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Effective Heart Disease Prediction Using IBM Auto AI Service

1. Introduction

1.1 Overview

- Cardiovascular diseases (CVDs) are the number 1 cause of death world wide, 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 death rate by heart failure.

1.2 Purpose

- In this project, we need to build a model using Auto AI and build a web application where we can showcase the prediction of heart failure.

2. Literature Survey

2.1 Existing problem

- It is dealt with the patient's data provided for CVD's that might occur.
- The prediction model is introduced with different combinations of features and several known classification techniques [2].
- Manually collecting and performing model integration to understand the problem is one of the tedious job for understanding the nature of data.

2.2 Proposed solution

- Machine Learning technique is one of the powerful tools to predict the level of grimness.
- In this project, we will use soft wares by IBM to predict whether patient is having risk of heart failure or not.
- Auto AI app will help us to analyze and predict the grimness for heart failure.

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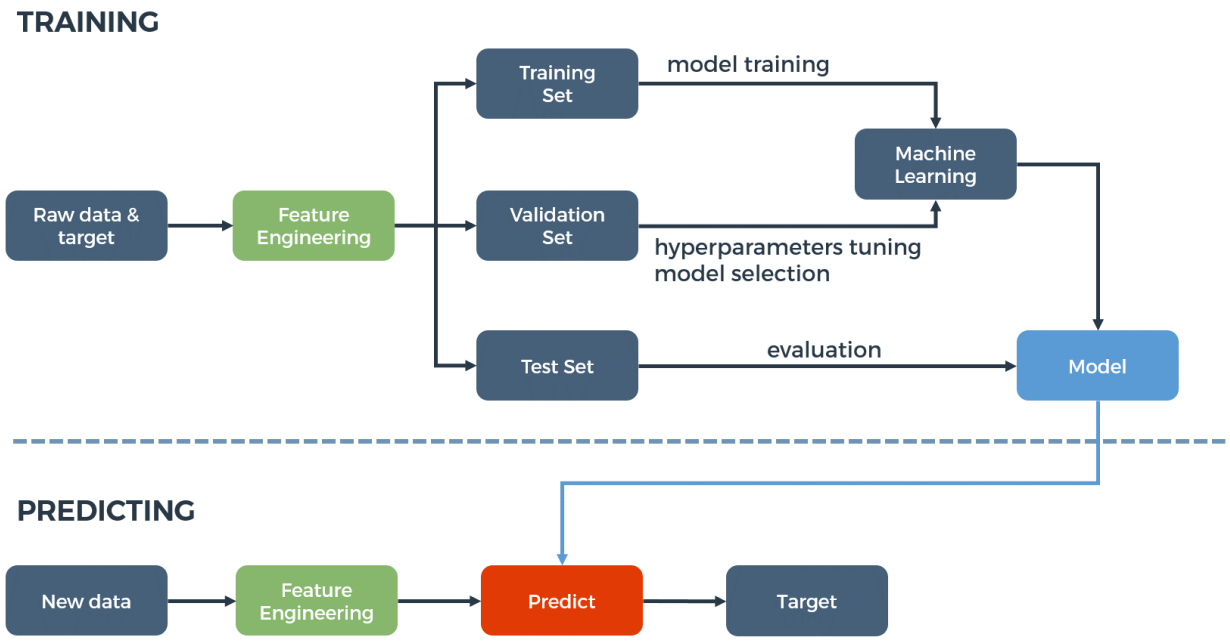
3. Theoretical Analysis

3.1 Block diagram

- Following flow is used by data scientist to build the model and prediction of result.



- To collect the raw data using google form, hospital form, etc
- We have to then perform feature engineering that includes data cleaning, data preprocessing.
- We also perform exploratory data analysis to understand the data.
- We extract the dependent and independent variables.
- We then split it into training and test set.
- Afterwards, we build the model.
- Using accuracy of model for test set, we tune the model and finalize hyper tuning parameters to get best model.
- We them predict the unknown data set for its further use.

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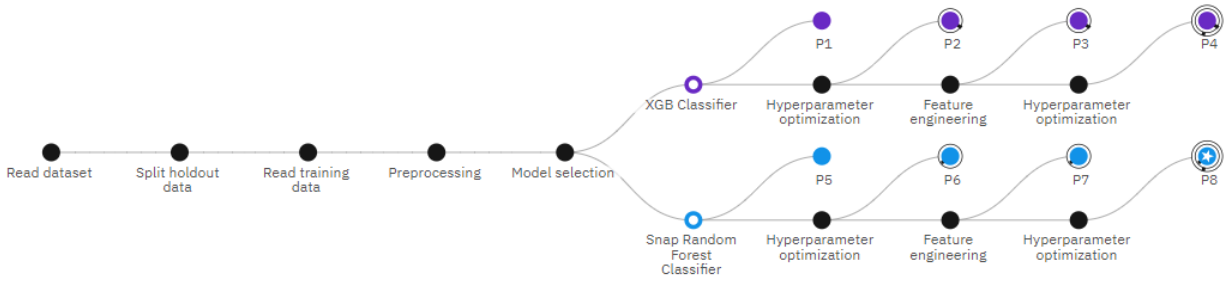
3.2 Hardware/Software designing

Following are the IBM software's used for completion of project:

1. Watson Studio
2. Machine Learning - Auto AI
3. Cloud Foundry Orgs
4. Node-Red App

4. Experimental Investigations

- Experiment is started with following steps:
  - We created IBM Watson Studio and Node-RED Service
  - We created a Watson studio project
  - We added Auto AI Experiment
  - We run the Auto AI Experiment to build a Machine learning model on the desired dataset
  - Snap Random Forest classifier is found to be the best model.
  - It has accuracy of 87.3% required 93 seconds to build.
  - We then save the model.
  - Deploy the model as a web server and generate scoring End Point
  - Create a WEB application Using Node-RED to take user input and showcase Prediction on UI



Flow for Choosing Classifier

- Installed Node-Red dashboard
- Uploaded JSON file into Node-Red App
- We chose api in pre token and changed HTTPS request to URL of the model.

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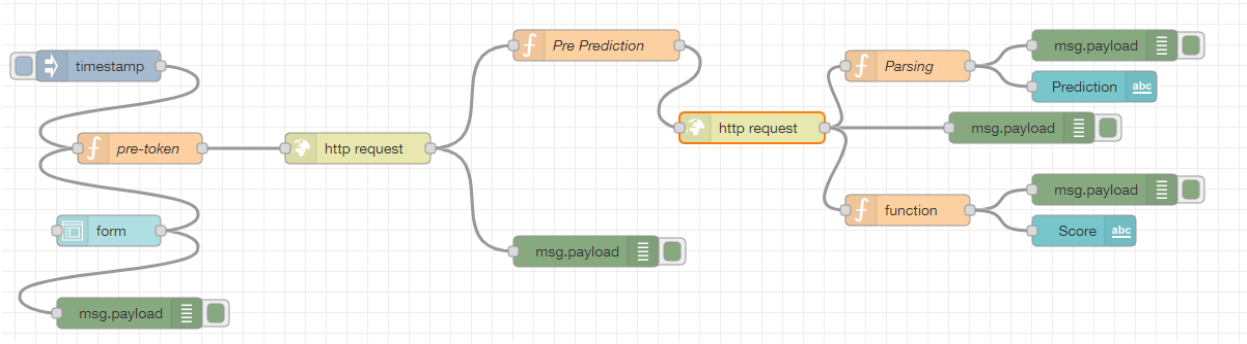
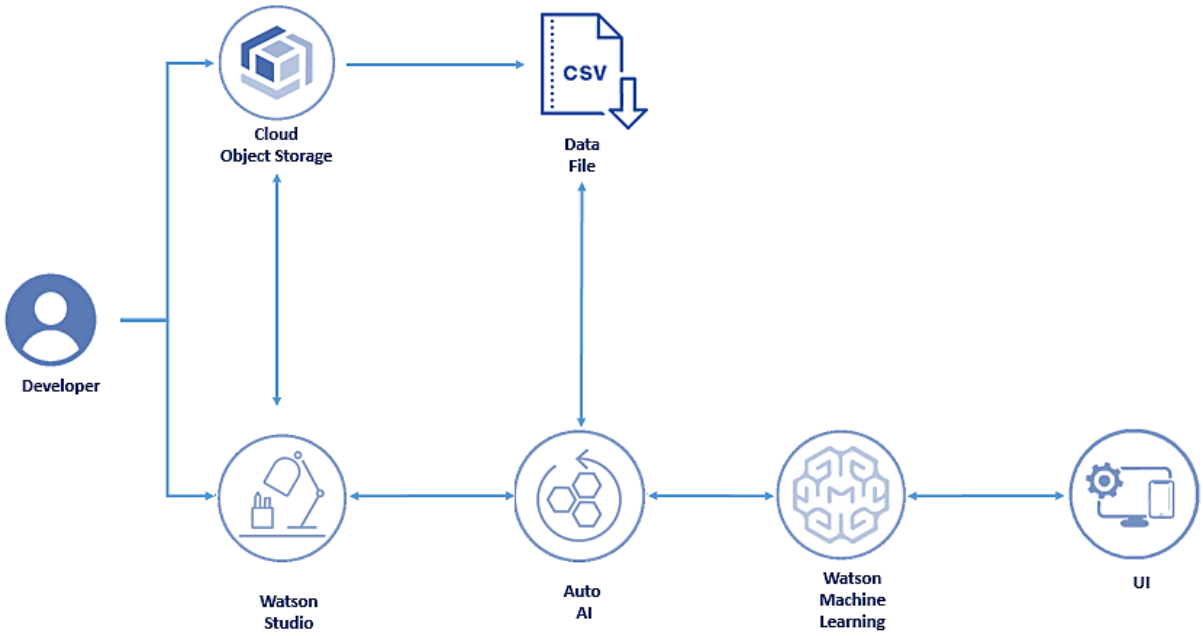
- We then deployed it to get the UI based app.
- The flow for JSON file is shown below:



JSON for Node-Red App

5. Flowchart

- In this project, we do not need to perform manual steps.
- Following is the flowchart of what we have processed to get UI based model.
- The given data set is passed through Auto AI through Machine Learning process to build up app for prediction of heart failure.



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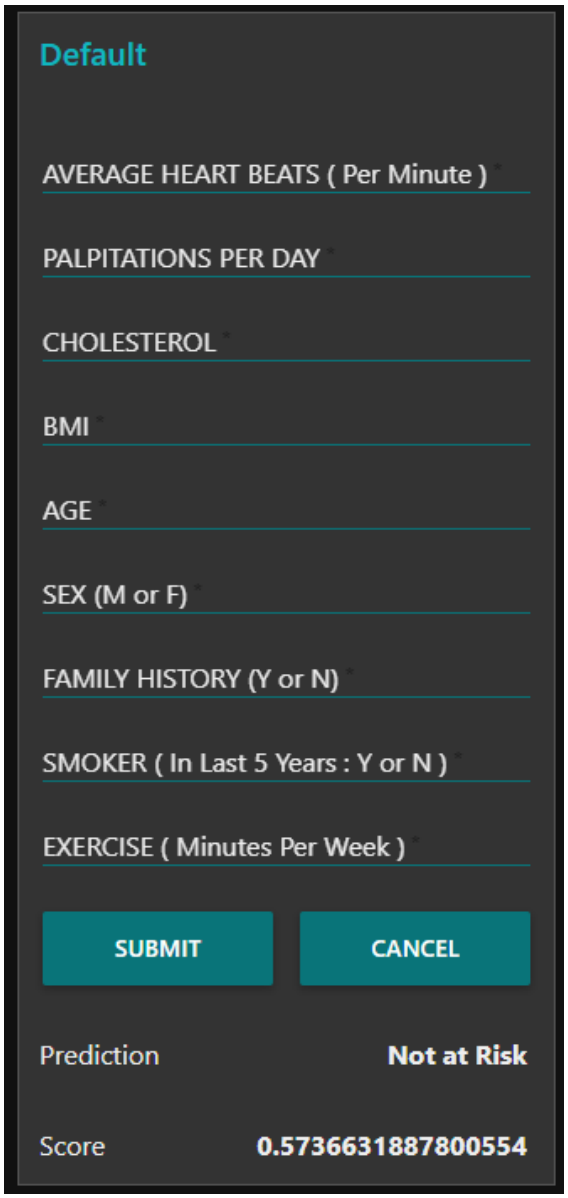
6. Result

- This app will help the patient to understand the level of grimness to get Heart Disease.
- In case of grimness, patient can decide to visit hospital for consultation by doctor.
- The sample for prediction in the form of app is shown below:



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7. Advantages & Disadvantages

7.1 Advantages

1. It automates the manual tasks that data scientists must complete as they build and train machine learning models.
2. It performs the tasks easily and within short duration.

7.2 Disadvantages

1. It does not provide exploratory data analysis.
2. Model is built up with 87.3% accuracy.
3. Here we are unable to predict True Positive, True Negative, False Positive and False Negative.
4. Classificatio report is not generated to understand precision of the model.

8. Applications

- It can be applied sectors like medical, business, etc to predict the data.

9. Conclusion

- We can conclude that model built shows the prediction for patient to posses heart failure or not.
- It is also be predicting based on score that we can observe in the sample.
- Model performs well for prediction.

10. Future Scope

- Models built up using IBM tools will help us for prediction of heart failure, lung failure, business analysis, etc.
- There are chances to enhance the technology that build a model to get insights of data.

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11. Bibliography

1. IBM Cloud
2. Effective Heart Disease Prediction Using Hybrid Machine Learning Techniques, Chandrasegar Thirumalai, Gautam Srivastava, IEEE Access (Vol 7), Pages: 81542-81554

Appendix

Source Code:

The source code for building model in python is as:

```
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://us-
south.ml.cloud.ibm.com/ml/v4/deployments/da304108-f208-4233-b5ed-
b96cb1a53eae/predictions?version=2022-07-27', json=payload_scoring,
 headers={'Authorization': 'Bearer ' + mltoken})
```