A MINI PROJECT REPORT

On

DIABETES MELLITUS PREDICTION USING AUTO AI

Submitted By

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Under the Esteemed Guidance of

MRS. SMITA KARPE

Assistant Professor

in partial fulfillment of the Academic Requirements for the Degree of

BACHELOR OF TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

MALLA REDDY ENGINEERING COLLEGE FOR WOMEN

(Autonomous Institution-UGC, Govt. of India)

Accredited by NBA & NAAC with 'A' Grade, UGC, Govt. of India

NIRF Indian Ranking, Accepted by MHRD, Govt. of India

Band A (6th to 25th) National Ranking by ARIIA, MHRD, Govt. of India

Approved by AICTE, ISO 9001:2015 Certified Institution

AAAA+ Rated by Digital Learning Magazine, AAA+ Rated by Careers 360 Magazine

3rd Rank CSR, Platinum Rated by AICTE-CII Survey, 141 National Ranking by India Today Magazine

National Ranking-Top 100 Rank band by Outlook Magazine, National Ranking-Top 100 Rank band by Times News Magazine

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2020-2021

Department of Computer Science and Engineering

DECLARATION

We hereby declare that the Mini Project entitled "**DIABETES MELLITUS PREDICTION USING IBM AUTO AI SERVICE**" submitted to Malla Reddy Engineering College for Women affiliated to Jawaharlal Nehru Technological University, Hyderabad (JNTUH) for the award of the Degree of Bachelor of Technology in Computer Science and Engineering is a result of original research work done by us. It is further declared that the Mini Project report or any part thereof has not been previously submitted to any University or Institute for the award of Degree.

HAMSINI BATTULA (17RH1A0574)
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CERTIFICATE

This is to certify that the Mini Project work entitled **"DIABETES MELLITUS PREDICTION USING IBM AUTO AI SERVICE"** submitted by

HAMSINI BATTULA (17RH1A0574)
J.YUKTHA REDDY (17RH1A0581)
KHANITHA FATHIMA (17RH1A05A5)

In partial fulfillment for the award of degree of **BACHELOR OF TECHNOLOGY** in Computer Science and Engineering, Jawaharlal Nehru Technological University, Hyderabad during the year **2020-2021.**

Project Guide | **Head of the Department**

Mrs. SMITA KARPE
Assistant Professor

Dr. C.V.P.R.PRASAD
Professor

External Examiner

ABSTRACT

Diabetes mellitus is a chronic disease characterized by hyperglycemia. It may cause many complications. According to the growing morbidity in recent years, in 2040, the world's diabetic patients will reach 642 million, which means that one of the ten adults in the future is suffering from diabetes. A model can be built that can efficiently discover the rules to predict diabetes mellitus of patients based on the given parameter about their health. The model needs to be deployed in the IBM cloud to get a scoring endpoint which can be used as API in web app building. The model prediction needs to be showcased on the User Interface.

This analysis helps us to predict whether the patient is diabetic or not. As, this machine learning model analyses many diabetic patients and builds model to predict a patient's condition. The aim of this research is to build a machine learning using Auto AI graphical tool in Watson Studio automatically analyses the data and generates candidate model pipelines customized for the predictive modeling problem. These model pipelines are created iteratively as Auto AI analyses the dataset and discovers data transformations, algorithms, and parameter settings that work best for problem setting. Results are displayed, showing the automatically generated model pipelines ranked according to your problem optimization objective. We can save a pipeline as a Watson Machine Learning model, deploy the model, and score it to view a prediction. A User interface which takes inputs from the user. The Model Analyses the Inputs and returns the Prediction that is showcased on the User interface.

ACKNOWLEDGEMENT

We feel honored and privileged to place our warm salutation to our college Malla Reddy Engineering College for Women and Department of Computer Science & Engineering which gave us the opportunity to have expertise in engineering and profound technical knowledge.

We would like to deeply thank our Honorable member of parliament **Sri.Ch. MALLA REDDY Garu**, founder chairman MRGI, the largest cluster of institutions in the state of Telangana for providing us with all the resources in the college to make our project successful.

We wish to convey gratitude to our Principal **Dr. Y. MADHAVEE LATHA**, for providing us with the environment and means to enrich our skills and motivating us in my endeavor and helping us to realize my full potential.

We would like to thank **Mrs. A. RADHA RANI**, Director of Computer Science and Engineering & Information Technology for encouraging us to take up a project on this subject and successfully motivating us towards the Project Work

We express our sincere gratitude to **Dr. C. V. P. R. PRASAD**, Head of the Department of Computer Science & Engineering for inspiring us to take up a project on this subject and successfully guiding us towards its completion.

We would also like to thank our Project Co-Ordinator **Mr. KUMARASWAMY**, Assistant Professor for his kind encouragement and overall guidance in viewing this program a good asset with profound gratitude.

We would like to thank our Project guide **Mrs. SMITA KARPE,** Assistant Professor and all the Faculty members for their valuable guidance and encouragement towards the completion of our project work.

With Regards & Gratitude,

B.HAMSINI (17RH1A0574)
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KHANITHA FATHIMA (17RH1A05A5)

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CHAPTER 1

INTRODUCTION

1.1 Overview

The project Diabetes mellitus prediction using IBM Auto AI service is a web based application developed by Machine Learning Which can be used to predict diabetes mellitus of patients based on the given parameter about their health. The model needs to be deployed in the IBM cloud to get a scoring endpoint which can be used as API in web app building. It can be further explored to diagnose the diabetes in various patients and classify them into differently according to their severity.

1.2 Purpose

Diabetes mellitus is a chronic disease characterized by hyperglycemia. The aim of the Diabetes Mellitus prediction using Auto AI Project is to help patients to diagnose whether they are diabetic or not. The predicted output gives them the analysis about the diabetes mellitus or sugar levels in their body. This analysis should also help the patients to get accurate results by using the data set of various diabetic cases. We can choose the tools you need to analyze and visualize data, to cleanse and shape data, to ingest streaming data, or to create and train machine learning models.
It provides a suite of tools for data scientists, application developers and subject matter experts, allowing them to collaboratively connect to data.

CHAPTER 2

HEALTH SURVEY

2.1 Existing Problem

According to International Diabetes Federation 382 million people are living with diabetes across the whole world. By 2035, this will be doubled as 592 million. Diabetes should not be ignored if it is untreated then Diabetes may cause some major issues in a person like: heart related problems, kidney problem, blood pressure, eye damage and it can also affects other organs of human body. Diabetes is a chronic and potentially fatal disease which affects your whole body. Billions of people have diabetes, and the worrying fact is that a high percentage of affected patient are not even aware that they are diabetic.

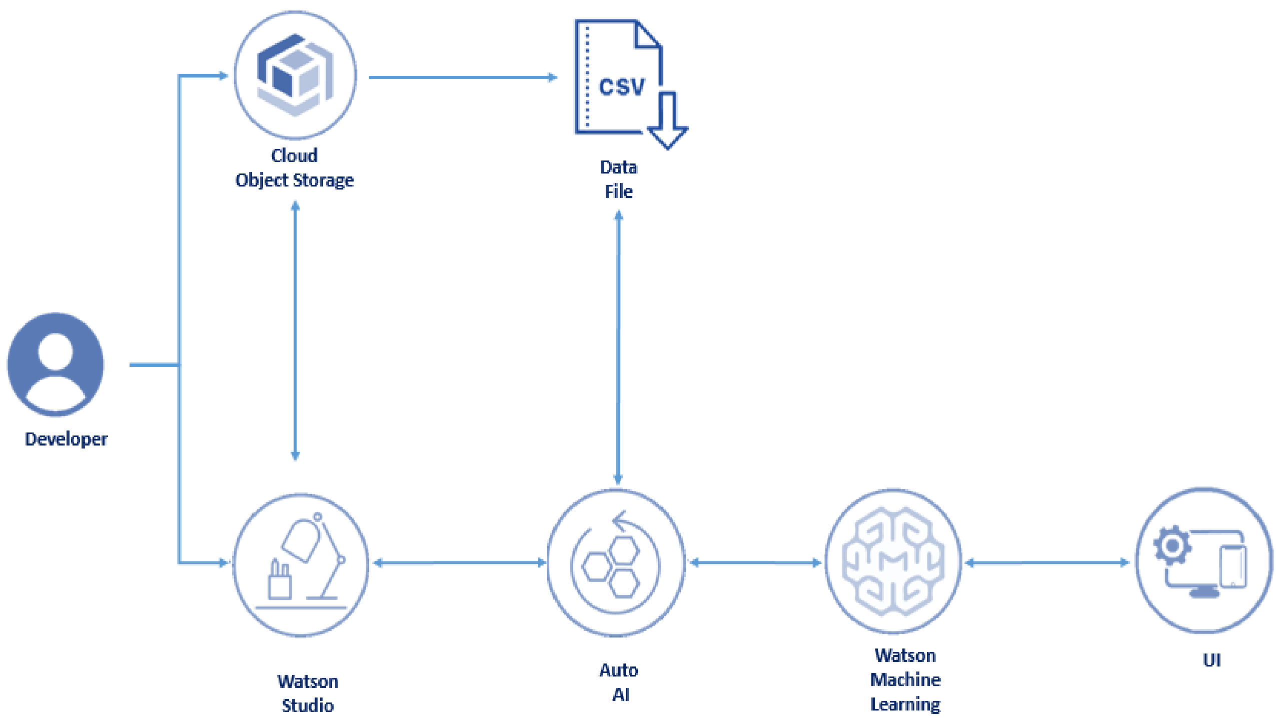
2.2 Proposed Solution

Our proposed solution is a Diabetes Mellitus prediction using Auto AI designed to provide better result for prediction by constructing models from datasets collected from patients.For this purpose we use the Pima Diabetes Dataset, we apply various Machine Learning classification and ensemble Techniques to predict diabetes. This project aims to predict diabetes via three different supervised machine learning methods including: SVM, Logistic regression, ANN. Predictive models have been built to leverage big data analytics for building estimates of possibility of development of complications in patients with diabetes. Many such models have been developed to predict the development of both long-term (eg, retinal, cardiovascular, and renal) and short-term (i.e, hypoglycemia) complications of diabetes. The discriminative power of this prediction method was 83.0% in the training set and 76.9% in an independent testing set, making it superior to conventional monitoring of fasting glucose levels.

CHAPTER 3

THEORETICAL ANALYSIS

3.1 Block Diagram



In the above block diagram first it takes the health parameters like Age, BMI, Pregnancies, Diabetes Pedigree Function, blood pressure, Skin Thickness and Insulin etc., from Pima Diabetes Dataset. The collection set is sent to Watson machine learning and the patterns are conditioned by using gradient boosting regressed to develop optimized model and is then integrated with node red UI to predict diabetes using user inputs.

3.2 Software and Hardware Used

3.2.1 Watson Studio

Watson Studio provides us with the environment and tools to solve your business problems by collaboratively working with data. We can choose the tools you need to analyze and visualize data, to cleanse and shape data, to ingest streaming data, or to create and train machine learning models.

It provides a suite of tools for data scientists, application developers and subject matter experts, allowing them to collaboratively connect to data, Wrangle that data and use it to build, train and deploy models at scale. We can choose between code or no-code tools to build and train our own ML/DL models, or easily retrain and customize pre-trained Watson APIs.

Watson Studio AI tools support popular frameworks, including:

TensorFlow

Caffe

PyTorch

Keras etc.,

Watson Studio AI tools in three categories:

- Visual Recognition
- Natural language classification
- Watson Machine Learning.

3.2.2 Node-RED

Node-RED is a flow-based development tool for visual programming developed originally by IBM for wiring together hardware devices, APIs and online services as part of the Internet of Things. It is a model that lends itself very well to a visual representation and makes it more accessible to a wider range of users. Node-RED consists of a Node.js based runtime that you point a web browser at to access the flow editor. Node-RED provides a web browser-based flow editor, which can be used to create JavaScript functions.

3.2.3 Watson Machine Learning-V2

V2 Watson Machine Learning service instance uses new, simplified authentication. Obtaining bearer tokens from IAM is now performed using a generic user API key instead of a Watson Machine Learning specific API key. It is no longer necessary to create specific credentials on the Watson Machine Learning instance.

Uses: Automate and operationalize AI

Dynamically retrain models

Integrated UI end-to-end

Deploy decision optimization

Model management – creation, deployment, retraining and evaluation

Why Watson Machine learning:

1. Auto AI
2. SPSS Modeler
3. Improved decision making

3.2.4 Windows 7 or higher

Windows is an operating system that Microsoft has produced for use on personal computers. It is the follow-up to the Windows Vista Operating System, which was released in 2006. An operating system allows your computer to manage software and perform essential tasks. It is also a Graphical User Interface (GUI) that allows you to visually interact with your computer's functions in a logical, fun, and easy way. Interact with your computer's functions in a logical, fun, and easy way.

3.2.5 Hardware Used

- Processor – Dual Core or higher
- Hard Disk – 50 GB
- Memory – 1GB RAM

CHAPTER 4

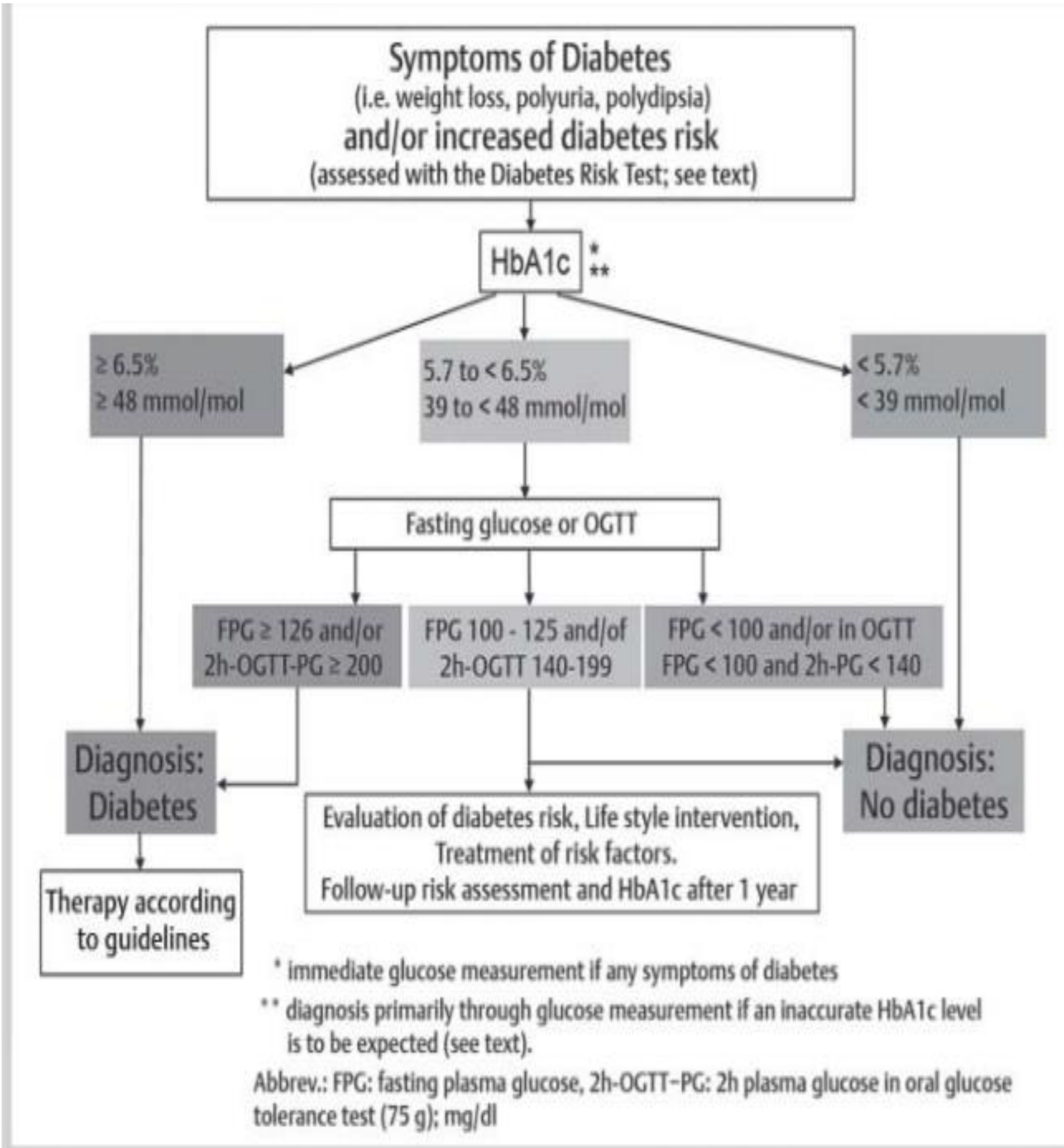
EXPERIMENTAL INVESTIGATION

Fukuoka Cohort was constructed from 2003 to 2009 in Kyushu area in Japan, which contains a total of 12,949 persons. Cross-sectional study of the Fukuoka Cohort revealed an inverse relation between serum bilirubin level and the prevalence of type 2 diabetes mellitus. Effects were paralleled with normalization of oxidative stress markers and expression of NAD (P)H oxidase subunits in kidney. These results suggested that oxidative stress is an exacerbating factor of type 2 diabetes mellitus and that antioxidant therapies are of value to diabetic nephropathy. Diabetes mellitus is a potentially morbid condition with high prevalence worldwide, thus being a major medical concern.
Experimental models play an important role in understanding such a disease, which is treatable only.

Experimental diabetes was induced via the administration of streptozotocin (50 mg.kg −1 ; STZ, Sigma Aldrich Co., St. Louis, MO) diluted in sodium citrate buffer (10 mM; pH 4.5; intraperitoneally [i.p.]) . Animals in the control groups received an injection of sodium citrate buffer alone. The majority of the experiments are conducted on rodent models (mice and rats). Selective inbreeding resulted in the development of numerous models with pathogenic characteristics and the manifestation of type 1 and 2 diabetes and the related phenotypes of obesity and insulin resistance.
In addition to analyzing the pathogenic mechanisms of the disease and its complications, these models are used to evaluate new treatment solutions as well as the transplantation of beta cells and disease prevention.

CHAPTER 5

FLOW CHART

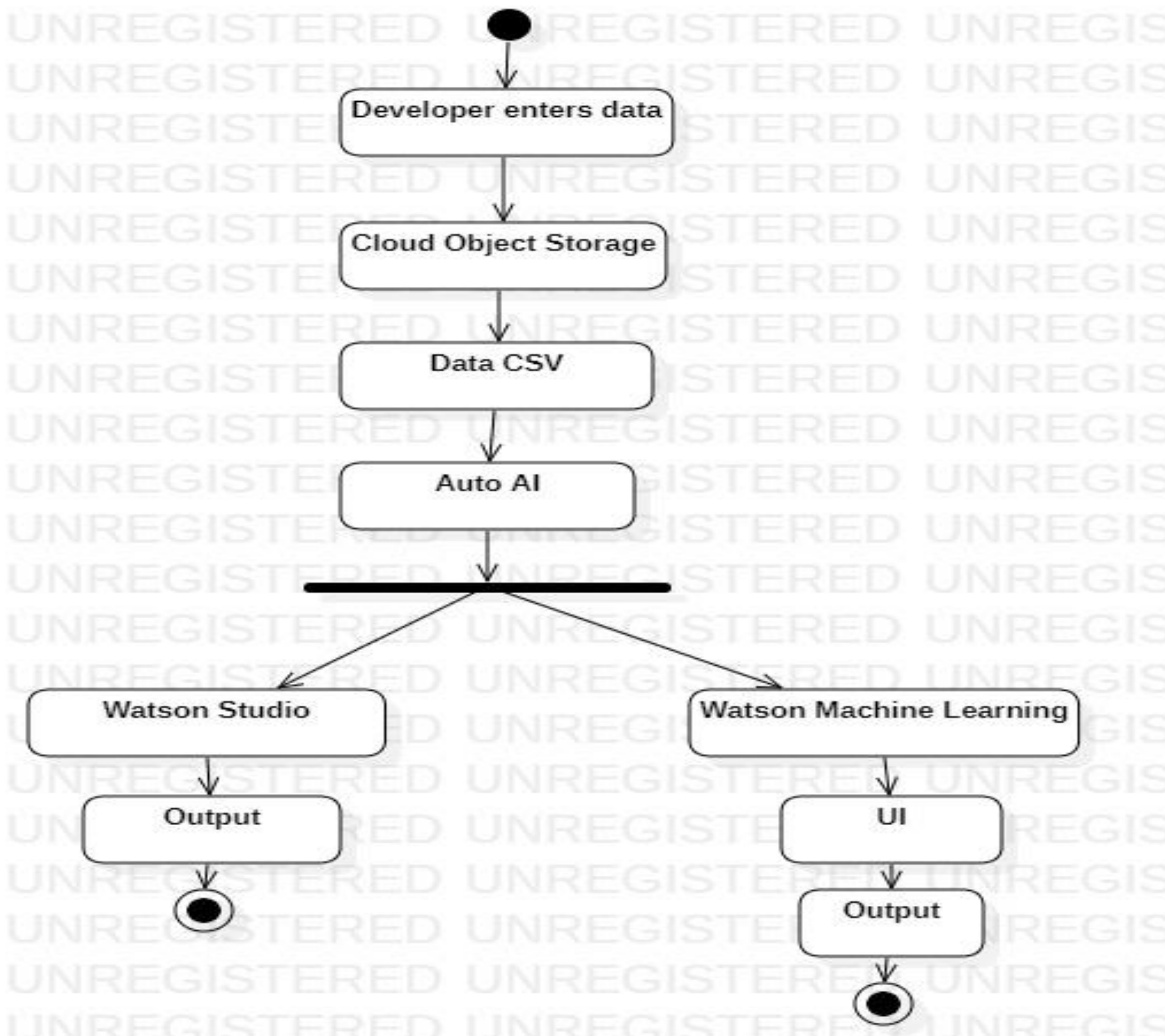


CHAPTER 6

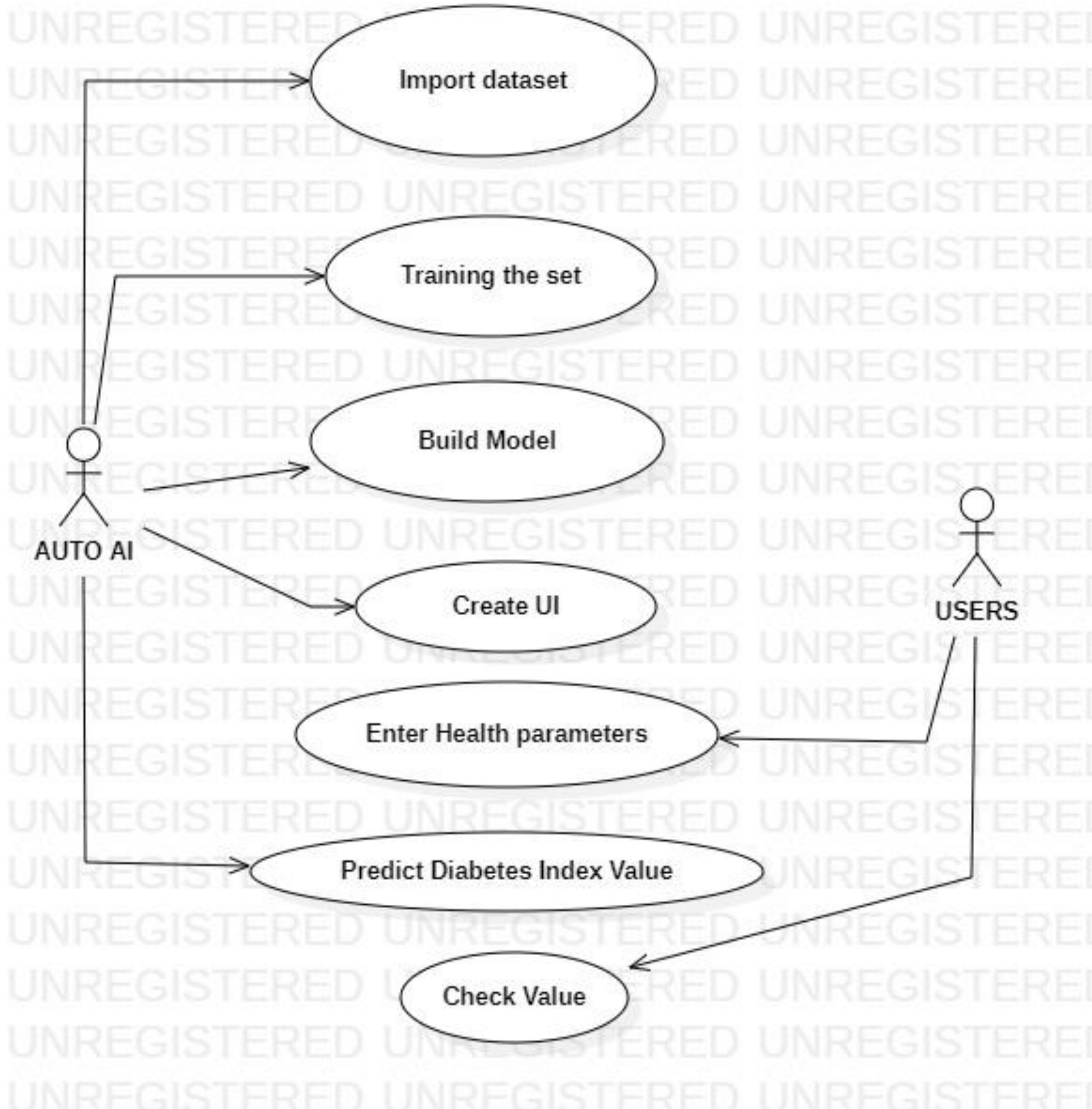
DESIGN AND IMPLEMENTATION

A. USE CASE DIAGRAMS :

i) Activity Diagram



ii) Use Case Diagram



B) SOURCE CODE

Deployment.js

```
constXMLHttpRequest = require("xmlhttprequest").XMLHttpRequest;

const API_KEY = "<your API key>";

functiongetToken(errorCallback, loadCallback) {

        constreq = new XMLHttpRequest();

        req.addEventListener("load", loadCallback);

        req.addEventListener("error", errorCallback);

        req.open("POST", "https://iam.eu-gb.bluemix.net/identity/token");

        req.setRequestHeader("Content-Type", "application/x-www-form-urlencoded");

        req.setRequestHeader("Accept", "application/json");

        req.send("grant_type=urn:ibm:params:oauth:grant-type:apikey&apikey="          +
API_KEY);
}
functionapiPost(scoring_url, token, payload, loadCallback, errorCallback){

        constoReq = new XMLHttpRequest();

        oReq.addEventListener("load", loadCallback);

        oReq.addEventListener("error", errorCallback);

        oReq.open("POST", scoring_url);

        oReq.setRequestHeader("Accept", "application/json");

        oReq.setRequestHeader("Authorization", "Bearer " + token);

        oReq.setRequestHeader("Content-Type", "application/json;charset=UTF-8");
        oReq.send(payload);
}

getToken((err) => console.log(err), function () {
```

```
        lettokenResponse;
        try {
                tokenResponse = JSON.parse(this.responseText);
        } catch(ex) {

        }
                const payload = '{"input_data":

 [{"fields": [array_of_input_fields],

"values": [array_of_values_to_be_scored,

another_array_of_values_to_be_scored]}]}';

        constscoring_url = "https://eu-

gb.ml.cloud.ibm.com/ml/v4/deployments/c85f5163-51c5-4ff1-944e-

52be2900b53c/predictions?version=2020-12-08";

        apiPost(scoring_url, tokenResponse.token, payload, function (resp) {

                letparsedPostResponse;

                try {
                        parsedPostResponse = JSON.parse(this.responseText);

                } catch (ex) {
                                }
                console.log("Scoring response");

                console.log(parsedPostResponse);

        }, function (error) {

                console.log(error);
        });
});
```

Current flow :

[{"id":"2fbe4844.9e17f8",

"type":"tab",

"label":"diabetes mellitus",

"disabled":false,"info":""},

{"id":"d7b659e6.fbac08",

"type":"ui_form",

"z":"2fbe4844.9e17f8",

"name":"

","label":"

","group":

"f7a0867c.4cb3a8",

"order":1,"width":0,"height":0,"options":

[{"label":"preg","value":"pregnancy","type":"number","required":true,"rows":null},

{"label":"plas","value":"plas","type":"number","required":true,"rows":null},

{"label":"pres","value":"pres","type":"number","required":true,"rows":null},

{"label":"skin","value":"skin","type":"number","required":true,"rows":null},

{"label":"test","value":"test","type":"number","required":true,"rows":null},

{"label":"mass","value":"mass","type":"number","required":true,"rows":null},

{"label":"pedi","value":"pedi","type":"number","required":true,"rows":null},

{"label":"clas","value":"clas","type":"number","required":true,"rows":null}],"

formValue":{"pregnancy":"","plas":"","pres":"","skin":"","test":"","mass":"","pedi":"

","clas":""},

"payload":"","submit":"submit","cancel":"cancel","topic":"","x":70,"y":40,"wires":[["
65535e2e.d5c54"]]},
{"id":"38876d10.e72922","type":"debug","z":"2fbe4844.9e17f8","name":"","active":f
alse,"tosidebar":true,"console":false,"tostatus":false,"complete":"payload","targetTyp
e":"msg","statusVal":"","statusType":"auto","x":450,"y":220,"wires":[]},
{"id":"65535e2e.d5c54",
"type":"function",
"z":"2fbe4844.9e17f8",
"name":"setting global
values","func":"global.set(\"pregnancy\",msg.payload.pregnancy)\n
global.set(\"plas\",msg.payload.plas)\n
global.set(\"pres\",msg.payload.pres)\n
global.set(\"skin\",msg.payload.skin)\n
global.set(\"test\",msg.payload.test)\n
global.set(\"mass\",msg.payload.mass)\n
global.set(\"pedi\",msg.payload.pedi)\n
global.set(\"age\",msg.payload.age)\n
global.set(\"class\",msg.payload.class)\n
var apikey = \"FNwA4bz8qXTrKxDB4UNMRua-
s8X_bHZHU7yHiLadmigJ\"\nmsg.headers={\"content-type\":\"application/x-www-
form-urlencoded\"}\nmsg.payload={\"grant_type\":\"urn:ibm:params:oauth:grant-
type:apikey\",\"apikey\":apikey}\nreturn

msg;","outputs":1,"noerr":0,"initialize":"","finalize":"","x":260,"y":80,"wires":[["388
76d10.e72922","18f2c957.4e8527"]]},
{"id":"18f2c957.4e8527",
"type":"httprequest",
"z":"2fbe4844.9e17f8",
"name":"",
"method":"POST",
"ret":"obj","paytoqs":"ignore",
"url":"https://iam.cloud.ibm.com/identity/token","tls":"","persist":false,"proxy
":"","authType":"","x":470,"y":60,"wires":[["bb92d6a.a482528","37fe31c8.25217e"]]
},{"id":"bb92d6a.a482528","type":"debug","z":"2fbe4844.9e17f8","name":"","active
":false,"tosidebar":true,"console":false,"tostatus":false,"complete":"false","statusVal":
"","statusType":"auto","x":650,"y":160,"wires":[]},
{"id":"37fe31c8.25217e",
"type":"function",
"z":"2fbe4844.9e17f8",
"name":"calling variables",
"func":
"var pregnancy = global.get(\"pregnancy\")\n
var plas = global.get(\"plas\")\nvar pres = global.get(\"pres\")\nvar skin =
global.get(\"skin\")\nvar test = global.get(\"test\")\nvar mass =
global.get(\"mass\")\nvar pedi = global.get(\"pedi\")\nvar age =
global.get(\"age\")\nvar clas = global.get(\"class\")\nvar token =

msg.payload.access_token\nmsg.headers={'Content-Type':
'application/json',\"Authorization\":\"Bearer
\"+token,\"Accept\":\"application/json\"}\nmsg.payload={\"input_data\":[{\"fields\":
[[\"pregnancy\",\"plas\",\"pres\",\"skin\",\"test\",\"mass\",\"pedi\",\"age\",\"clas\"]],
\"values\":[[pregnancy,plas,pres,skin,test,mass,pedi,age,clas]]}]}\nreturn
msg;","outputs":1,"noerr":0,"initialize":"","finalize":"","x":640,"y":40,"wires":[["a9f5
7163.0bdc7"]]},
{"id":"a9f57163.0bdc7",
"type":"httprequest",
"z":"2fbe4844.9e17f8",
"name":"",
"method":"POST",
"ret":"obj",
"paytoqs":"ignore",
"url":"https://eu-gb.ml.cloud.ibm.com/ml/v4/deployments/c85f5163-51c5-
4ff1-944e-52be2900b53c/predictions?version=2020-09-
01","tls":"","persist":false,"proxy":"","authType":"","x":791,"y":80,"wires":[["efe8f9
5.c93f308","c91d5ea.527e7a"]]},
{"id":"efe8f95.c93f308",
"type":"debug",
"z":"2fbe4844.9e17f8",
"name":"",

"active":true,

"tosidebar":true,

"console":false,

"tostatus":false,

"complete":"false",

"statusVal":"

","statusType":"auto","x":970,"y":120,"wires":[]},

{"id":"c91d5ea.527e7a",

"type":"function",

"z":"2fbe4844.9e17f8",

"name":"",

"func":"msg.payload=msg.payload.predictions[0].values[0][0]\nreturn

msg;","outputs":1,"noerr":0,"initialize":"","finalize":"",

"x":1000,"y":60,"wires":[["98

244fce.aa24d","147a23dc.4660bc"]]},

{"id":"98244fce.aa24d",

"type":"debug",

"z":"2fbe4844.9e17f8",

"name":"",

"active":true,

"tosidebar":true,

"console":false,

"tostatus":false,

"complete":"payload",

"targetType":"msg","statusVal":"","statusType":"auto","x":1

250,"y":100,"wires":[]},

{"id":"147a23dc.4660bc",

"type":"ui_text",

"z":"2fbe4844.9e17f8",

"group":"f7a0867c.4cb3a8",

"order":2,

"width":0,

"height":0,

"name":"",

"label":"diabetes mellitus",

"format":"{{msg.payload}}",

"layout":"row-spread",

"x":1270,

"y":40,"wires":[]},

{"id":"f7a0867c.4cb3a8",

"type":"ui_group",

"z":"",

"name":"Enterthevalues",

"tab":"8569bfa8.be3ec",

"order":1,

"disp":true,

"width":"6",

"collapse":false},

{"id":"8569bfa8.be3ec",

"type":"ui_tab",

"z":"",

"name":"PREDICT",

"icon":"dashboard",

"disabled":false,

"hidden":false}]

Calling Variables :

```
var pregnancy = global.get("pregnancy")

varplas = global.get("plas")

varpres = global.get("pres")

var skin = global.get("skin")

var test = global.get("test")

var mass = global.get("mass")

varpedi = global.get("pedi")

var age = global.get("age")

varclas = global.get("class")


var token = msg.payload.access_token
```

```
msg.headers={'Content-Type': 'application/json',"Authorization":"Bearer

"+token,"Accept":"application/json"}

msg.payload={"input_data":[{"fields":[["pregnancy","plas","pres","skin","test","mass

","pedi","age","clas"]],

"values":[[pregnancy,plas,pres,skin,test,mass,pedi,age,clas]]}]

}
returnmsg;
```

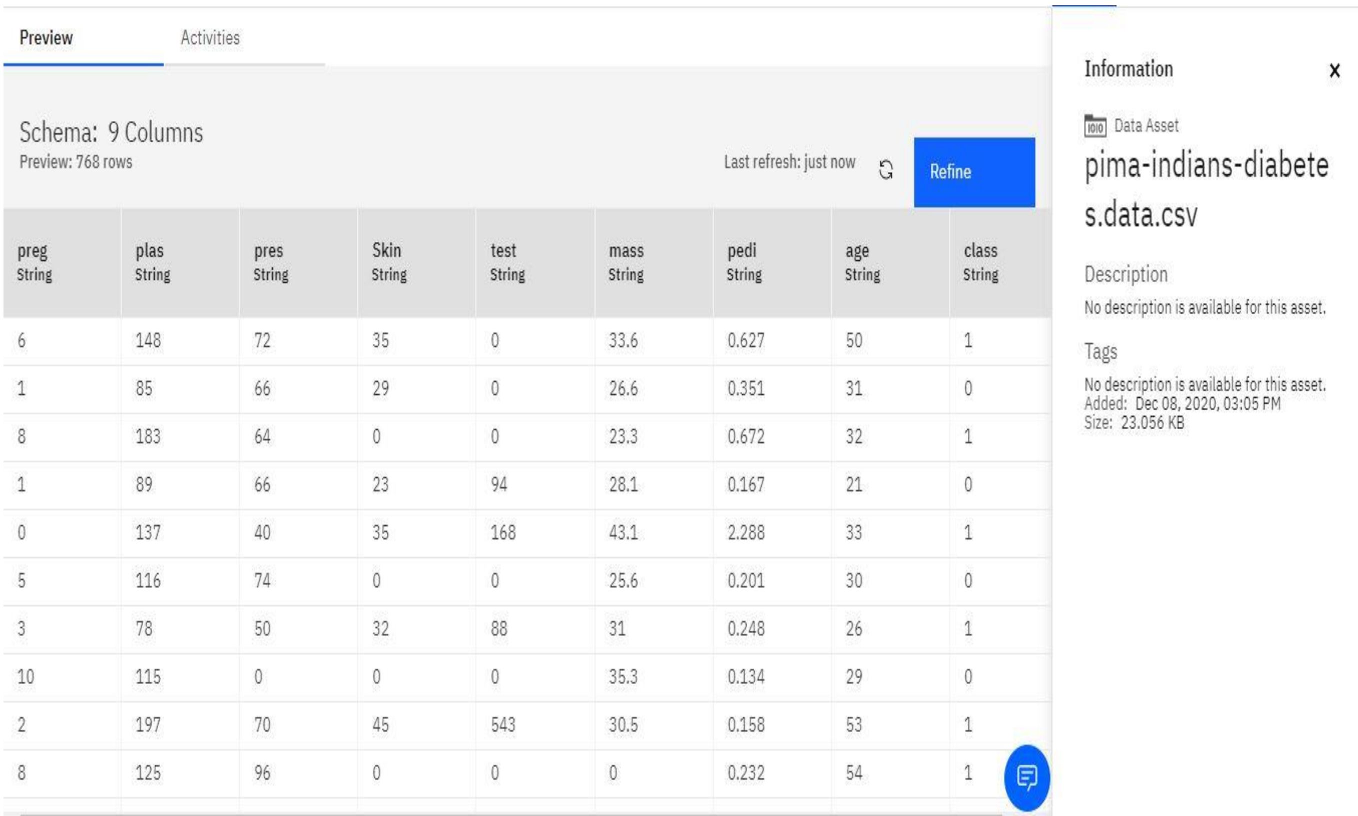
Prediction :

```
msg.payload=msg.payload.predictions[0].values[0][0]

returnmsg;
```

CHAPTER 7

OUTPUT



preg String	plas String	pres String	Skin String	test String	mass String	pedi String	age String	class String
6	148	72	35	0	33.6	0.627	50	1
1	85	66	29	0	26.6	0.351	31	0
8	183	64	0	0	23.3	0.672	32	1
1	89	66	23	94	28.1	0.167	21	0
0	137	40	35	168	43.1	2.288	33	1
5	116	74	0	0	25.6	0.201	30	0
3	78	50	32	88	31	0.248	26	1
10	115	0	0	0	35.3	0.134	29	0
2	197	70	45	543	30.5	0.158	53	1
8	125	96	0	0	0	0.232	54	1

Fig 12.1 pima-indians-diabetes.data.csv (collection of dataset).

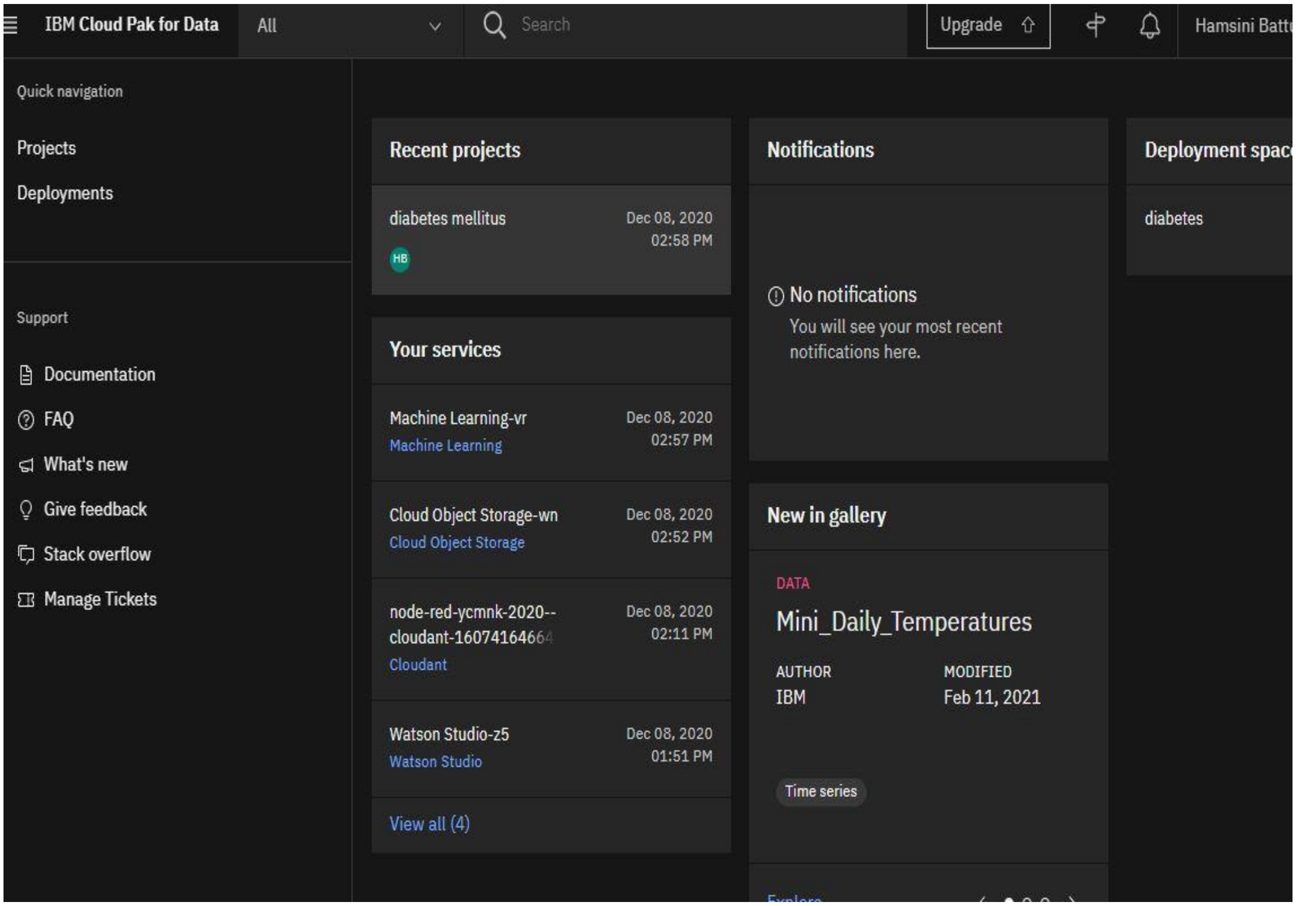


Fig 12.2 Project workspace of watson studio including services, cloud object storage and deployment of the diabetes melitus project.

My Projects / diabetes mellitus / new ai - P2 GradientBoostingReg...

Input Schema

Input

Column	Type
plas	"integer"
Skin	"integer"
class	"integer"
mass	"double"
pedi	"double"
preg	"integer"
pres	"integer"
test	"integer"

Fig 12.3 Input schema of (data.csv) of diabetes mellitus with data types.

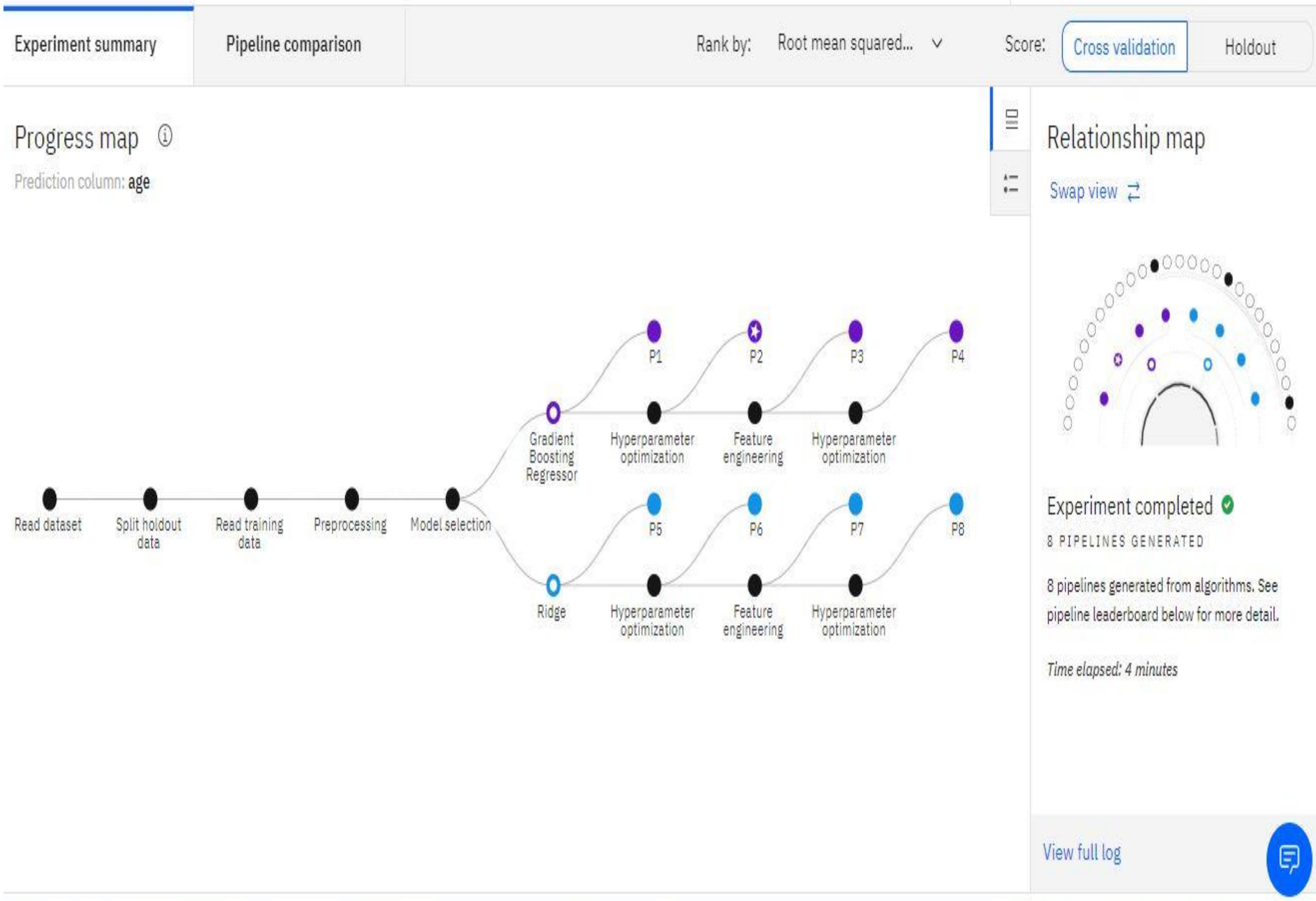
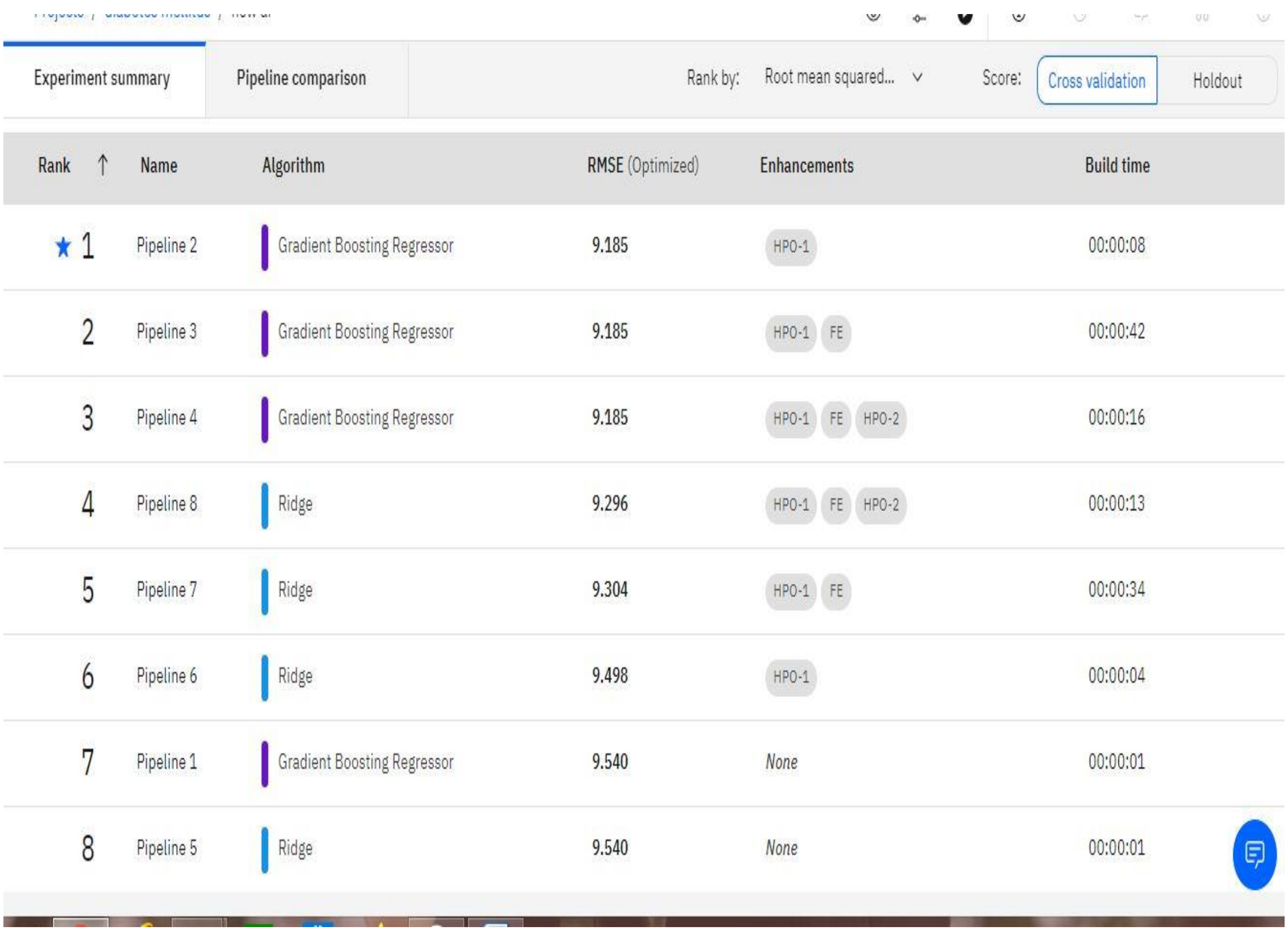


Fig 12.4 Progress Map with Relationship map and pipeline comparison.



Rank	Name	Algorithm	RMSE (Optimized)	Enhancements	Build time
★ 1	Pipeline 2	Gradient Boosting Regressor	9.185	HPO-1	00:00:08
2	Pipeline 3	Gradient Boosting Regressor	9.185	HPO-1 FE	00:00:42
3	Pipeline 4	Gradient Boosting Regressor	9.185	HPO-1 FE HPO-2	00:00:16
4	Pipeline 8	Ridge	9.296	HPO-1 FE HPO-2	00:00:13
5	Pipeline 7	Ridge	9.304	HPO-1 FE	00:00:34
6	Pipeline 6	Ridge	9.498	HPO-1	00:00:04
7	Pipeline 1	Gradient Boosting Regressor	9.540	None	00:00:01
8	Pipeline 5	Ridge	9.540	None	00:00:01

Fig 12.5 Experiment Summary pipelines with optimized RMSE

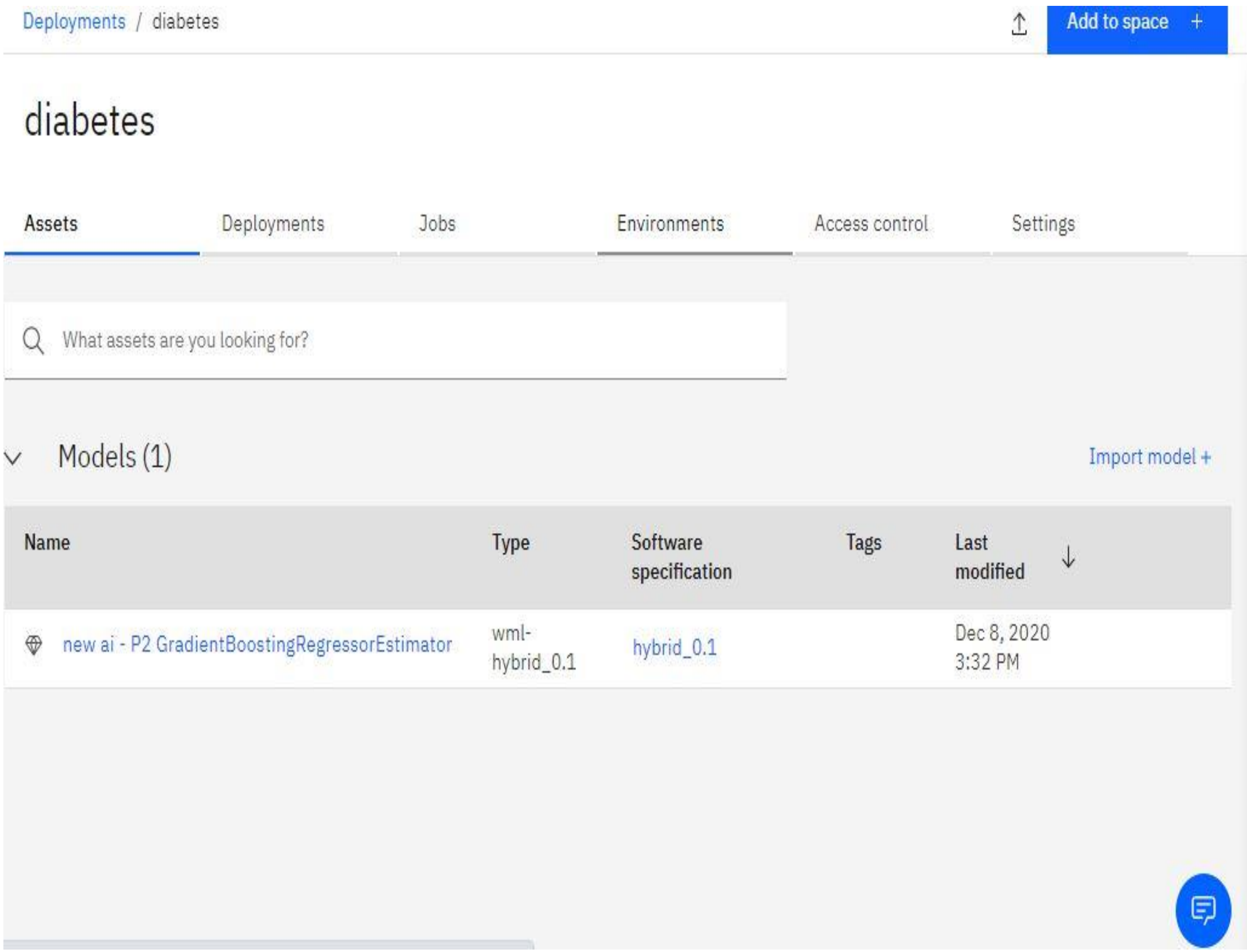


Fig 12.6 Model displaying Gradient Boosting Regressor Estimator

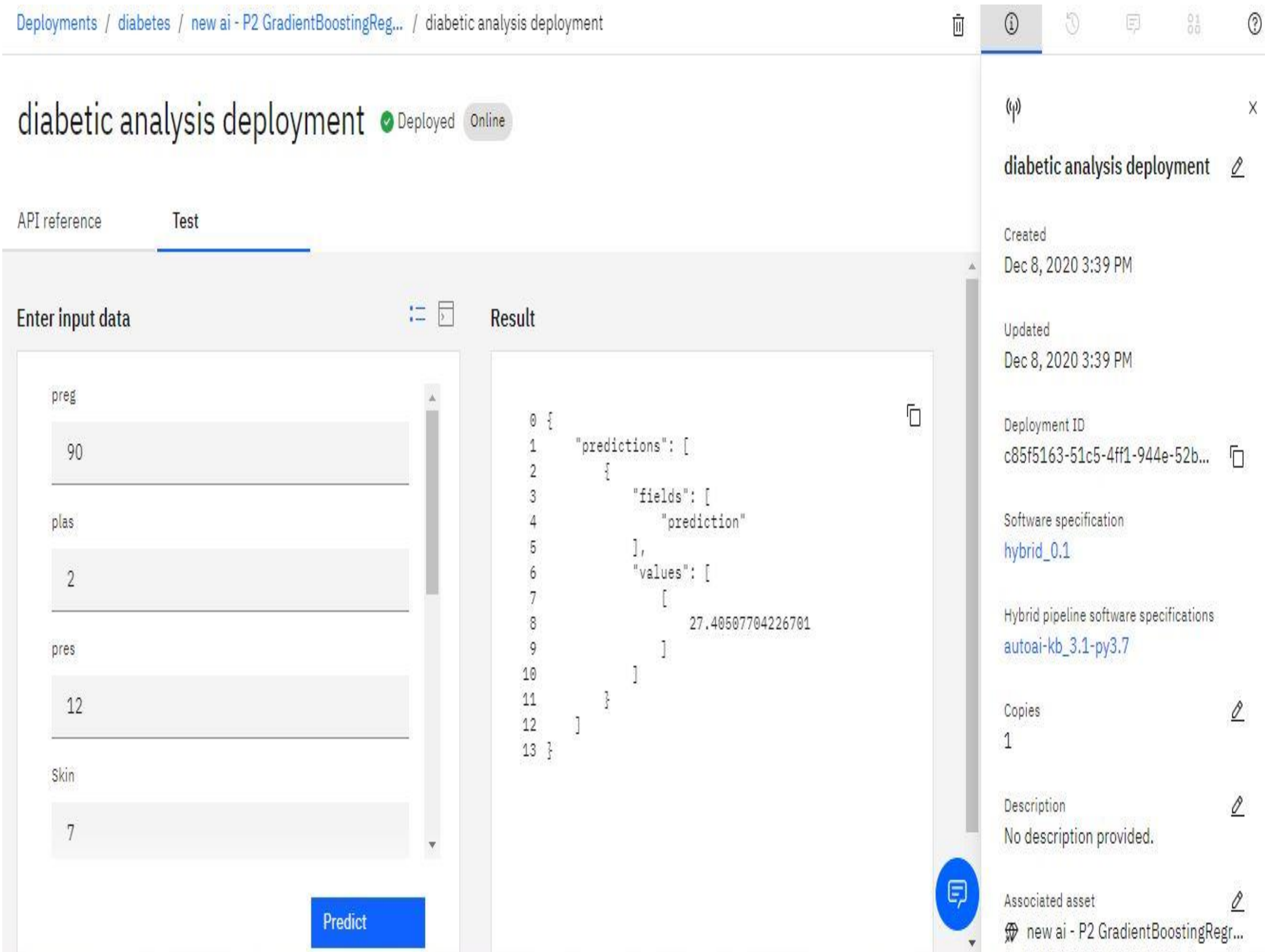
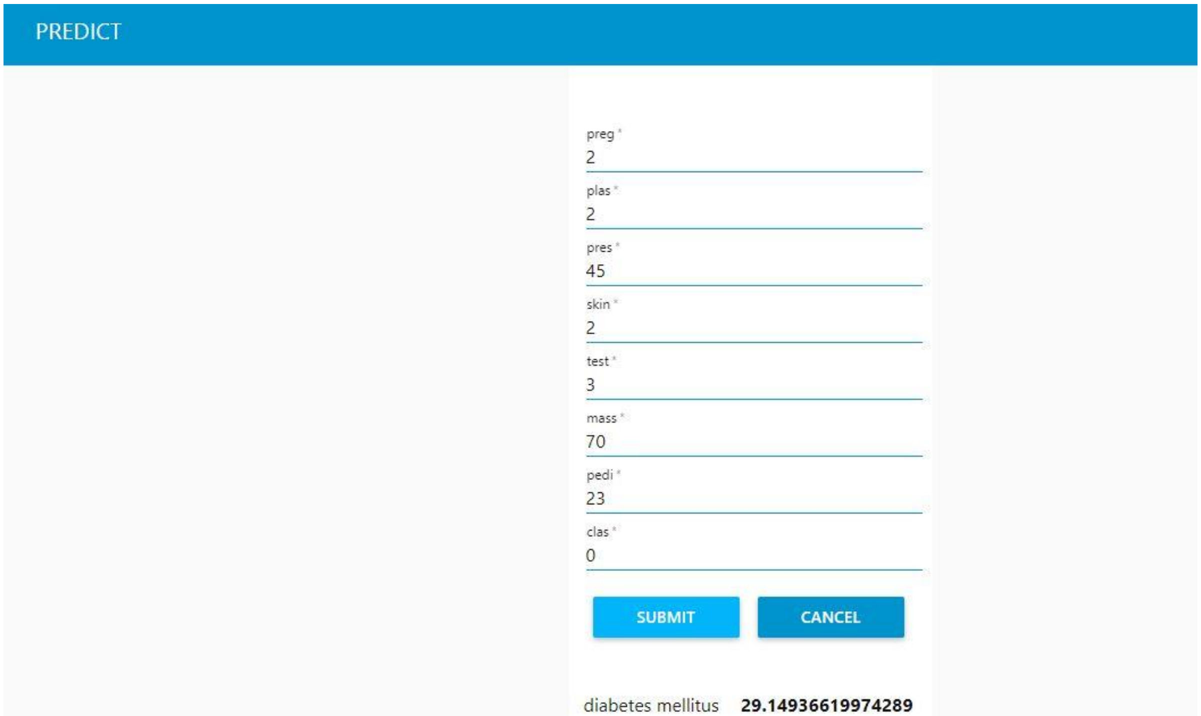
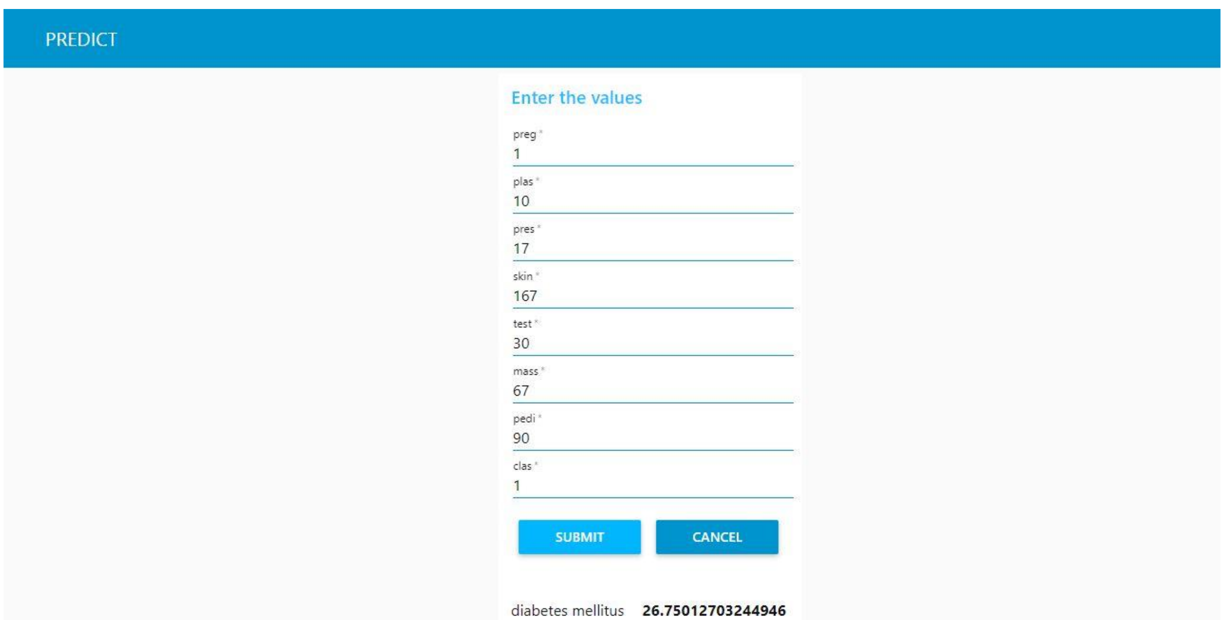


Fig 12.7 Prediction of values for diabetes mellitus in Watson studio deployment.





Figures 12.8 Diabetes Mellitus prediction in Node-RED using health parameters.

CHAPTER 8

APPLICATIONS

- It helps patients to predict whether they are suffering from diabetes or not.
- It takes less time to know the prediction.
- It is effective and applicable to all.
- Sensitivity, specificity and accuracy.
- Can be done through blood samples.
- Various stages are determined through graph to know the level of disease.
- Glucose, insulin and blood levels in our body can be known.
- Easy for patients to track through mobile apps also.(ex: Mhealth)
- Tracking the data is easy.
- Regression methods are used here.
- Accurate and quick to display reports.

CHAPTER 9

CONCLUSION

Through this dataset, the project displays the prediction method to understand the patients who are all suffering from diabetes and collection of their overall reports are loaded in a dataset to keep a regular check for their good health. To know up to what extent they are and how much can be cured further. By this we can conclude that this prediction is reliable to patients to detect disease and to help them. We dealt with the issue of imbalanced data using the adjusted-threshold method and class weight method. The end users of technical advances in diabetes care include health care professionals in hospitals, diabetes management centers, and research institutes. Barriers for the use of AI in diabetes care include cost, access, and implementation. AI has added newer dimensions of self-care for patients with diabetes, introduced rapid and reliable decision making and flexible follow-ups for health care providers, and optimized resource utilization in health care systems. With a growing array of devices and apps, interoperability is reported as a common potential barrier to their use in diabetes management. Technical advances have simplified the management of diabetes and enabled patients to efficiently operate and execute the required management strategies.

CHAPTER 10

FUTURE SCOPE

- These models can be built into an online computer program to help physicians in predicting patients with future occurrence of diabetes and providing necessary preventive interventions.

- We built predictive models using Logistic Regression and Gradient Boosting Machine (GBM) techniques which boost the accuracy rate with predictions.

- These models can be set up in a computer program online to help physicians in assessing patients' risk of developing Diabetes Mellitus.

- AI can influence and improve 3 main domains of diabetes care: patients with diabetes, health care professionals, and health care systems.

- Technical advances have simplified the management of diabetes and enabled patients to efficiently operate and execute the required management strategies.

- Better glycemic control can be reported with the use of mobile apps in the management of type 2 diabetes mellitus.

CHAPTER 11

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