart failure at early stages.
In hospitals for initial diagnosis the prediction could detect if the patient might suffer from heart failure.

9. CONCLUSION

The heart failure prediction auto AI based project executed successfully using IBM watson machine learning service and auto AI experiment.It predicted the apt machine learning model for the heart dataset which is the 'Gradient boosting classifier' Machine learning algorithm which
had the maximum accuracy among the classification models.The web page/form developed using node red was very useful for providing the inputs through dropdown and text and can help the user see the output instantly.

10. FUTURE SCOPE

In the future, the predictions scalability and accuracy can be improved in numerous ways. Various other ways of normalizing the data can be analyzed and the results can be compared to give out better results. Advanced techniques and algorithms can be used to predict heart failure in less time complexity. Extra diagnostic factors can be too received from the user that can be helpful in increasing the effectiveness of the prediction. Even the user's old health history could be collected and the predictions can be done with respect to that data. With the prediction, the users can be provided with necessary instructions to follow to avoid any further complications and bring them to a risk free level.

11. BIBLIOGRAPHY

These are some of the links which were helpful in completing this project:
https://dataplatform.cloud.ibm.com/docs/content/wsj/getting-started/projects.html?audience=wdp&context=wdp
https://dataplatform.cloud.ibm.com/docs/content/wsj/analyze-data/autoai-overview.html?audience=wdp&context=wdp
https://dataplatform.cloud.ibm.com/docs/content/wsj/analyze-data/autoai-build.html?audience=wdp&context=wdp

APPENDIX

A. Source Code

Auto AI python code for heart failure prediction:

```
import requests
# NOTE: you must manually set API_KEY below using information retrieved from your IBM Cloud account.
API_KEY = "<your API key>"
token_response = requests.post('https://iam.cloud.ibm.com/identity/token', data={"apikey":
```

```
API_KEY, "grant_type": 'urn:ibm:params:oauth:grant-type:apikey'})
mltoken = token_response.json()["access_token"]
header = {'Content-Type': 'application/json', 'Authorization': 'Bearer ' + mltoken}
# NOTE: manually define and pass the array(s) of values to be scored in the next line
payload_scoring = {"input_data": [{"fields": [array_of_input_fields], "values":
[array_of_values_to_be_scored, another_array_of_values_to_be_scored]}]}
response_scoring =
requests.post('https://eu-gb.ml.cloud.ibm.com/ml/v4/deployments/cb292ec4-6c05-4511-8215-
28
81cc50228d/predictions?version=2021-08-04?version=2021-08-04', json=payload_scoring,
headers={'Authorization': 'Bearer ' + mltoken})
print("Scoring response")
print(response_scoring.json())
```

Node Red JSON code:


```
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TE
ROL\",\n\t\t\t\t\"BMI\",\n\t\t\t\t\"AGE\",\n\t\t\t\t\"SEX\",\n\t\t\t\t\"FAMILYHISTORY\",\n\t\t\t\t\"
SMOKE
RLAST5YRS\",\n\t\t\t\t\"EXERCISEMINPERWEEK\"\n\t\t\t],\n\t\t\t\"values\":
[\n\t\t\t\t[\n\t\t\t\t\tavg,\n\t\t\t\t\tpalp,\n\t\t\t\t\tcho,\n\t\t\t\t\tbmi,\n\t\t\t\t\tage,\n\t\t\t\t\tsex,\n\t\t\t\t\tfam,
\n\t\t\t\t\tsmoke,\n\t\t\t\t\texmin\n\t\t\t\t]\n\t\t\t]\n\t\t}\n\t]\n}\nreturn
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