

# EFFECTIVE HEART DISEASE PREDICTION USING IBM AUTO AI SERVICE

## 1. INTRODUCTION

### 1.1 Overview

Cardiovascular diseases (CVDs) are the number one 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 built using the Random Forest Classifier Algorithm using AutoAI and a web application is created using Node Red Application and it showcases the prediction of heart failure.

### 1.2 Purpose

The project helps us to predict the heart failure of human being given various parameters like

Features	Data Type
AVGHEARTBEATSPERMIN	Numeric
PALPITATIONSPERDAY	Numeric
CHOLESTEROL	Numeric
BMI	Numeric
AGE	Numeric
SEX	Categorical (F/M)
FAMILY HISTORY	Categorical (Y/N)
SMOKERLAST5YRS	Categorical (Y/N)
EXERCISEMINPERWEEK	Numeric
HEARTFAILURE	Categorical (Y/N) (Target Variable)

These parameters determine in predicting whether a person will get a heart disease or not. The machine gets trained by the given data set. In this case the 10800 rows are available and 11 features are available and the target variable is HEARTFAILURE.

## 2. LITERATURE SURVEY

### 2.1 Existing problem

Lippi et al. [1] focused on the possibility of cardiovascular disease during the COVID-19 pandemic. ,e nationwide quarantine has compelled the government to implement various forms of lockdown to reduce the transmission of COVID-19. As a result of these restrictions, all citizens remain at home, resulting in physical inactivity. Although the WHO has established clear guidelines on the amount of physical activity required to maintain adequate health, strict quarantine, on the other hand, has increased the risk of cardiovascular mortality. After quarantine, negative health effects are observed. As a result, the authors proposed the fact that it is necessary to maintain physical exercise even during quarantine to avoid unfavorable cardiovascular consequences. ,is has influenced the current research study's 2 Computational Intelligence and Neuroscience design

The random forest algorithm was used in the study [2] to predict the occurrence of heart disease in patients. A total of 303 samples from the Kaggle dataset were considered. ,metrics used to evaluate performance were accuracy, sensitivity, and specificity. In the classification of heart disease, the algorithm achieved a prediction rate of 93.3%

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S. Krishnan J. Geetha S [3] has made a system that predicts the developing potential results of Heart Disease. Their aftereffects of this system give the chances of happening heart disease to the extent rate. They have considered datasets used are organized similar to therapeutic parameters. Their structure evaluates those parameters using the information mining plan strategy. Their datasets were set up in python programming using two standard Machine Learning Algorithm to be explicit Decision Tree Algorithm and Naive Bayes Algorithm and have exhibited the best estimation among these two to the extent the precision level of heart illness

K.G Dinesh, K.A.raj, K.D.Santhosh, V. M.eswari [4] has talked about heart illness expectation and performed information pre-preparing utilizes strategies like the removal of noisy data, removal of missing data, filling default values if applicable and classification of attributes for prediction and decision making at different levels. Their exhibition of the finding model is acquired by utilizing techniques like order, exactness, affectability and particularity examination. This has proposed a forecast model to anticipate whether people have heart illness or not and to give mindfulness or finding on that. They have done examination by comparing the accuracies of applying rules with the individual consequences of Support Vector Machine, Gradient Boosting, Random backwoods, Naive Bayes classifier and calculated relapse on the dataset taken in a district to display an exact model of foreseeing cardiovascular ailment.

Senthil Kumar Mohan et al,[5] proposed Effective Heart Disease Prediction Using Hybrid Machine Learning Techniques in which strategy that objective is to finding critical includes by applying Machine Learning bringing about improving the exactness in the expectation of cardiovascular malady. The expectation model is created with various blends of highlights and a few known arrangement strategies. We produce an improved exhibition level with a precision level of 88.7% through the prediction model for heart disease with hybrid random forest with a linear model (HRFLM) they likewise educated about Diverse data mining approaches and expectation techniques, Such as, KNN, LR, SVM, NN, and Vote have been fairly famous of late to distinguish and predict heart disease.

Avinash Golande et al,[6] proposed Heart Disease Prediction Using Effective Machine Learning Techniques in which Specialists utilize a few data mining strategies that are available to support the authorities or doctors distinguish the heart disease. Usually utilized methodology utilized are decision tree, k- closest and Naïve Bayes. Other unique characterization-based strategies utilized are packing calculation, Part thickness, consecutive negligible streamlining and neural systems, straight Kernel selfarranging guide and SVM (Bolster Vector Machine). The following area obviously gives subtleties of systems that were utilized in the examination.

Lakshmana Rao et al,[7] Machine Learning Techniques for Heart Disease Prediction in which the contributing elements for heart disease are more (circulatory strain, diabetes, current smoker, high cholesterol, etc.). So, it is difficult to distinguish heart disease. Different systems in data mining and neural systems have been utilized to discover the seriousness of heart disease among people. The idea of CHD ailment is bewildering, in addition, in this manner, the disease must be dealt with warily. Not doing early identification, may impact the heart or cause sudden passing. The perspective of therapeutic science furthermore, data burrowing is used for finding various sorts of metabolic machine learning a procedure that causes the framework to gain from past information tests, models without being expressly customized. Machine learning makes rationale dependent on chronicled information

Marimuthu M et al [8], proposed Heart disease is one of the prevalent disease that can lead

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to reduce the lifespan of human beings nowadays. Each year 17.5 million people are dying due to heart disease. Life is dependent on component functioning of heart, because heart is necessary part of our body. Heart disease is a disease that effects on the function of heart. An estimate of a person's risk for coronary heart disease is important for many aspects of health promotion and clinical medicine. A risk prediction model may be obtained through multivariate regression analysis of a longitudinal study

Balakrishnan et al [9] proposed Machine learning is a technique converts the raw clinical data into an informational data that helps for decision making and prediction. Cardiovascular disease is one of the major causes of mortality around the world. It is considered in a large scale, so prediction of cardiovascular disease is more important in the clinical survey analysis as day by day it gets increased. The amount of data in the health club is huge. As cardiovascular is one of the major causes for death there are some data analytical techniques that predicts the occurrence of cardiovascular disease. It can be achieved through selecting a correct combination of prediction models and features. Prediction models were developed using different classification techniques based on feature selection and there are certain algorithms which provide varied and improved accuracy. Here prediction model is developed using Random Forest classification technique - Method for classification, regression by constructing a multitude of decision trees at training time. Developed by aggregating tree Avoids over fitting can deal with large number of features. Helps with feature selection based on importance where necessary features only classified. Pre-processing will be done first considering the clinical data. It will be spited into train and test data with which accuracy can be achieved.

### **2.2 Proposed solution**

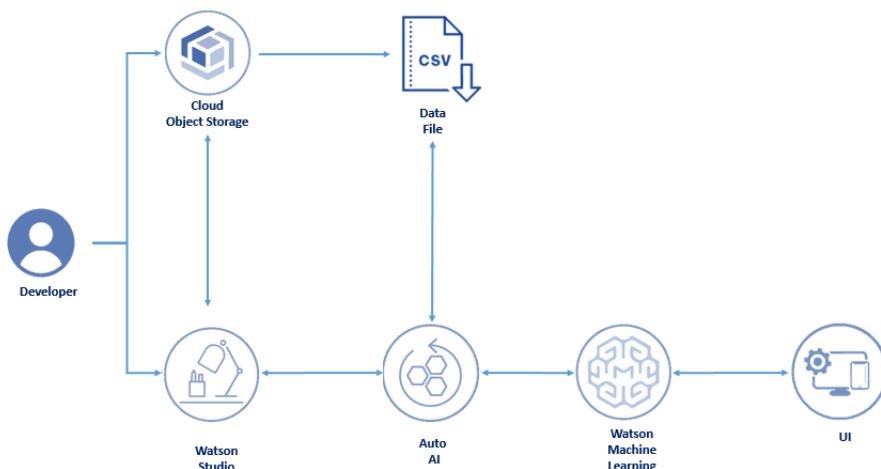
#### **What is the method or solution suggested by you?**

The heart is important organ of human body part. Life is completely dependent on efficient working of the heart. What if a heart undergoes a disorder, cardiovascular diseases are the most challenging disease for reducing patient count. According to survey conducted by WHO, about 17 million people die around the globe due to cardiovascular diseases. The problem has various parameters and these are involved in identifying whether a person will be affected by heart disease or not. The parameters and its corresponding values are inputted to the machine learning algorithms by dividing the data into training and testing phases. The trained data is measures with its accuracy level and also the data is tested with values. Based on the efficiency of the algorithm and the accuracy obtained, the Random forest model is able to result with a higher accuracy value.

## **3. THEORITICAL ANALYSIS**

### **3.1 Block diagram**

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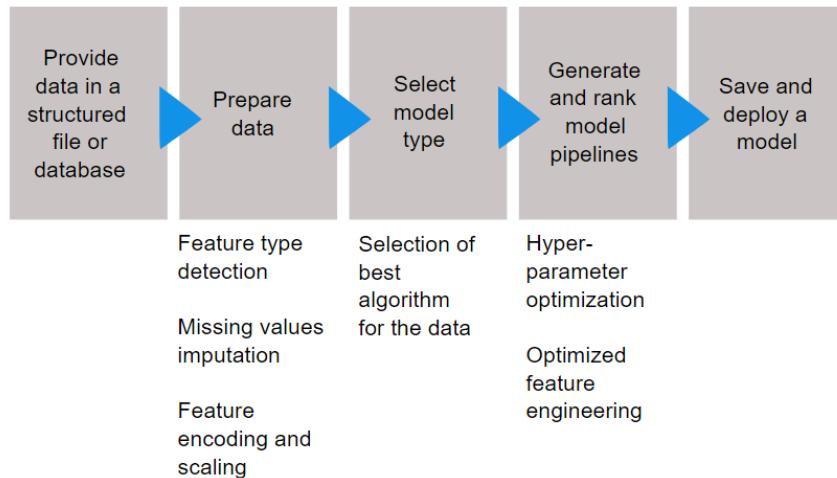


Block Diagram

The developer creates the Cloud object storage in the ibm cloud. Cloud Object storage is a service offered by IBM for storing and accessing the unstructured data. Objects are pieces of data that is uploaded in the cloud storage.

IBM Watson studio is an integrated environment designed to develop, manage models and deploy AI powered Applications. It is Software as a Service. A project is created in IBM Watson Studio

### AUTO AI



AUTO AI

The AutoAI graphical tool in Watson Studio analyzes the data and discovers data transformations, algorithms, and parameter settings that work best for the predictive modeling problem. AutoAI displays the results as model candidate pipelines ranked on a leaderboard and the specific model can be appropriately chosen by the developer based on the result obtained.

### Deploy the ML model as a webserver

Node Red Service

Submitted by M.Nirmala / Assistant Professor, Hindusthan College of Engineering and Technology, Coimbatore. email: nirmala.mca@hicet.ac.in

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It is a programming tool for wiring together hardware devices, API's and Online services. It is a browser based editor that makes it easy to wire together flows using wide range of nodes in the palette that can be deployed in its run time in a single click.

### 3.2 Hardware / Software designing

#### HARDWARE SPECIFICATION

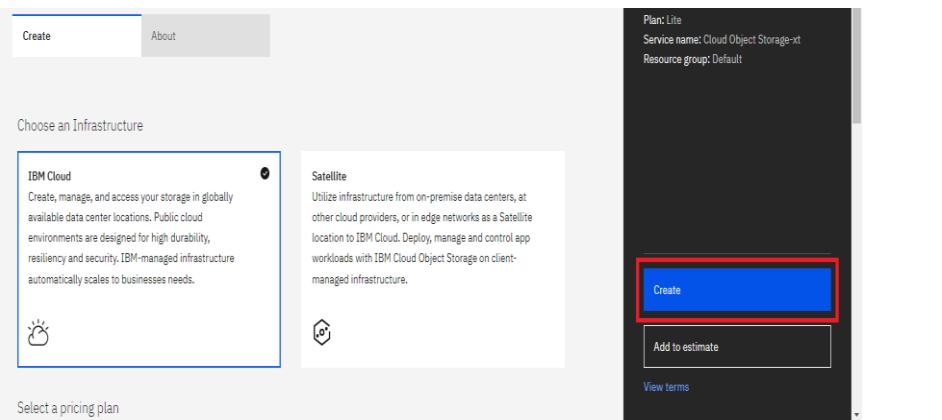
Processor	Intel(R) Core(TM) i3-3227U CPU @ 1.90GHz 1.90 GHz
Ram	4 GB.
HDD	100 GB.
Monitor type	15 Inch VGA.
Keyboard	110Keys Keyboard

#### SOFTWARE SPECIFICATION

Operating system	Windows 10
Web Browser	Chrome, Mozilla firefox
Set up	Watson Studio
Storage	IBM Cloud Platform
Application Development	Node Red Service
Machine Learning Service	AUTO AI

## 4. EXPERIMENTAL INVESTIGATIONS

Analysis or the investigation made while working on the solution.

Create the cloud Object storage in the IBM Cloud Platform. The cloud object is names as cloud object storage – 5m	
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<p>Create the Watson Studio called as WATSON STUDIO NIRMALA with the location as Dallas and the plan as Lite</p>	
<p>After the Watson Studio creation Click on the Launch in IBM Cloud Pak for Data. Click on the new project for a New project as NIRMALA_HEART_DISEASE_PREDICTION_PROJ</p>	
<p>Click on Asset and select the new tool to create an operational or configuration asset. The tool created is Code Editors and choose Jupyter Notebook</p>	
<p>The new notebook called as NIRMALA_HEART_NOTEBOOK is created</p>	

Submitted by M.Nirmala / Assistant Professor, Hindusthan College of Engineering and Technology, Coimbatore. email: nirmala.mca@hicet.ac.in

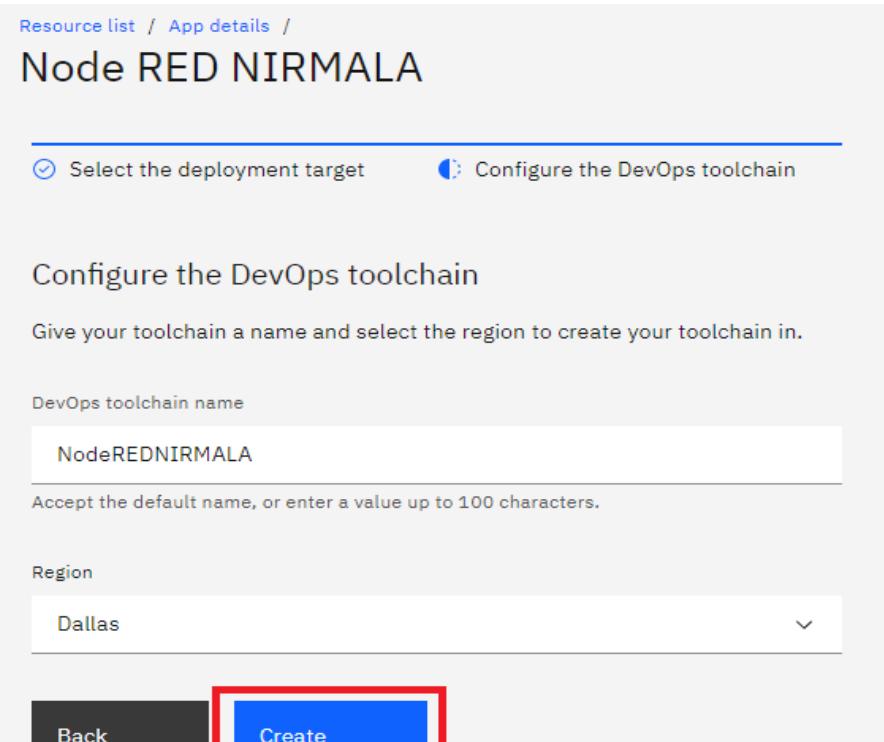
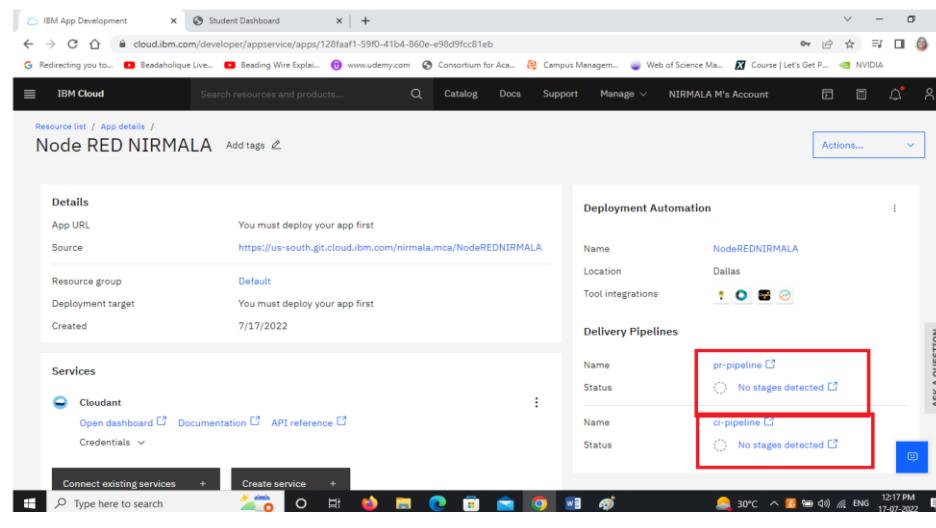
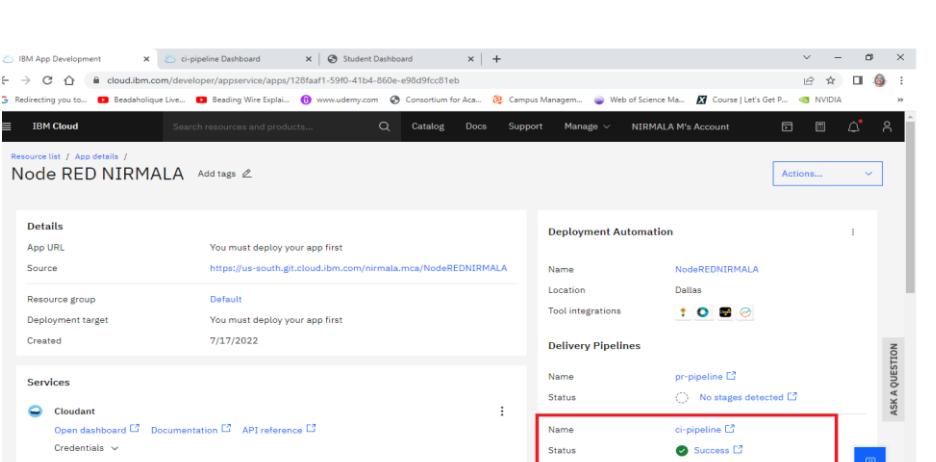
## EFFECTIVE HEART DISEASE PREDICTION USING IBM AUTO AI SERVICE

<p><b>Node Red Service</b></p> <p>It is a programming tool for wiring together hardware devices, API's and Online services. A node red service called as NODE RED NIRMALA is created with the location as dallas and pricing plan as Lite</p>	
<p>After the App is created Deploy the App. Choose cloud foundry as the deployment target</p>	

## EFFECTIVE HEART DISEASE PREDICTION USING IBM AUTO AI SERVICE

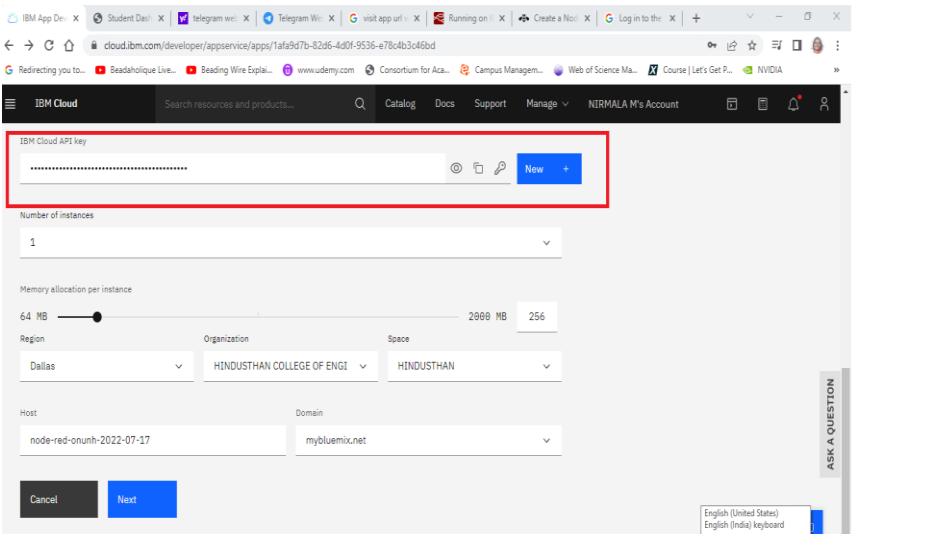
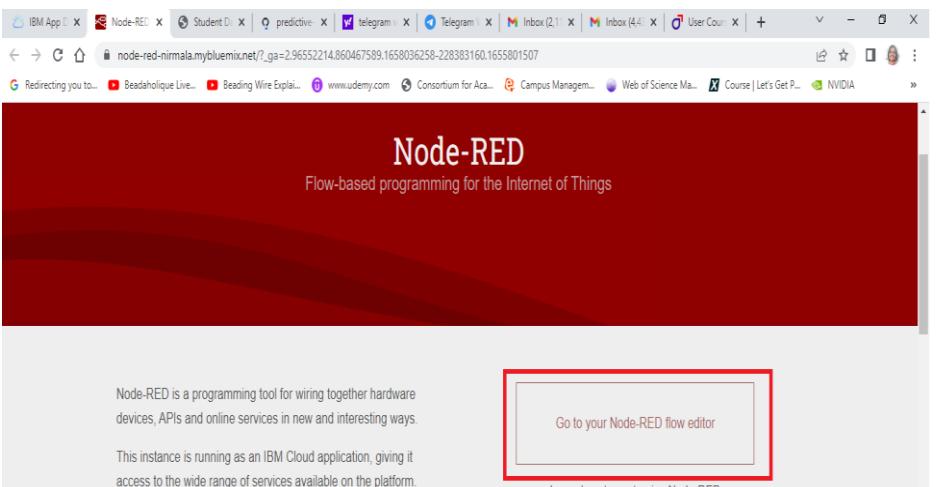
<p>An API key is created for this application.</p>	<p>on a managed serverless platform. Auto-scale workloads, and pay only for the resources that you consume.</p> <p>IBM Cloud Foundry Public is deprecated. <a href="#">Learn more</a></p> <p>IBM Cloud API key <input type="text" value="IBM Cloud API key"/> <span style="border: 2px solid red; padding: 2px;">The value is required.</span> <span style="border: 2px solid blue; padding: 2px; background-color: #0070C0; color: white; border-radius: 5px; font-weight: bold; text-decoration: none;">New +</span> <span style="border: 1px solid black; padding: 2px;">Create a new API key with full access</span></p> <p>Number of instances <input type="text" value="1"/></p> <p>2. Select the domain and provide a host name.</p>
<p>Create an API key and download the API key</p>	<p>IBM App Development Student Dashboard</p> <p>IBM Cloud</p> <p>Code Engine IBM</p> <p>Run your app, job, or container on a managed serverless platform. Auto-scale workloads, and pay only for the resources that you consume.</p> <p>IBM Cloud Foundry Public is deprecated.</p> <p>IBM Cloud API key <input type="text" value="IBM Cloud API key"/> <span style="border: 2px solid red; padding: 2px;">The value is required.</span></p> <p>Number of instances <input type="text" value="1"/></p> <p>Foundry org, you must create one. Create org. <span style="border: 1px solid black; padding: 2px;">Steps</span></p> <p>1. Select the number of instances, memory allocation, region, org, and space.</p> <p>2. Select the domain and provide a host name.</p> <p>API Key for NodeRED NIRMALA API KEY FOR NODE RED NIRMALA</p> <p><input type="checkbox"/> Save this key in a secrets store for reuse</p> <p>Cancel OK</p>

## EFFECTIVE HEART DISEASE PREDICTION USING IBM AUTO AI SERVICE

<p>Configure the DevOps toolchain. Give a toolchain name and select the region to create your toolchain in</p>	 <p>Resource list / App details / Node RED NIRMALA</p> <p>Select the deployment target      Configure the DevOps toolchain</p> <p>Configure the DevOps toolchain</p> <p>Give your toolchain a name and select the region to create your toolchain in.</p> <p>DevOps toolchain name NodeREDNIRMALA</p> <p>Accept the default name, or enter a value up to 100 characters.</p> <p>Region Dallas</p> <p>Back      Create</p>
<p>From No stages detected it should change to success</p>	 <p>IBM App Development x Student Dashboard x   +</p> <p>IBM Cloud Search resources and products... Catalog Docs Support Manage NIRMALA M's Account</p> <p>Resource list / App details / Node RED NIRMALA Add tags Actions...</p> <p>Details</p> <p>App URL You must deploy your app first</p> <p>Source https://us-south.git.cloud.ibm.com/nirmala.mca/NodeREDNIRMALA</p> <p>Resource group Default</p> <p>Deployment target You must deploy your app first</p> <p>Created 7/17/2022</p> <p>Services</p> <p>Cloudant Open dashboard Documentation API reference Credentials</p> <p>Connect existing services + Create service + Type here to search</p> <p>Deployment Automation</p> <p>Name NodeREDNIRMALA</p> <p>Location Dallas</p> <p>Tool integrations</p> <p>Delivery Pipelines</p> <p>Name pr-pipeline Status No stages detected</p> <p>Name ci-pipeline Status No stages detected</p>
<p>It is changed to Progress and then it is changed to Success</p>	 <p>IBM App Development x ci-pipeline Dashboard x Student Dashboard x   +</p> <p>IBM Cloud Search resources and products... Catalog Docs Support Manage NIRMALA M's Account</p> <p>Resource list / App details / Node RED NIRMALA Add tags Actions...</p> <p>Details</p> <p>App URL You must deploy your app first</p> <p>Source https://us-south.git.cloud.ibm.com/nirmala.mca/NodeREDNIRMALA</p> <p>Resource group Default</p> <p>Deployment target You must deploy your app first</p> <p>Created 7/17/2022</p> <p>Services</p> <p>Cloudant Open dashboard Documentation API reference Credentials</p> <p>Deployment Automation</p> <p>Name NodeREDNIRMALA</p> <p>Location Dallas</p> <p>Tool integrations</p> <p>Delivery Pipelines</p> <p>Name pr-pipeline Status No stages detected</p> <p>Name ci-pipeline Status Success</p>

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## EFFECTIVE HEART DISEASE PREDICTION USING IBM AUTO AI SERVICE

<p>To open the node red application, Click on the dashboard, Choose cloud foundry apps and choose the Node red Application. Click the Visit App URL and Copy the IBM Cloud App Key , Choose the Region as Dallas ,and choose the Organization as Hindusthan College of Engineering and Technology and the space as Hindusthan which has been already created.</p>	
Get into the Node Red Instance on the IBM Cloud	
A project is how you organize your resources to achieve a particular goal. In the Watson Studio NIRMALA an already created project called as NIRMALA_HEART_DISE ASE_PREDICTION_PROJ is already present.	

## EFFECTIVE HEART DISEASE PREDICTION USING IBM AUTO AI SERVICE

Assume the Jupyter Notebook is created using New asset option and also the data set is loaded

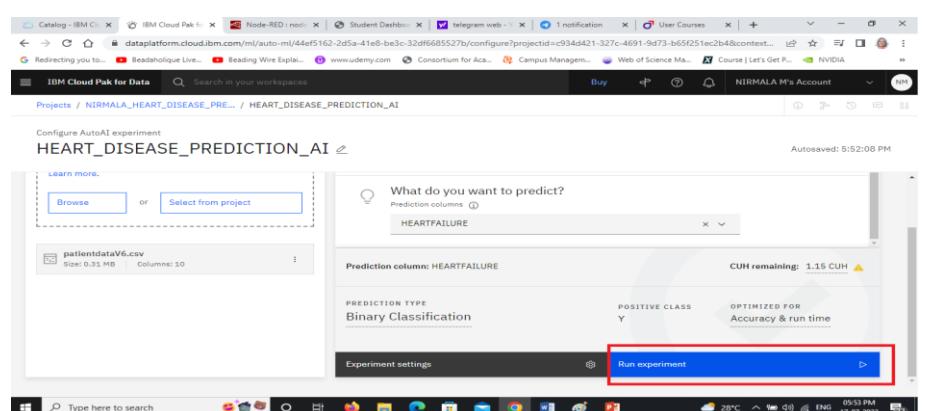
Assume there is a Machine Learning Model 8n already created

To add AUTO AI, Click on New Asset and Choose AUTO AI and create an AUTO AI experiment

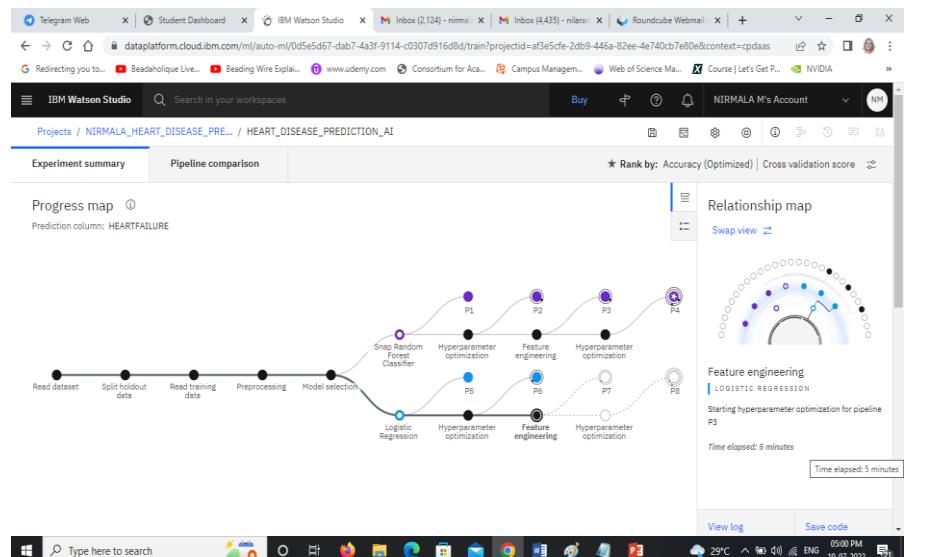
An AUTO AI Experiment called as HEART\_DISEASE\_PREDICTION\_AI is created and associated with the Machine learning-8n service with 8Vcpu and 32 GB RAM

# EFFECTIVE HEART DISEASE PREDICTION USING IBM AUTO AI SERVICE

If required change the Experimental Settings and Run the Experiment with 80:20 as Training and Testing data set ratio.



Output of AUTO AI Execution



Output of AUTO AI after the Execution and the model Algorithms with its accuracy is displayed in the descending order. The Higher ranking algorithm is in the Top position with respect to accuracy. In this case the snap Random Forest Classifier comes with an accuracy of 87% and the Logistic Regression comes with 79%

Rank	Name	Algorithm	Accuracy (Optimized) Cross Validation	Enhancements	Build time
1	Pipeline 4	Snap Random Forest Classifier	0.873	HPO-1 FE HPO-2	00:01:41
2	Pipeline 3	Snap Random Forest Classifier	0.872	HPO-1 FE	00:01:12
3	Pipeline 2	Snap Random Forest Classifier	0.869	HPO-1	00:00:12
4	Pipeline 1	Snap Random Forest Classifier	0.861	None	00:00:01
5	Pipeline 6	Logistic Regression	0.786	HPO-1	00:00:11
6	Pipeline 5	Logistic Regression	0.785	None	00:00:01

## EFFECTIVE HEART DISEASE PREDICTION USING IBM AUTO AI SERVICE

Once the pipeline creation is complete, you can view and compare the ranked pipelines in a leaderboard.

Choose Save model from the action menu for the pipeline with the highest accuracy or low error rate. This saves the pipeline as a Machine Learning asset in your project. A notification gives you the link to view the saved model in your project.

Rank	Name	Algorithm	Accuracy (Optimized) Cross Validation	Enhancements	Build Time
1	Pipeline 4	Snap Random Forest Classifier	0.873	HPO-1 FE HPO-2	00:01:41
2	Pipeline 3	Snap Random Forest Classifier	0.872	HPO-1 FE	00:01:12
3	Pipeline 2	Snap Random Forest Classifier	0.869	HPO-1	00:00:12
4	Pipeline 1	Snap Random Forest Classifier	0.861	None	00:00:01
5	Pipeline 8	Logistic Regression	0.791	HPO-1 FE HPO-2	00:02:04

Click on the Promote to Deployment Space

HEART\_DISEASE\_PREDICTION\_AI - P4 Snap Random...

Column	Type
AGE	"integer"
AVGHEARTBEATSPERMIN	"integer"
BMI	"integer"
CHOLESTEROL	"integer"
EXERCISEMINPERWEEK	"integer"
FAMILYHISTORY	"other"
PALPITATIONSPERDAY	"integer"
SEX	"other"
SMOKERLAST5YRS	"other"

New Deployment space is used to use a space to collect assets in one place to create, run and manage deployments

Promote to space

New deployment space

Define details

Name: HEART\_DISEASE\_PREDICTION\_MNIRMALA\_SPACE

Description (Optional): HEART\_DISEASE\_PREDICTION\_MNIRMALA\_SPACE IS THE NAME GIVEN

Select services

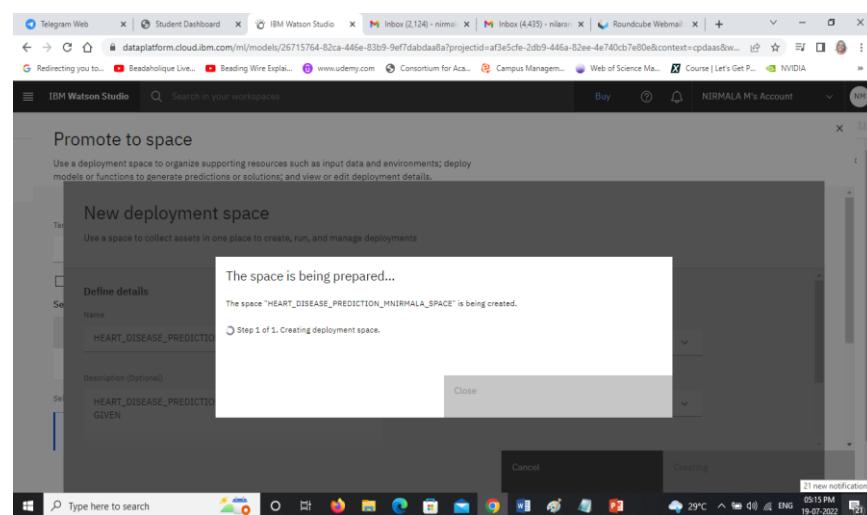
Select storage service: Cloud Object Storage-xt

Select machine learning service (optional): Machine Learning-MNIRMALA

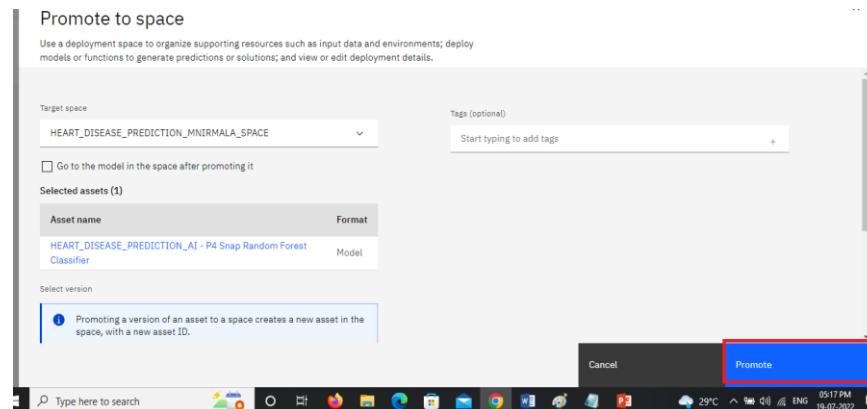
Create

## EFFECTIVE HEART DISEASE PREDICTION USING IBM AUTO AI SERVICE

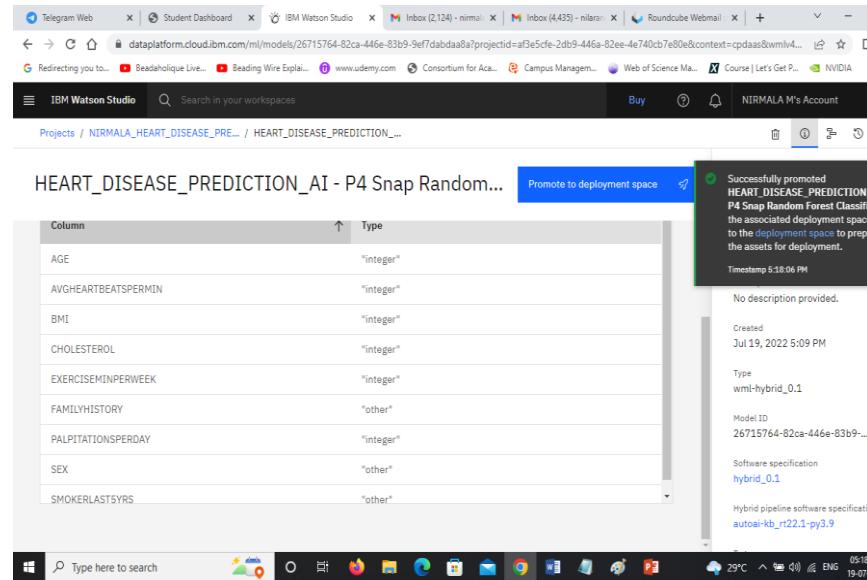
The new Deployment space called as HEART\_DISEASE\_PREDICTION\_MNIRMALA\_SPACE is created



Promoting an version of an asset to a space creates a new asset in the space with a new Asset ID



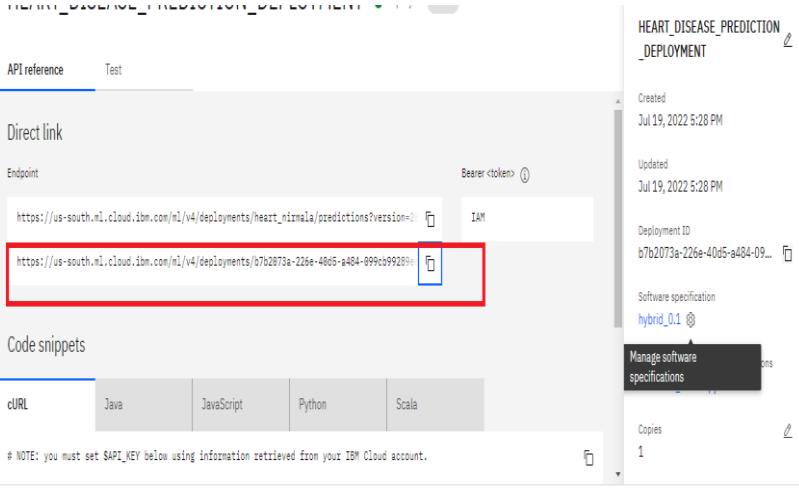
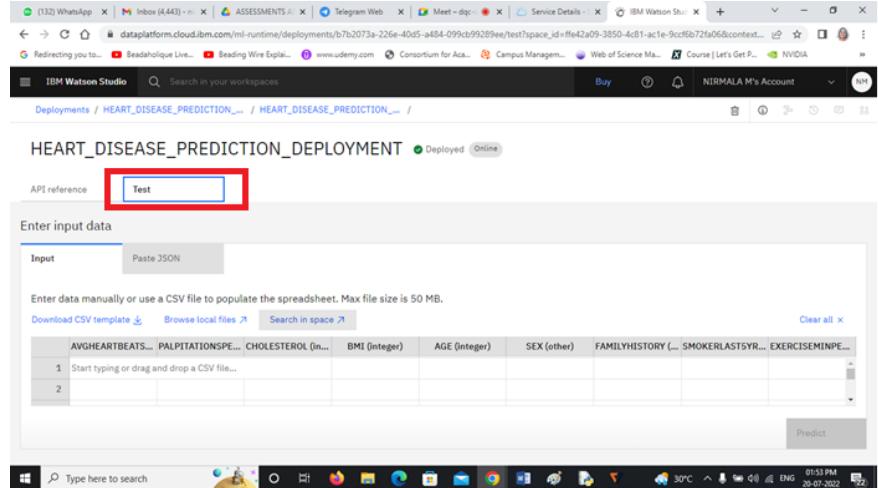
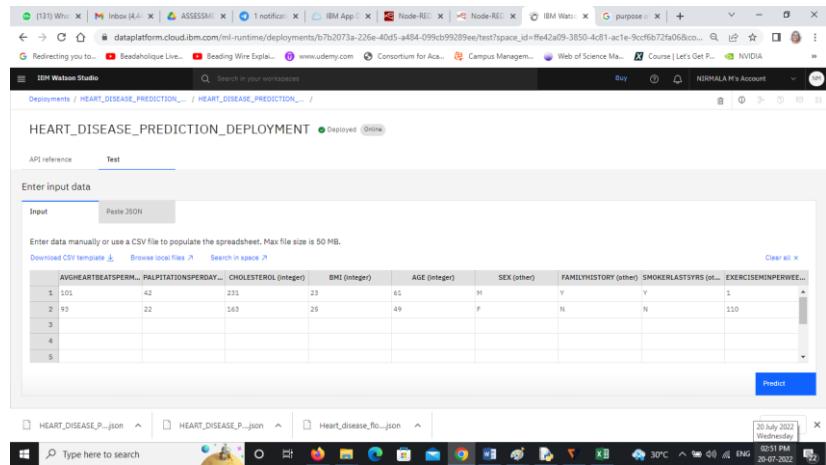
The HEART\_DISEASE\_PREDICTION\_AI-P4 Snap Random Forest classifier is associated to the created deployment space called as HEART\_DISEASE\_PREDICTION\_MNIRMALA\_SPACE



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<p>GOTO THE DEPLOYMENT_SPACE OR FROM THE NAVIGATION BAR, CHOOSE DEPLOYMENT SPACE</p>	<p>HEART_DISEASE_PREDICTION_MNIRMALA_SPACE HEART_DISEASE_PREDICTION_MNIRMALA_SPACE IS THE NAME GIVEN</p> <p>Overview Assets Deployments Jobs Manage</p> <p>Q. What assets are you looking for?</p> <p>Models (1)</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Type</th> <th>Software specification</th> <th>Tags</th> <th>Last modified</th> </tr> </thead> <tbody> <tr> <td>HEART_DISEASE_PREDICTION_AI - P4 Snap Random Forest...</td> <td>wml-hybrid_0.1</td> <td>hybrid_0.1</td> <td></td> <td>Jul 19, 2022 5:18 PM</td> </tr> </tbody> </table> <p>Import model + Deploy</p> <p>Drop files here or browse for files to upload. Stay on the page until upload completes. Incomplete uploads are cancelled.</p>	Name	Type	Software specification	Tags	Last modified	HEART_DISEASE_PREDICTION_AI - P4 Snap Random Forest...	wml-hybrid_0.1	hybrid_0.1		Jul 19, 2022 5:18 PM					
Name	Type	Software specification	Tags	Last modified												
HEART_DISEASE_PREDICTION_AI - P4 Snap Random Forest...	wml-hybrid_0.1	hybrid_0.1		Jul 19, 2022 5:18 PM												
<p>Click Create</p>	<p>Create a deployment</p> <p>HEART_DISEASE_PREDICTION_DEPLOYMENT</p> <p>Serving name ⓘ</p> <p>heart_nirmala</p> <p>Description</p> <p>HEART DISEASE PREDICITON DEPLOYMENT</p> <p>Tags</p> <p>Add tags to make assets easier to find.</p> <p>Add a tag</p> <p>Create</p>															
<p>The Online deployment HEART_DISEASE_PREDICTION_DEPLOYMENT in space HEART_DISEASE_PREDICTION_MNIRMALA_SPACE is ready to access</p>	<p>Notifications</p> <p>History Settings</p> <p>Find notifications</p> <p>Today</p> <p>Online deployment ready. The online deployment HEART_DISEASE_PREDICTION_DEPLOYMENT in space HEART_DISEASE_PREDICTION_MNIRMALA_SPACE is ready to a... 05:29 PM</p>															
<p>Click on the Assets to goto the Created Model called as HEART_DISEASE_PREDICTION_AI-P4 Snap Random Forest classifier</p>	<p>HEART_DISEASE_PREDICTION_AI - P4 Snap Random Forest Classifier</p> <p>Created Jul 19, 2022 5:18 PM</p> <p>Type wml-hybrid_0.1</p> <p>Model ID 860944ca76f54463a427-b3...</p> <p>Software specification hybrid_0.1</p> <p>Hybrid pipeline software specifications autoai-kb_r122.1.py3.9</p> <p>Description No description provided.</p> <p>Deployments Model details</p> <p>DEPLOYMENT TYPES 1 Online Deployment(s)</p> <table border="1"> <thead> <tr> <th>Online</th> <th>(1)</th> <th>Name</th> <th>Status</th> <th>Last modified</th> </tr> </thead> <tbody> <tr> <td>Online</td> <td>(1)</td> <td>HEART_DISEASE_PREDICTION_DEPLOYMENT</td> <td>Deployed</td> <td>Jul 19, 2022 5:28 PM</td> </tr> <tr> <td>Batch</td> <td>(0)</td> <td>HEART_DISEASE_PREDICTION_DEPLOYMENT</td> <td></td> <td></td> </tr> </tbody> </table> <p>HEART_DISEASE_PREDICTION_DEPLOYMENT</p> <p>HEART DISEASE PREDICITON DEPLOYMENT</p> <p>HEART DISEASE PREDICITON DEPLOYMENT</p>	Online	(1)	Name	Status	Last modified	Online	(1)	HEART_DISEASE_PREDICTION_DEPLOYMENT	Deployed	Jul 19, 2022 5:28 PM	Batch	(0)	HEART_DISEASE_PREDICTION_DEPLOYMENT		
Online	(1)	Name	Status	Last modified												
Online	(1)	HEART_DISEASE_PREDICTION_DEPLOYMENT	Deployed	Jul 19, 2022 5:28 PM												
Batch	(0)	HEART_DISEASE_PREDICTION_DEPLOYMENT														

## EFFECTIVE HEART DISEASE PREDICTION USING IBM AUTO AI SERVICE

<p>Copy the end point</p>	<p><a href="https://us-south.ml.cloud.ibm.com/ml/v4/deployments/heart_nirmala/predictions?version=2022-07-19">https://us-south.ml.cloud.ibm.com/ml/v4/deployments/heart_nirmala/predictions?version=2022-07-19</a></p>
<p><b>Endpoints specify where resources can be accessed by APIs and play a key role in guaranteeing the correct functioning of the software that interacts with it.</b> In short, API performance relies on its ability to communicate effectively with API Endpoints.</p>	
<p>Click on Test</p>	
<p>Give the values for prediction and click predict</p>	

## EFFECTIVE HEART DISEASE PREDICTION USING IBM AUTO AI SERVICE

Output displayed is

The screenshot shows a "HEART\_DISEASE\_PREDICTION\_AI - P4 Snap Random Forest Classifier test prediction" interface. It displays a "Binary classification" section with a pie chart showing 50% for 'N' and 50% for 'Y'. Below the chart is a table view showing 2 records. The table has columns for "Prediction" (Y or N) and "Confidence". The first record has a confidence of 76%, and the second record has a confidence of 92%. A "Download" button is at the bottom right.

To create the node red service flow, click the Node red flow editor

The screenshot shows the "Node-RED" interface on IBM Cloud. It features a red header with the text "Node-RED: Flow-based programming for the Internet of Things". Below the header, there's a brief introduction to Node-RED and a "Go to your Node-RED flow editor" button, which is highlighted with a red box. At the bottom, there's a "Learn how to customise Node-RED" link.

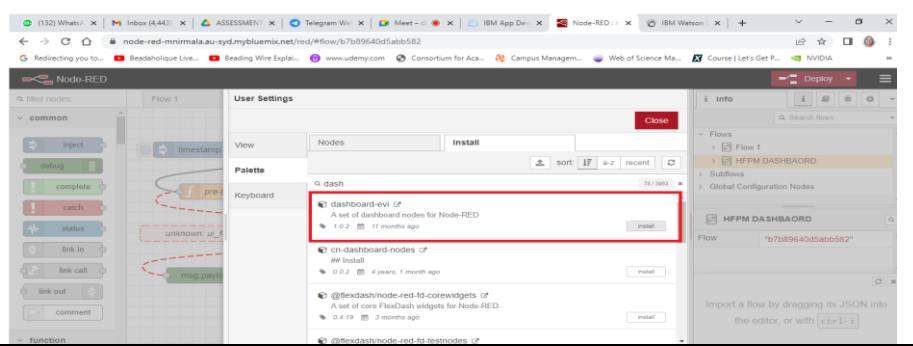
Click on the menu bar on the right end and choose import and upload the provided json file

The screenshot shows the "Import nodes" dialog in the Node-RED interface. It displays a clipboard with JSON code for importing nodes. The code includes definitions for various nodes like "inject", "debug", "complete", "catch", "status", "link in", "link call", "link out", and "comment". The "Import" button is visible at the bottom right of the dialog.

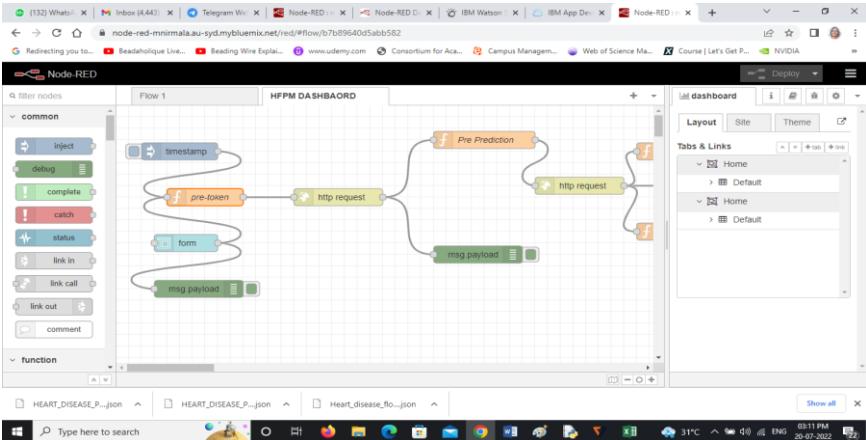
## EFFECTIVE HEART DISEASE PREDICTION USING IBM AUTO AI SERVICE

After the json file is imported to enable the hfpmp dashboard flow install the dashboard-evi and press install for it to get enabled.

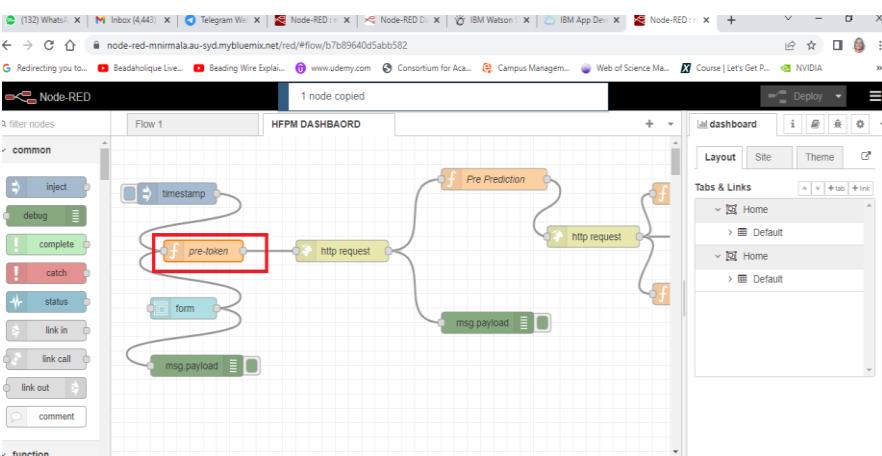
To do it choose palette and type dashboard-evi and install it



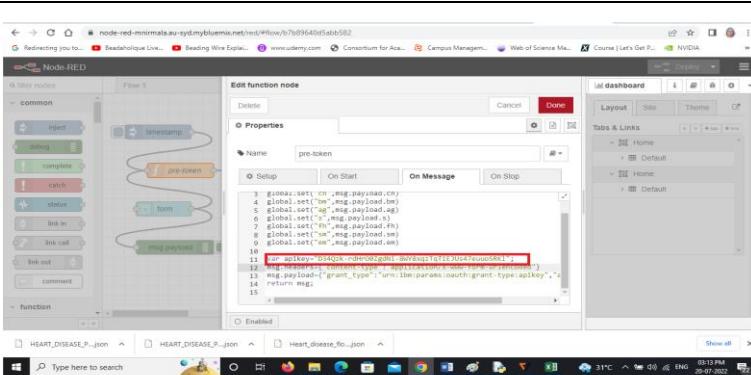
Output of dashboard



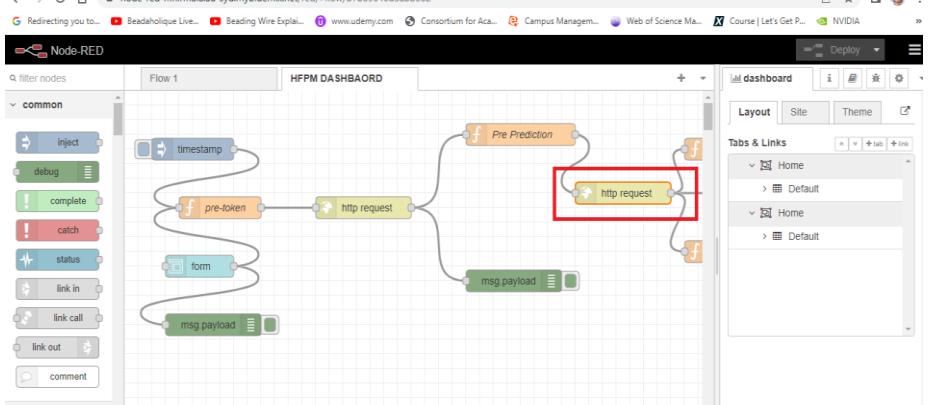
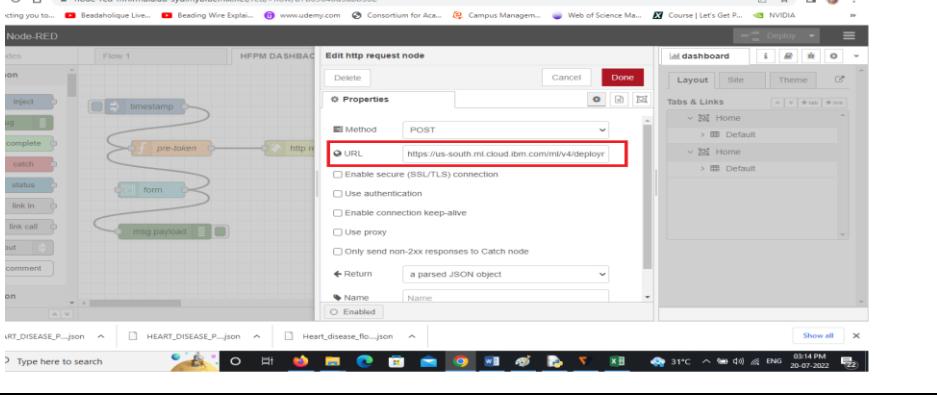
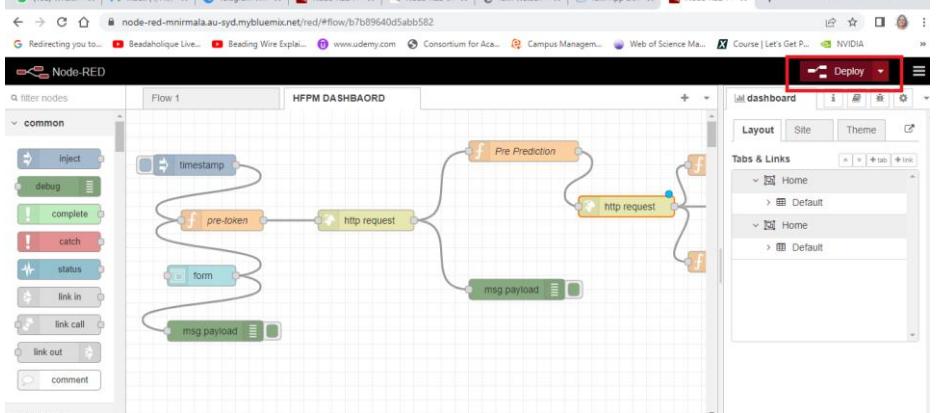
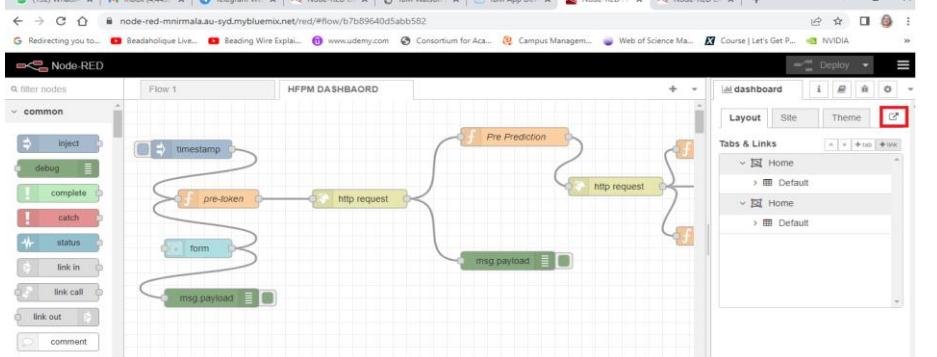
Double click on the pretoken and paste the APIkey created and click done



Copy the API Key



## EFFECTIVE HEART DISEASE PREDICTION USING IBM AUTO AI SERVICE

<p>Click on the second http request and copy the Scoring URL in the URL Column</p>	
<p>Copy this in the URL Column <a href="https://us-south.ml.cloud.ibm.com/ml/v4/deployments/b7b2073a-226e-40d5-a484-099cb99289ee/predictions?version=2022-07-19">https://us-south.ml.cloud.ibm.com/ml/v4/deployments/b7b2073a-226e-40d5-a484-099cb99289ee/predictions?version=2022-07-19</a></p>	
<p>Click on Deploy and after successfully deployed</p>	
<p>Click the Link button on the left</p>	

## EFFECTIVE HEART DISEASE PREDICTION USING IBM AUTO AI SERVICE

A window of the node red will be opened

The screenshot shows a browser window titled "Home" with a form for heart disease prediction. The form fields include: 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), and EXERCISE ( Minutes Per Week ). Below the form are two buttons: SUBMIT and CANCEL.

Output of the Predicted result

The screenshot shows the same "Home" page as above, but the prediction results are displayed. The "Prediction" field shows "Not at Risk" and the "Score" field shows "0.9210792406516917".

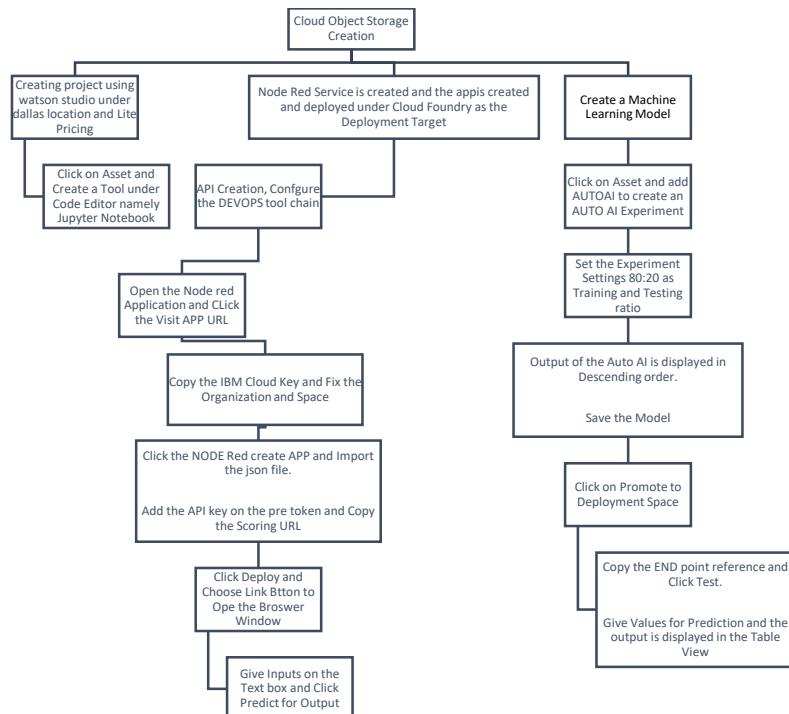
Output of the Predicted result

The Application is Build using using Node-RED which takes inputs from the user and showcases the prediction on UI in the Browser window

This screenshot is identical to the one above, displaying the "Not at Risk" prediction and score "0.9210792406516917".

### 5. FLOWCHART

# EFFECTIVE HEART DISEASE PREDICTION USING IBM AUTO AI SERVICE



## 6. RESULT

The screenshot shows the IBM Watson Studio interface with two main sections:

**Deployment Details:**

- Deployment Name: HEART\_DISEASE\_PREDICTION\_DEPLOYMENT
- Status: Deployed (Online)
- API reference (selected tab)
- Test tab
- Enter input data section:
  - Input tab (selected)
  - Paste JSON button
  - Enter data manually or use a CSV file to populate the spreadsheet. Max file size is 50 MB.
  - Download CSV template, Browse local files, Search in space buttons
  - Table view showing sample data (rows 1-5):
 

	AVGHEARTBEATSPERMINUTE	PALPITATIONSPERDAY	CHOLESTEROL (integer)	BMI (integer)	AGE (integer)	SEX (other)	FAMILYHISTORY (other)	SMOKERLAST5YRS (other)	EXERCISEMINPERWEEK
1	101	42	231	23	61	M	Y	Y	1
2	93	22	163	25	49	F	N	N	110
3									
4									
5									
  - Predict button

**Prediction Results:**

- HEART\_DISEASE\_PREDICTION\_AI - P4 Snap Random Forest Classifier test prediction
- Prediction type: Binary classification
- Prediction percentage: 50% (2 Records)
- Table view showing prediction results (rows 1-10):
 

	Prediction	Confidence
1	Y	76%
2	N	92%
3		
4		
5		
6		
7		
8		
9		
10		
- Download button

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## EFFECTIVE HEART DISEASE PREDICTION USING IBM AUTO AI SERVICE

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

BMI ~  
AGE ~  
SEX (M or F) ~  
FAMILY HISTORY (Y or N) ~  
SMOKER ( In Last 5 Years : Y or N ) ~  
EXERCISE ( Minutes Per Week ) ~

Prediction      Not at Risk  
Score      0.9210792406516917

# EFFECTIVE HEART DISEASE PREDICTION USING IBM AUTO AI SERVICE

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 At Risk

Score 0.7561388485571917

## 7. ADVANTAGES & DISADVANTAGES

### Advantages

- The problem is able to predict the whether the person is at risk of heart failure.
- The data is clean and does not require exploratory data Analysis.
- The data does not contain missing values

### Disadvantages

- The problem has to support with more parameters to be suitable for a generalized application.

## 8. APPLICATIONS

The problem can be applied in a hospital environment to identify with the given parameters whether the person will have a heart disease.

With the given parameters, whether the patient is at risk or not can be identified.

## 9. CONCLUSION

Identifying the processing of raw healthcare data of heart information will help in the long term saving of human lives and early detection of abnormalities in heart conditions. Machine learning techniques were used in this work to process raw data and provide a new and novel discernment towards heart disease. Heart disease prediction is challenging and very important in the medical field. However, the mortality rate can be drastically controlled if the disease is detected at the early stages and preventative measures are adopted as soon as possible. The project is able to predict the patient is at risk or not with respect to heart disease.

## 10. FUTURE SCOPE

Further extension of this study is highly desirable to direct the investigations to real-world datasets instead of just theoretical approaches and simulations. The future course of this research can be performed with diverse mixtures of machine learning techniques to better prediction techniques. Furthermore, new feature selection methods can be developed to get a broader perception of the significant features to increase the performance of heart disease prediction

## EFFECTIVE HEART DISEASE PREDICTION USING IBM AUTO AI SERVICE

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