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Effective Heart Disease Prediction Using IBM Auto AI Service

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
- In this project, a classification model is built using IBM Auto AI for the prediction of heart failure.
- For achieving this objective, a heart disease prediction dataset is used which contains 9 features such as Avg heartbeats per min, cholesterol, bmi, etc

Services Used

- IBM Watson Studio
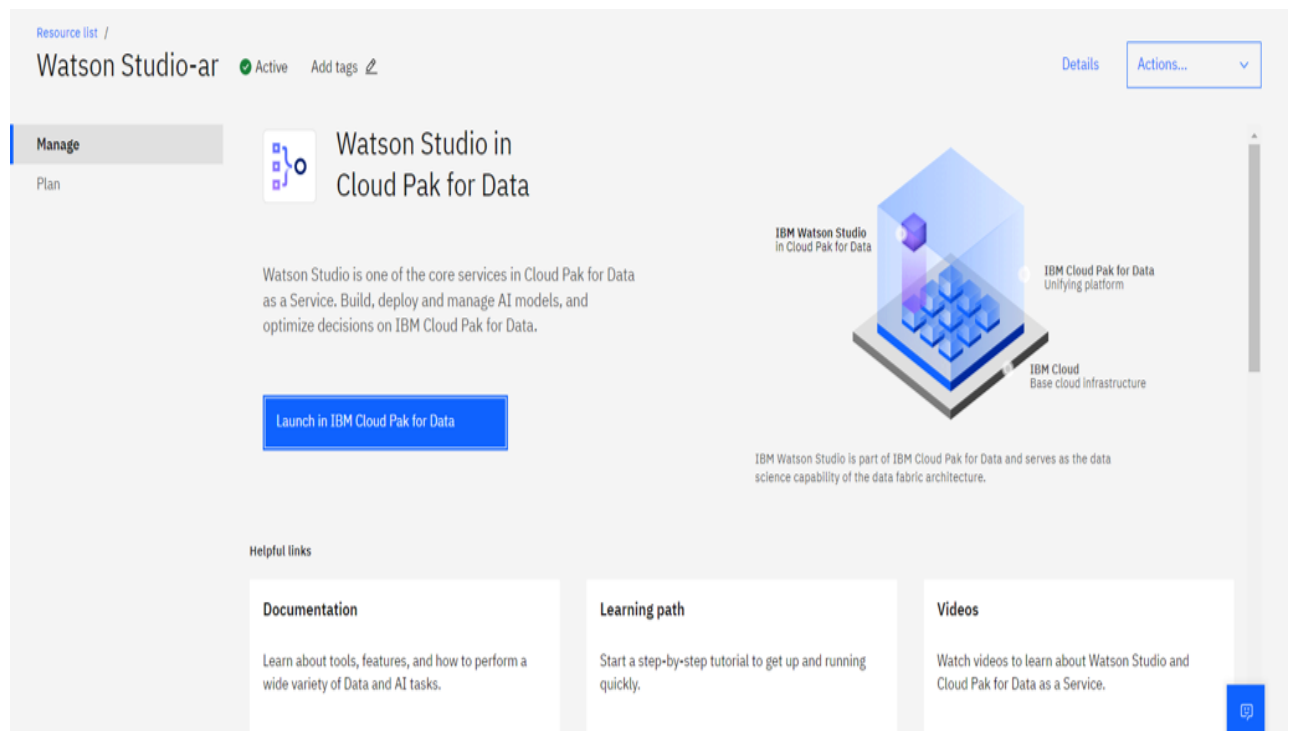
- IBM Watson Machine Learning

Machine Learning-cl ✓ Active   Add tags ✎

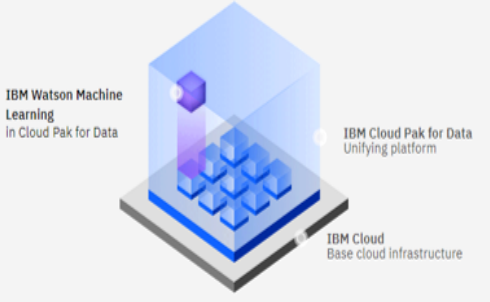Details   Actions...

Manage
Plan
Connections

Watson Machine Learning in Cloud Pak for Data

Use Watson Machine Learning on Cloud Pak for Data to put AI models to work. Deploy, monitor, and update models to get the insights you need from your data modeling.

Launch in IBM Cloud Pak for Data

IBM Watson Machine Learning
in Cloud Pak for Data

IBM Cloud Pak for Data
Unifying platform

IBM Cloud
Base cloud infrastructure

IBM Watson Machine Learning is part of IBM Cloud Pak for Data and serves as the data science capability of the data fabric architecture.

Helpful links

Documentation	Learning path	Videos
Learn about the tools and capabilities you need to run, monitor, and update your AI assets.	Check out sample projects, notebooks, and data sets to help you be productive.	Watch videos to learn about Watson Machine Learning and Cloud Pak for Data as a Service.

- Node-RED

Node-RED on IBM Cloud

Node-RED
Flow-based programming for the Internet of Things

Node-RED is a programming tool for wiring together hardware devices, APIs and online services in new and interesting ways.
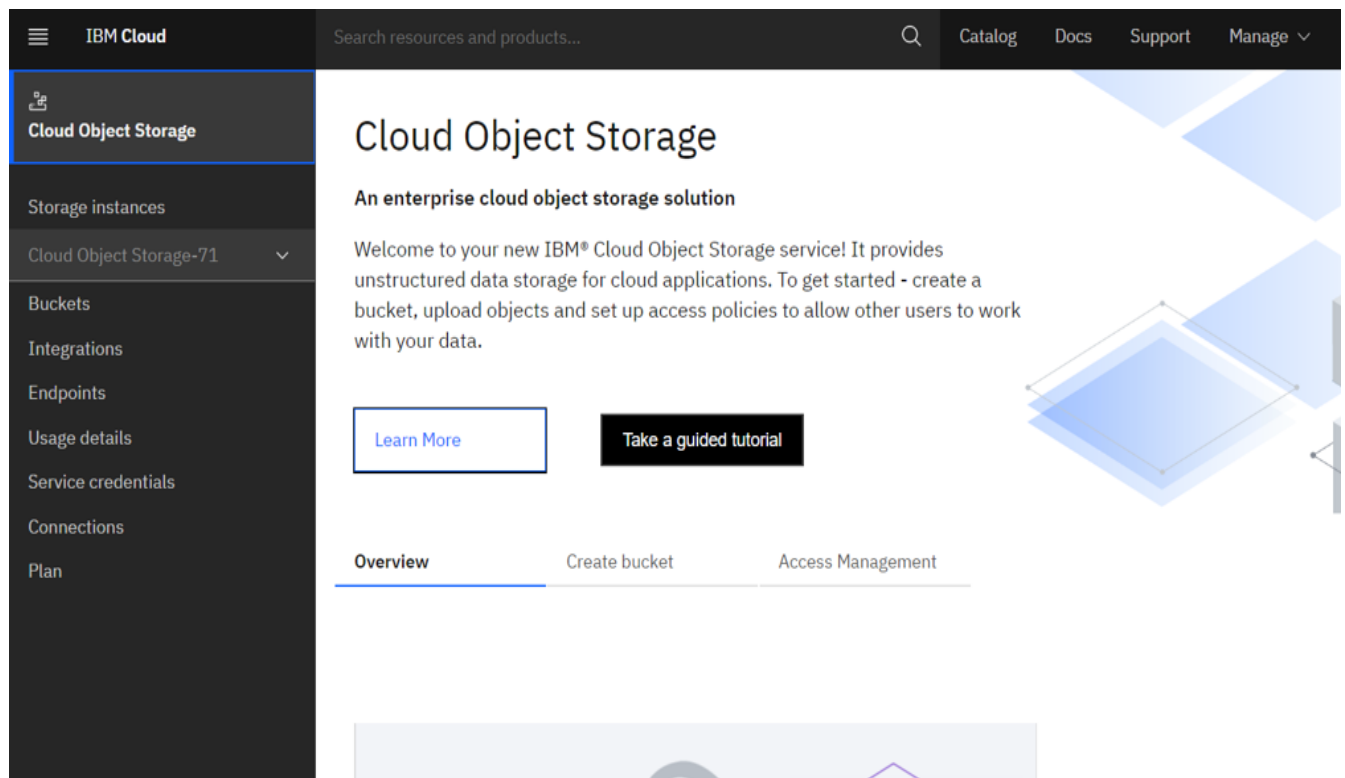
This instance is running as an IBM Cloud application, giving it access to the wide range of services available on the platform.

More information about Node-RED, including documentation, can be found at nodered.org.
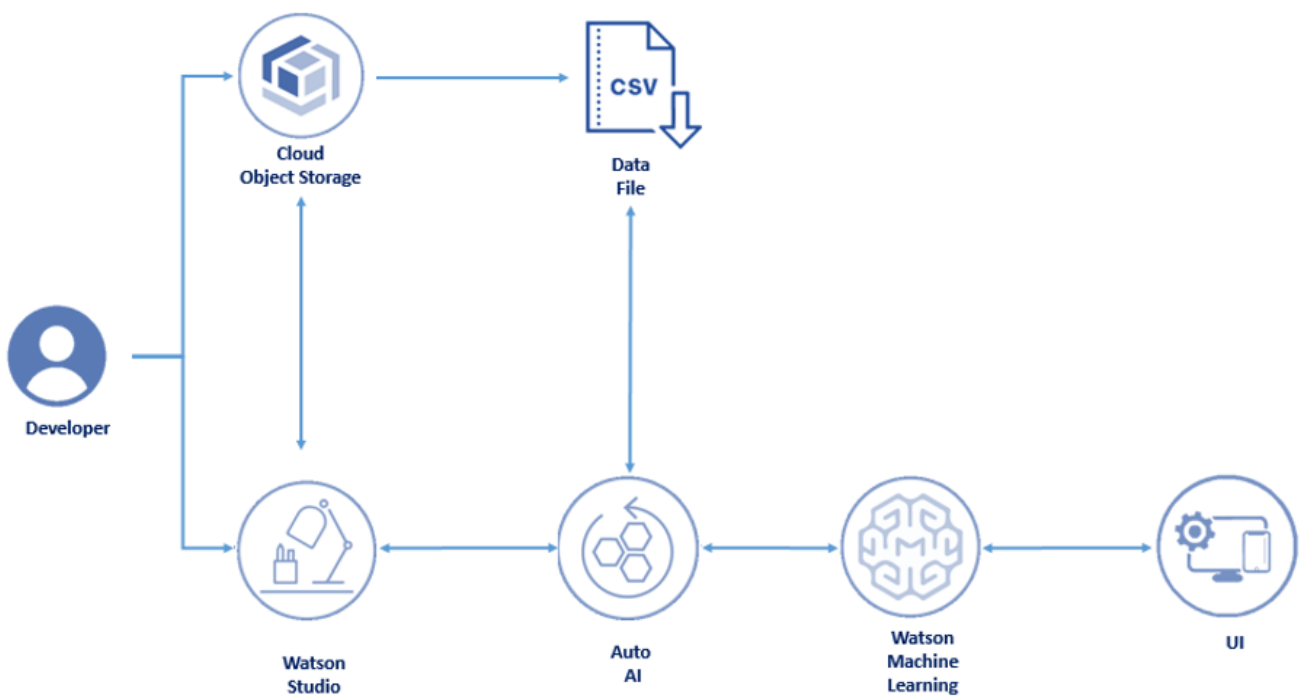
Go to your Node-RED flow editor

Learn how to customise Node-RED

- IBM Cloud Object Storage

Technical Architecture

Given below is the technical architecture of the project.

Based on the architecture, the flow of the project can be explained as follows:

1.Log in to IBM account

Firstly, log in to your IBM cloud account.

2. Create IBM Watson Studio, Cloud Object Storage and Node-RED Service

Search the catalog for IBM Watson Studio, Cloud Object Storage and Node-RED Service and create instances of the same.

3. Create a Watson Studio project

Create a machine learning service in IBM Watson for deploying your classification model.

4. Add Auto AI Experiment

5. Run the Auto AI Experiment to build an optimal Machine learning model on the given dataset

6. Save the model

7. Deploy the model on a web server and generate scoring End Point

8. Create a WEB application Using Node-RED to take user input

9. Showcase Prediction on UI

Result

The given dataset was used to create an Auto-AI experiment. A binary classification model was built which takes the various features from the dataset as input and classifies the given instance into either one of the two classes i.e. 'Y'(prone to heart disease) or 'N'(not prone to heart disease).

The Auto-AI experiment chose the following two algorithms for classification:

1. SNAP Random Forest classifier and
2. XGB classifier

The flow of the Auto-AI experiment is given as follows:

1. Read dataset
2. Split holdout data
3. Read training data
4. Preprocessig
5. Model Selection
6. From here, the flow proceeds to both the classification algorithms via dedicated pipelines and makes the predictions supported by hyperparameter optimization and feature engineering techniques.

Progress map ⓘ

Prediction column: HEARTFAILURE
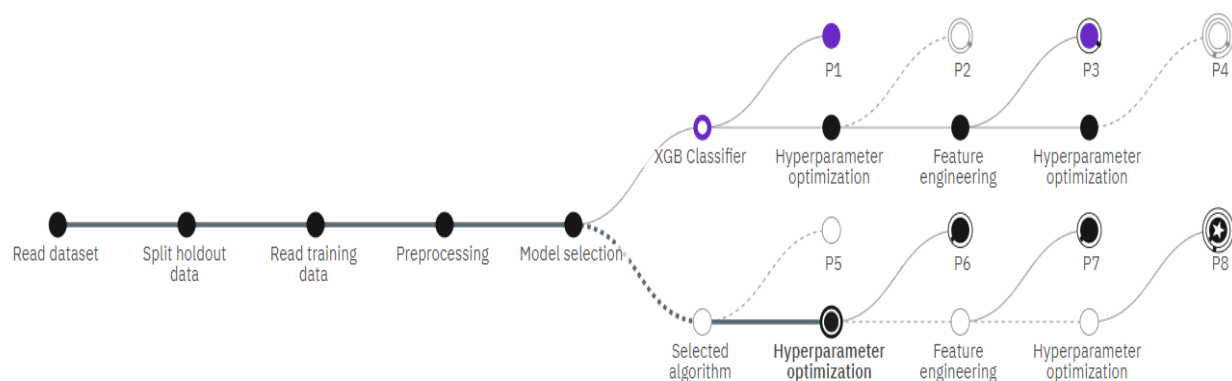
After the models are built, the SNAP random forest algorithm along with two rounds of hyperparameter optimization and feature engineering gives the best accuracy i.e. 87.3%. Hence, this model is selected for further deployment as a service.

Pipeline leaderboard ▽

	Rank ↑	Name	Algorithm	Accuracy (Optimized) Cross Validation	Enhancements	Build time
★	1	**Pipeline 8**	○ Snap Random Forest Classifier	**0.873**	HPO-1 FE HPO-2	00:01:39
	2	**Pipeline 3**	○ XGB Classifier	**0.873**	HPO-1 FE	00:00:52
	3	**Pipeline 7**	○ Snap Random Forest Classifier	**0.872**	HPO-1 FE	00:01:10
	4	**Pipeline 6**	○ Snap Random Forest Classifier	**0.869**	HPO-1	00:00:11
	5	**Pipeline 1**	○ XGB Classifier	**0.869**	*None*	00:00:01

After that, a json flow for the web service is created using node-RED.
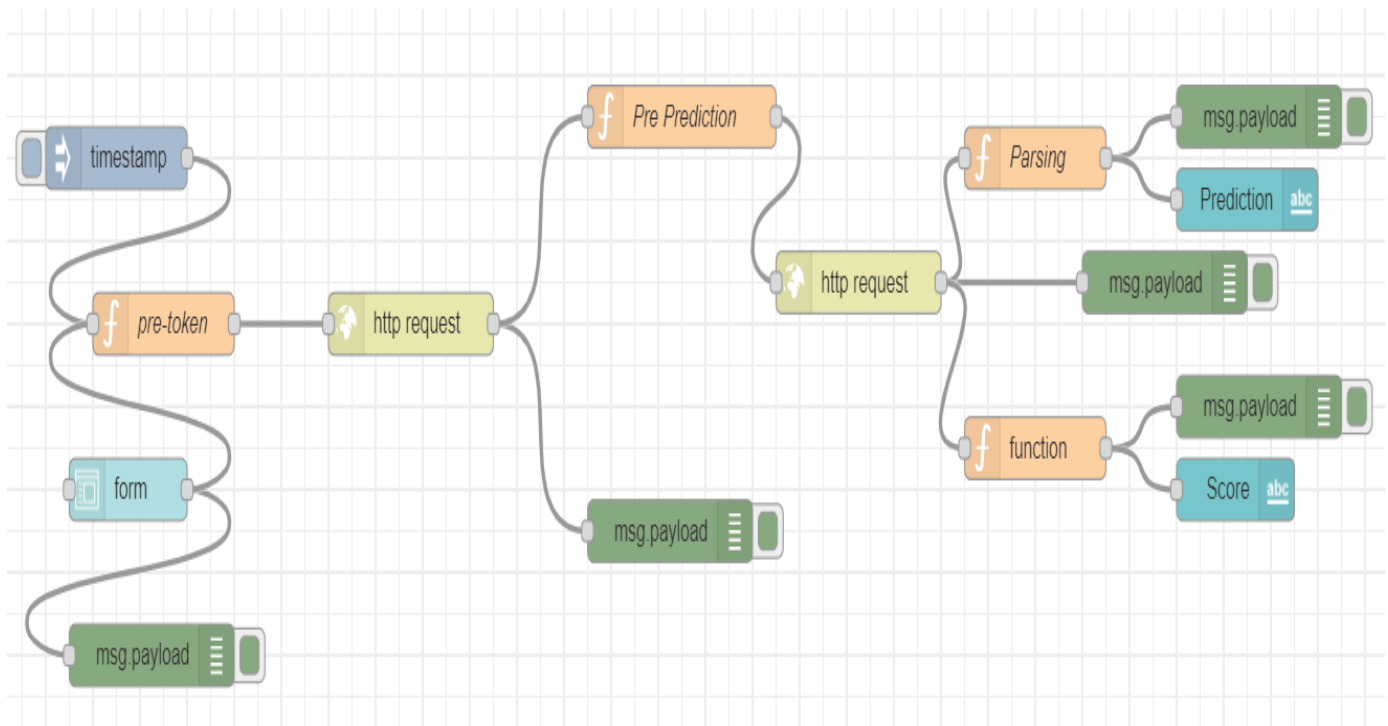
After deploying this service, the dashboard for the same is created as below:

Heart disease Predictor

Heart Disease Prediction using AutoAI

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

Hence, according to the various parameters inserted by the user, the prediction is done by the model and is displayed accordingly.

Output Screenshots:

Heart Disease Prediction using AutoAI

AVERAGE HEART BEATS (Per Minute) *

93

PALPITATIONS PER DAY *

22

CHOLESTEROL *

163

BMI *

25

AGE *

49

SEX (M or F) *

F

FAMILY HISTORY (Y or N) *

N

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

N

EXERCISE (Minutes Per Week) *

110

SUBMIT	CANCEL

Prediction   **Not at Risk**

Score   **0.9210792406516917**

Heart Disease Prediction using AutoAI

AVERAGE HEART BEATS (Per Minute) *

134

PALPITATIONS PER DAY *

7

CHOLESTEROL *

228

BMI *

34

AGE *

63

SEX (M or F) *

F

FAMILY HISTORY (Y or N) *

Y

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

N

EXERCISE (Minutes Per Week) *

92

SUBMIT   CANCEL

Prediction   **At Risk**

Score   **0.8132361145580516**

Heart Disease Prediction using AutoAI

AVERAGE HEART BEATS (Per Minute) *

80

PALPITATIONS PER DAY *

36

CHOLESTEROL *

164

BMI *

31

AGE *

45

SEX (M or F) *

F

FAMILY HISTORY (Y or N) *

Y

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

N

EXERCISE (Minutes Per Week) *

141

SUBMIT　　　**CANCEL**

Prediction　　　　　　　　　**Not at Risk**

Score　　　　　　**0.5736631887800554**

Conclusion:

Thus, using the various IBM cloud services and Auto-AI, the classification model is successfully built and deployed for the effective heart disease prediction.