

Project presentation on,

Remote Health Monitoring System with Analytics Dashboard



Sisira Kumar Kapat

Department of Computer Science & Engineering,
UCP Engineering School,
Berhampur, Orissa

Agenda

- Introduction to the project
- Literature Review
- Existing problem
- Proposed Solution
- Block Diagram
- Hardware/Software Design
- Experimental Investigation
- Flow Chart
- Result Analysis
- Advantages and Disadvantages
- Application
- Conclusion
- References

Introduction

- This project addresses the current demand of wearable which could be developed further to function and meet the need of patients effectively.
- Utilization of sensors decreases the possibility of human mistake, ensures better care and treatment, reduces medical expenses, lessens the involved space of the room and improves overall performance.
- This system is much practical in maintaining social distancing and to avoid spread of the Covid-19 or such contagious diseases.

Purpose

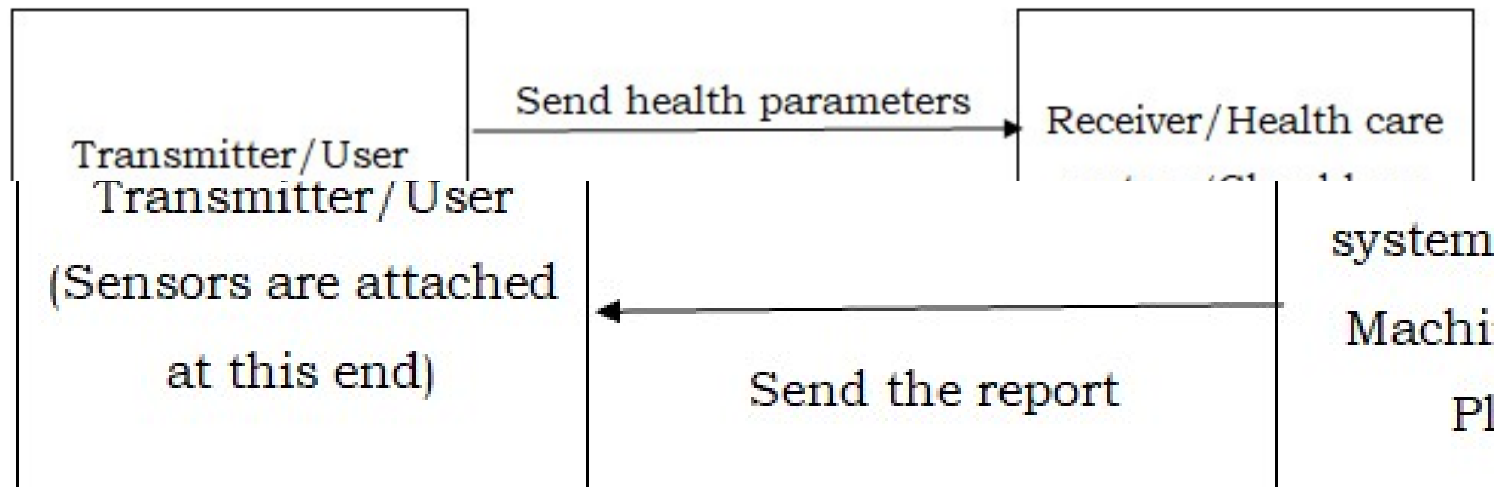
- The purpose of this project is to use ICT in healthcare.
- Bustling time schedule and unpredictable situations of life increases the probability of health risk, independent of the age of a person.
- Though we cannot replace the healthcare system with this, but this project ultimately supplements the existing healthcare system.

Existing Problem

- Hesitation to move to a hospital.
- Busy schedule of the people. The denial will increase the health issue and subsequently results into a health hazard.
- The numbers of health professionals are limited, which increases the personal overhead to each health professionals. For example, a single doctor can check or treat up to a certain number of patients in specific time duration.
- Patients who met with an accident, patients at the time of child-birth (delivery cases) or such patients in critical condition need emergency attention. A wearable can be much helpful in observing the status of such patients. The doctor can observe remotely to such patients till they arrive the hospital.

Proposed Solution

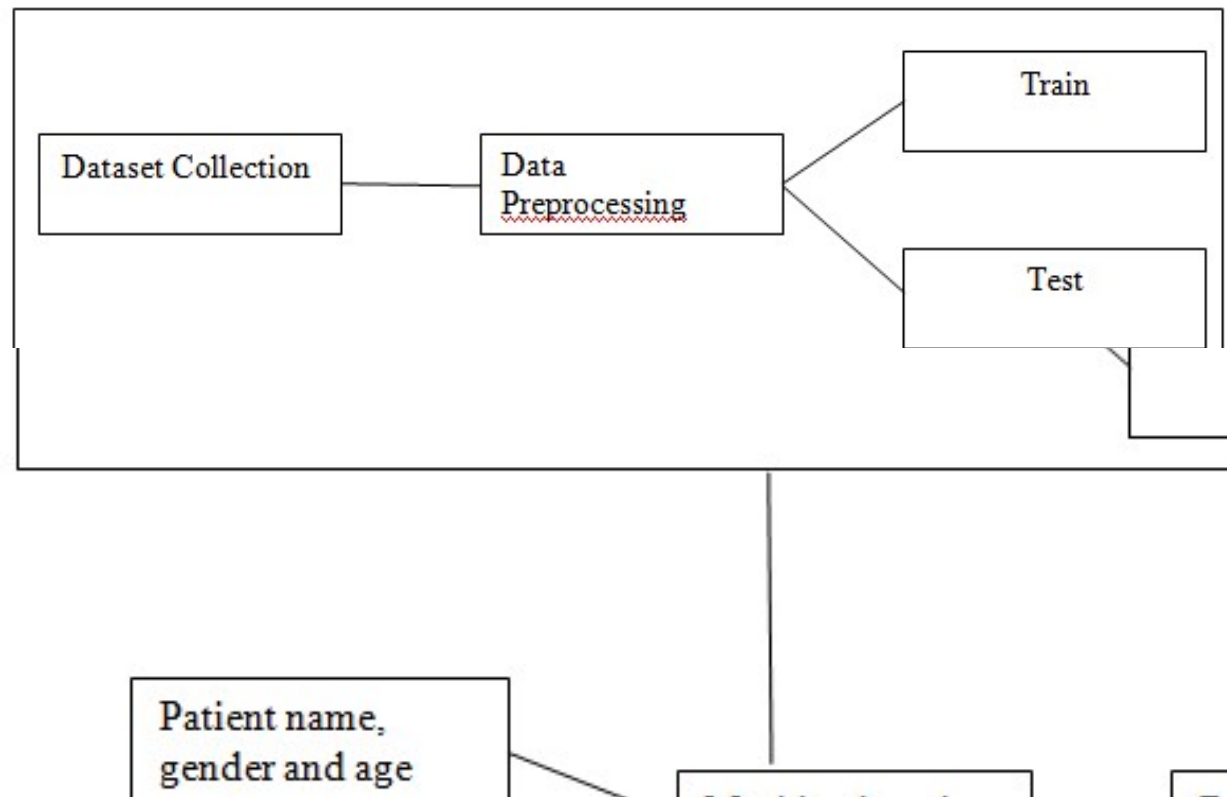
- Integrate sensors with handheld devices or wearable.



Block Diagram

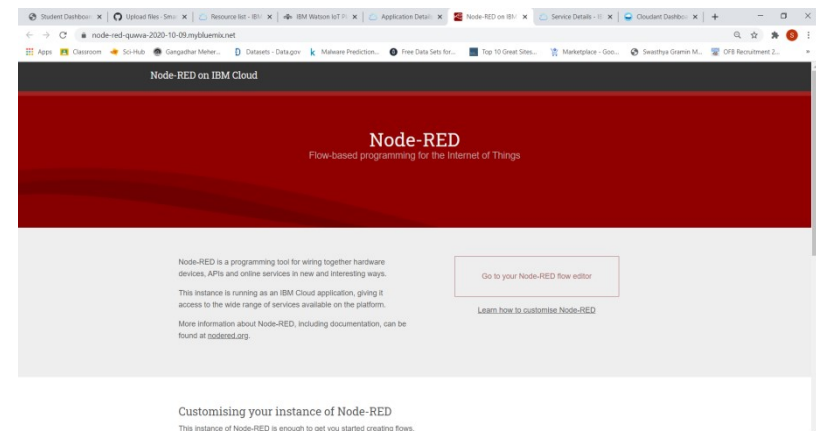
- The system is composed of three components such as,
 - User interface to enter name, gender and age
 - IoT interface to collect the health parameters
 - Machine learning model in the cloud to evaluate the data

Block Diagram (Cont...)



Hardware/Software Design

- IoT Service (IBM Watson IoT Platform)
 - Temperature Sensor
 - Blood Pressure Sensor
 - Pulse Sensor
- Node-RED user interface
- Machine Learning Model design
- Cloudant Database Design

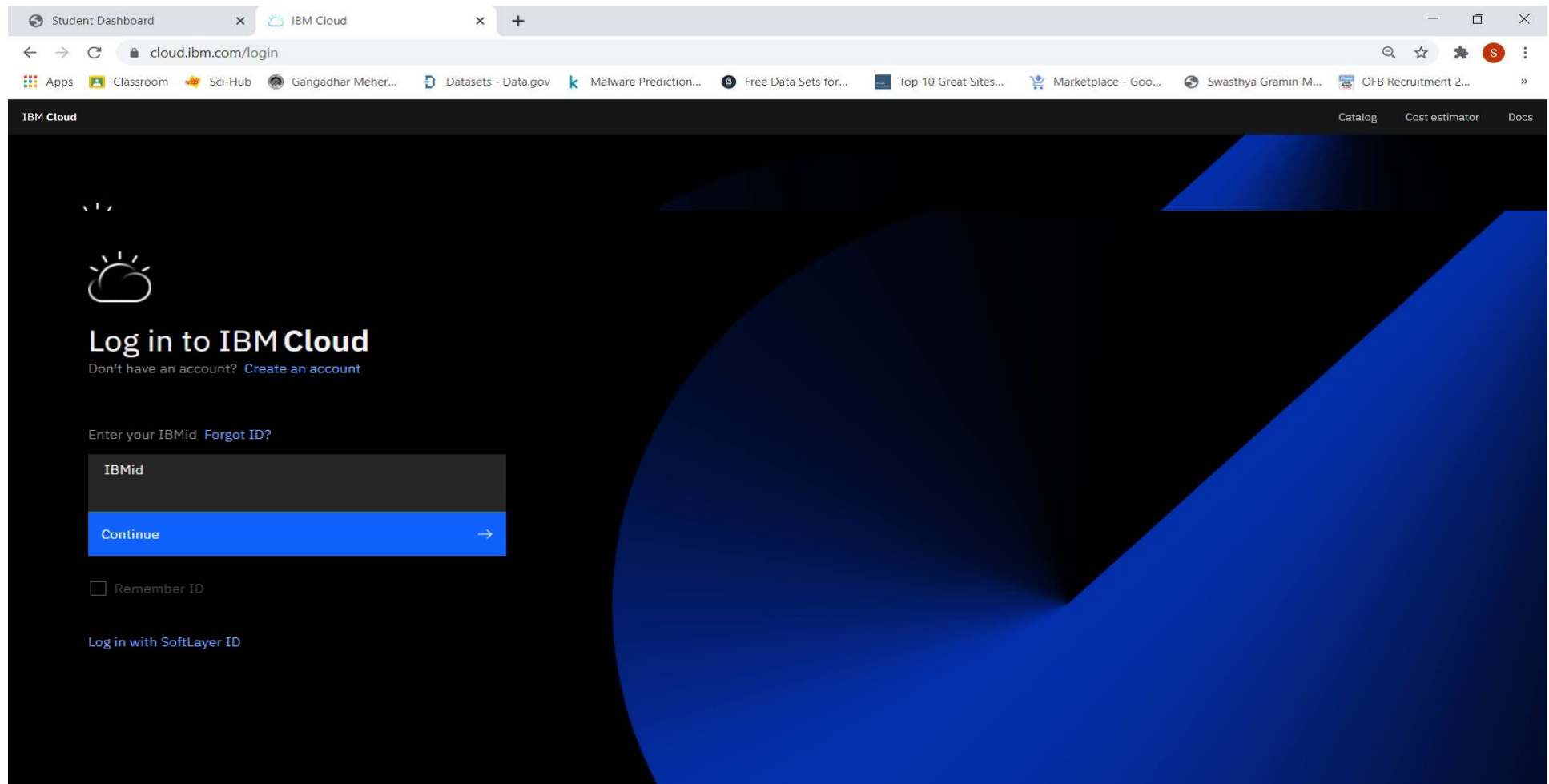


Procedure for hardware/software design

- IBM Academic Initiative account
- Create and launch Node-RED instance
- Create an IBM Watson IoT Platform
- Configure the IoT platform
- Configure the Watson Studio service
- Configure and connect the online simulator
- Build a machine learning model
- Create a node-RED flow to get data from IBM IoT device
- Create HTTP requests
- Create UI to input user data
- Store the user data in the cloud database
- Create node-RED to display the detailed prediction

Hardware/Software Design (cont...)

- The system is designed by using IBM cloud online resources.



Resources used

Student Dashboard | Upload files - SmartPracticescho... | Resource list - IBM Cloud

cloud.ibm.com/resources

Apps | Classroom | Sci-Hub | Gangadhar Meher... | Datasets - Data.gov | Malware Prediction... | Free Data Sets for... | Top 10 Great Sites... | Marketplace - Goo... | Swasthya Gramin M... | OFB Recruitment 2...

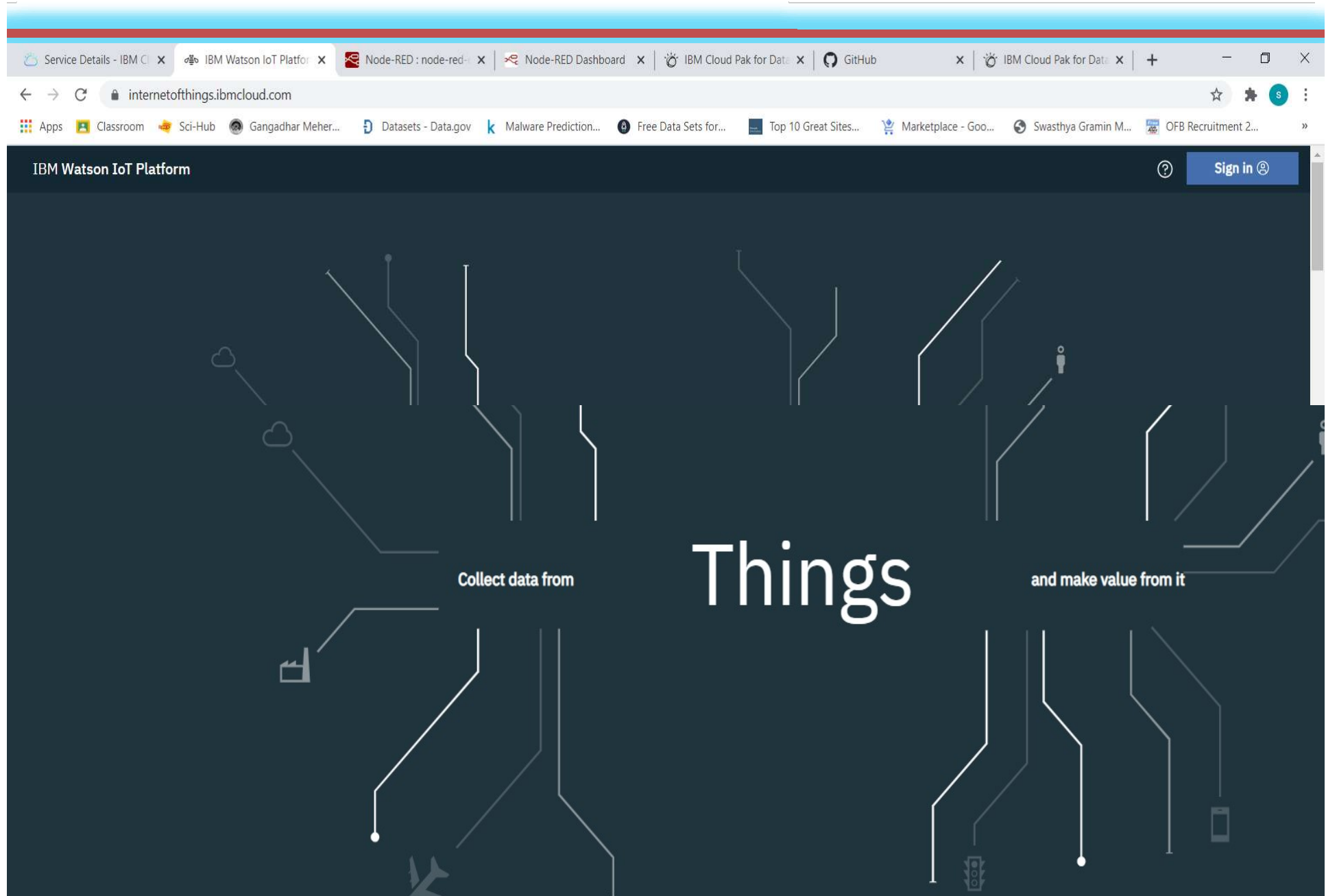
IBM Cloud | Search resources and offerings...

Resource list

Create resource +

Name	Group	Location	Offering	Status	Tags
Filter by name or IP address... Filter by group or org... Filter... Filter... Filter... Filter...					
Devices (0)					
VPC infrastructure (0)					
Clusters (1)					
Cloud Foundry apps (1)					
Cloud Foundry services (1)					
Services (5)					
Continuous Delivery	Default	Dallas	Continuous Delivery	Active	
Internet of Things Platform-m8	Default	Dallas	Internet of Things Platform	Active	
Machine Learning-oo	Default	Dallas	Machine Learning	Active	
Watson Studio-hx	Default	Dallas	Watson Studio	Active	
node-red-quwva-2020--cloudant-1602256163093	Default	London	Cloudant	Active	
Storage (1)					
Network (0)					

IBM Watson IoT Platform



IBM Watson IoT Platform

- This service is used to simulate the different sensors using IBM IoT.

Payload

Specify the event payload in the editor window or by uploading a [CSV file](#).

```
0 {  
1   "temperature": random(0, 41),  
2   "pulse": random(0, 200),  
3   "BPsystolic": random(0, 200),  
4   "BPdiastolic": random(0, 140)
```

API keys

Student Dashboard | Upload files - SmartPracticescho... | cloud.ibm.com | IBM Watson IoT Platform

txm87v.internetofthings.ibmcloud.com/dashboard/apps/browse

Apps | Classroom | Sci-Hub | Gangadhar Meher... | Datasets - Data.gov | Malware Prediction... | Free Data Sets for... | Top 10 Great Sites... | Marketplace - Goo... | Swasthya Gramin M... | OFB Recruitment 2...

IBM Watson IoT Platform

si2020gc00671@smartinternz.com
ID: txm87v

Browse IBM Cloud Apps

+ Generate API Key

Browse API Keys

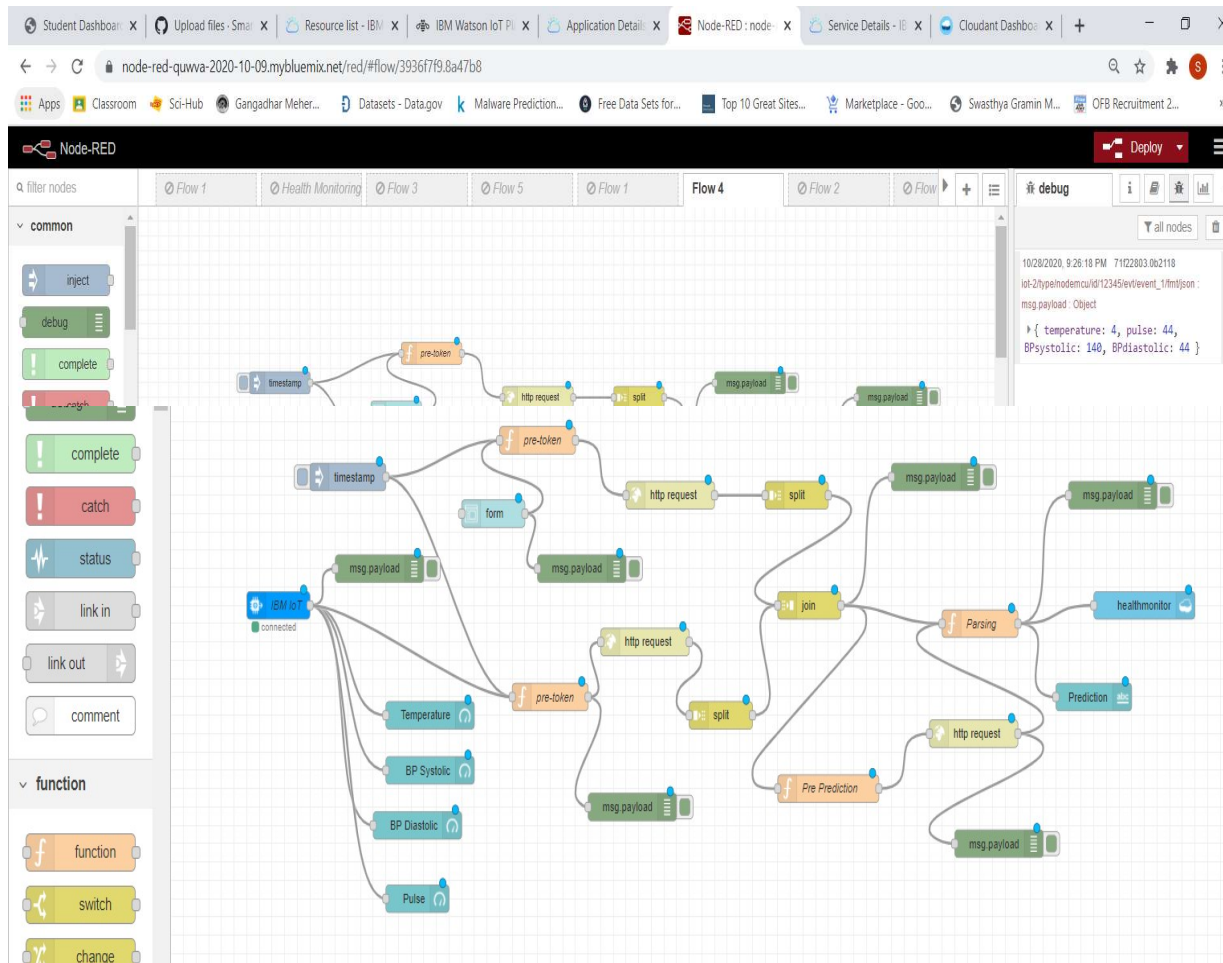
Type the app description to search for

This table shows a summary of the API keys that have been added for the organization. It can be filtered, organized, and search on using different criteria. To get started, you can add API keys by clicking Generate API Key, or by using the API. For more information about adding API keys, see [API key connection](#).

This table shows a summary of the API keys that have been added for the organization. It can be filtered, organized, and search on using different criteria. To get started, you can add API keys by clicking Generate API Key, or by using the API. For more information about adding API keys, see [API key connection](#).

<input type="checkbox"/> Key ↕	Description ↕	Role ↕	Expires ↕
3 results			
<input type="checkbox"/> a-txm87v-5uwqxji2vy	health monitoring	Standard Application	-
<input type="checkbox"/> a-txm87v-jvwesisanr	API Key for the device simulator	Standard Application	-
<input type="checkbox"/> a-txm87v-rmznky5skk	API Key for the device simulator	Standard Application	-

Node-RED UI Creation



Health Monitoring System

Health data

Name*

Health data

Name*

Prithvi

Gender*

male

age*

--

Machine Learning model Creation

The screenshot displays the IBM Cloud Pak for Data web interface. The browser's address bar shows the URL: `dataplatfom.cloud.ibm.com/projects/ed0a5d8b-4ff8-4a0b-a149-969f039cd918/assets?context=cpdaas`. The page header includes the IBM Cloud Pak for Data logo, an 'Upgrade' button, and the user's name 'SISIRA KUMAR KAPAT's A...'. The main navigation bar shows 'Projects / health monitor' and a 'Launch IDE' dropdown. A blue banner at the top contains an announcement: 'CPDaaS / Satellite Beta Program starts 11/30/20. Learn more.' The 'Assets' tab is selected in the top navigation bar. Below the tabs, there are two search bars with the placeholder text 'What assets are you looking for?'. The 'Data assets' section shows '0 assets selected.' and a table with one asset:

<input type="checkbox"/>	Name	Type	Created by	Last modified
<input type="checkbox"/>	CSV HMSSSSS.csv	Data Asset	SISIRA KUMAR KAPAT	Oct 19, 2020, 12:04 PM

Below the table, the 'AutoAI experiments' section is visible, with a 'New AutoAI experiment +' link.

Dataset

Attribute	Range
Age	0 to 80
Temperature	0 to 41
BP (<u>Cistole</u>)	0 to 200
BP (<u>Distole</u>)	0 to 140
BP (<u>Distole</u>)	0 to 140

Machine Learning model Creation (cont...)

The screenshot shows the IBM Cloud Pak for Data web interface. The browser's address bar displays `dataplatfrom.cloud.ibm.com/ml-runtime/spaces?context=cpdaas`. The page header includes the IBM Cloud Pak for Data logo, an 'Upgrade' button, and a user profile for 'SISIRA KUMAR KAPAT's A...'. A blue announcement banner at the top states: 'Announcement CPDaaS / Satellite Beta Program starts 11/30/20. [Learn more.](#)'. The main section is titled 'Deployments' and indicates '1 space'. A search bar is present with the text 'Which deployment space are you looking for?'. Below this is a table listing the deployment spaces.

Name	Last modified	Your role	Collaborators	Online deployments
Health Monitor	Oct 19, 2020 12:19 PM	Admin	SK	1

Machine Learning model Testing(cont...)

The screenshot displays the IBM Cloud Pak for Data interface for testing a machine learning model. The browser address bar shows the URL: `datapatform.cloud.ibm.com/ml-runtime/deployments/9ca2433b-f932-4703-8a7b-035c603d1593/test?space_id=24109664-6d5e-4877-be42-c6800066f6d8&context=cpdaas&flush=true`.

The interface includes a top navigation bar with the IBM Cloud Pak for Data logo and a user profile for SISIRA KUMAR KAPAT. Below this is a breadcrumb trail: `Deployments / Health Monitor / Health monitor - P3 DecisionTree... / Remote health`.

The main content area is divided into two sections: **Enter input data** and **Result**.

Enter input data section:

- Age: 32
- Temperature: 35
- Systolic: 100
- Diastolic: 90
- Pulse: (empty)

Result section:

```
0 1
1  "predictions": [
2    {
3      "fields": [
4        "prediction",
5        "probability"
6      ],
7      "values": [
8        [
9          "Hypothermia",
10         [
11           0,
12           0,
13           0,
14           0,
15           0,
16           0,
17           0,
18           0,
19           0,
20           0,
```

Machine Learning model Creation (cont...)

The screenshot shows the IBM Cloud Pak for Data interface. The top navigation bar includes the IBM Cloud Pak for Data logo, an Upgrade button, a user profile (SISIRA KUMAR KAPAT's A...), and a user icon (SK). The main header shows the current path: Deployments / Health Monitor. A blue announcement banner at the top states: "Announcement CPDaaS / Satellite Beta Program starts 11/30/20. [Learn more.](#)".

The main content area is titled "Health Monitor" and has a sub-header with tabs: Assets, Deployments, Jobs, Access control, and Settings. The "Assets" tab is selected. Below the tabs is a search bar with the placeholder text "What assets are you looking for?".

Under the search bar, there is a section titled "Models (1)" with a dropdown arrow and an "Import model +" link. Below this is a table with the following data:

Name	Type	Software specification	Last modified	
Health monitor - P3 DecisionTreeClassif...	wml-hybrid_0.1	hybrid_0.1	Oct 19, 2020 12:10 PM	

On the right side of the interface, there is a file upload area with the text "Drop files here or browse for files to upload." and a message "Stay on the page until upload completes.".

Database Creation

Student Dashboard | Upload files - SmartPr... | Resource list - IBM Clou... | IBM Watson IoT Platfor... | cloud.ibm.com | Service Details - IBM Cl... | Cloudant Dashboard -

6381c5b0-117b-47e5-9395-c6370e9ab57d-bluemix.cloudant.com/dashboard.html#database/healthmonitor/_all_docs

Apps | Classroom | Sci-Hub | Gangadhar Meher... | Datasets - Data.gov | Malware Prediction... | Free Data Sets for... | Top 10 Great Sites... | Marketplace - Goo... | Swasthya Gramin M... | OFB Recruitment 2...

healthmonitor

Document ID

Options

{ } JSON

🔔

All Documents

Query

Permissions

Changes

Design Documents

Changes









Design Documents

Table

Metadata

{ } JSON

Create Document

	id	key	value
<input type="checkbox"/>	 38bb673d1d88b5e78deee0b631cc21cc	38bb673d1d88b5e78deee0b631cc21cc	{ "rev": "1-85d43c01f66cb561a335fc89588f7..." }
<input type="checkbox"/>	 3f3dbcd03a8b2e8e15683dcca1917033	3f3dbcd03a8b2e8e15683dcca1917033	{ "rev": "1-01feaacb4ef977110c258e288801d..." }
<input type="checkbox"/>	 38bb673d1d88b5e78deee0b631cc21cc	38bb673d1d88b5e78deee0b631cc21cc	{ "rev": "1-85d43c01f66cb561a335fc89588f7..." }
<input type="checkbox"/>	 3f3dbcd03a8b2e8e15683dcca1917033	3f3dbcd03a8b2e8e15683dcca1917033	{ "rev": "1-01feaacb4ef977110c258e288801d..." }
<input type="checkbox"/>	 b35203f71459cf8999c1912a1e8cb907	b35203f71459cf8999c1912a1e8cb907	{ "rev": "1-cce..." }
<input type="checkbox"/>	 c84df809f324c45d292239aed1c1e068	c84df809f324c45d292239aed1c1e068	{ "rev": "1-5ct..." }
<input type="checkbox"/>	 caaabae46857c9d1327a171d93aa939d	caaabae46857c9d1327a171d93aa939d	{ "rev": "1-a84..." }
<input type="checkbox"/>	 f4470d666d5a2b71d365e92e84e73dd3	f4470d666d5a2b71d365e92e84e73dd3	{ "rev": "1-5b..." }

Data in the database

The screenshot shows a web browser with multiple tabs open, including 'Service Data', 'Cloudant Da', 'IBM Watson', 'Node-RED', 'node-red-q', and 'IBM Cloud P'. The address bar shows the URL: `6381c5b0-117b-47e5-9395-c6370e9ab57d-bluemix.cloudant.com/dashboard.html#database/healthm`. The browser's bookmark bar contains links to 'Apps', 'Classroom', 'Sci-Hub', 'Gangadhar Meher...', 'Datasets - Data.gov', 'Malware Prediction...', and 'Free D'.

The main content area displays the 'healthmonitor' database with a specific record ID: `c84df809f324c45d292239aed1c1e068`. Below this, there are two 'Save Changes' buttons with a checkmark icon, each followed by a 'Cancel' button. The record details are shown in a table-like format with line numbers 1 through 9 on the left and the corresponding JSON data on the right.

1	{
2	"_id": "c84df809f324c45d292239aed1c1e068",
3	"_rev": "1-5cbdc35f2fe97a9fb1eab4d27d7c9899",
4	"name": "raj",
5	"gender": "1",
6	"age": "35",
7	"Temperature": 34,
8	"Systolic": 110,
9	"Diastolic": 86,

Experimental Investigation (Progress map)








Progress map ⓘ

Prediction column: **status**



Pipeline Leaderboard (CV)

Pipeline leaderboard

Rank ↑	Name	Algorithm	Accuracy (Opt...	Enhancements	Build time
★ 1	Pipeline 3	 Decision Tree Classifier	0.959	HPO-1 FE	00:00:36
2	Pipeline 4	 Decision Tree Classifier	0.959	HPO-1 FE HPO-2	00:00:13
2	Pipeline 4	 Decision Tree Classifier	0.959	HPO-1 FE HPO-	
3	Pipeline 1	 Decision Tree Classifier	0.958	None	
4	Pipeline 2	 Decision Tree Classifier	0.958	HPO-1	
5	Pipeline 7	 Random Forest Classifier	0.953	HPO-1 FE	
6	Pipeline 8	 Random Forest Classifier	0.953	HPO-1 FE HPO-	

Some Terminologies associated with ML

- The accuracy of the classifier is the probability of correctly classifying the records in the test dataset.

$$\text{Accuracy} = \frac{\text{True Positive} + \text{True negative}}{\text{Total}}$$

- In multi-class classification, the true positive is the sum of all the true positive case of all the pipelines and similarly false positive, false negative and true negative is calculated.

Some Terminologies associated with ML

- The precision of the classifier is the probability of records actually being in a class if they are classified to be in that class.

$$\text{Precision} = \frac{\text{True Positive}}{\text{True Positive} + \text{False Positive}}$$

- The recall of the classifier is the probability that a record is classified as being in a class if it actually belongs to that class.

$$\text{Recall} = \frac{\text{True Positive}}{\text{True Positive} + \text{False Negative}}$$

- The F-measure is the harmonic mean of precision and recall.

$$F - \text{measure} = \frac{2 \times \text{Recall} \times \text{Precision}}{\text{Recall} + \text{Precision}}$$

Detailed Accuracy (CV)

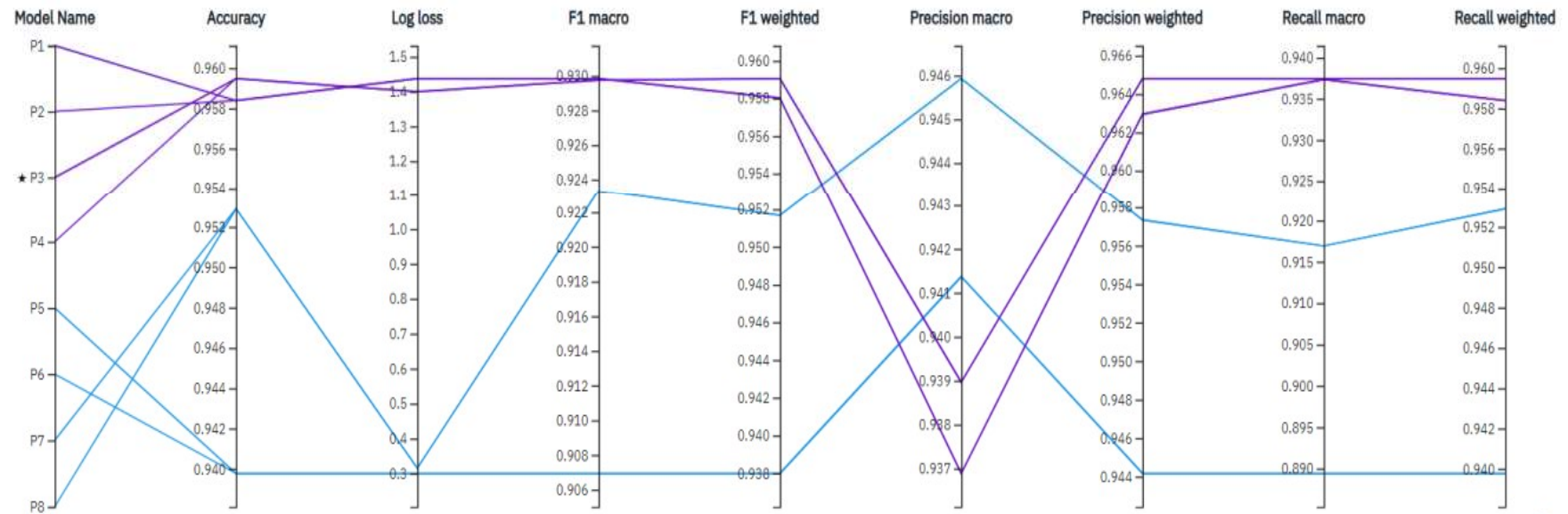
Pipeline leaderboard

Rank	↑	Name	Algorithm	Accuracy (Optimiz...	F1 macro	F1 micro	F1 weighted	Log loss	Precision m...	Precision m...	Precision w...	Recall macro	Recall micro	Recall weig...
★ 1		Pipeline 3	Decision Tree Classifier	0.959	0.930	0.959	0.959	1.400	0.939	0.959	0.965	0.937	0.959	0.959
2		Pipeline 4	Decision Tree Classifier	0.959	0.930	0.959	0.959	1.400	0.939	0.959	0.965	0.937	0.959	0.959
3		Pipeline 1	Decision Tree Classifier	0.958	0.930	0.958	0.958	1.437	0.937	0.958	0.963	0.937	0.958	0.958
3		Pipeline 1	Decision Tree Classifier		0.958		0.930	0.958	0.958	1.437		0.937	0.958	0
4		Pipeline 2	Decision Tree Classifier		0.958		0.930	0.958	0.958	1.437		0.937	0.958	0
5		Pipeline 7	Random Forest Classifier		0.953		0.923	0.953	0.952	0.315		0.946	0.953	0
6		Pipeline 8	Random Forest Classifier		0.953		0.923	0.953	0.952	0.315		0.946	0.953	0

Comparative analysis of different pipelines of cross validation

Metric chart ⓘ

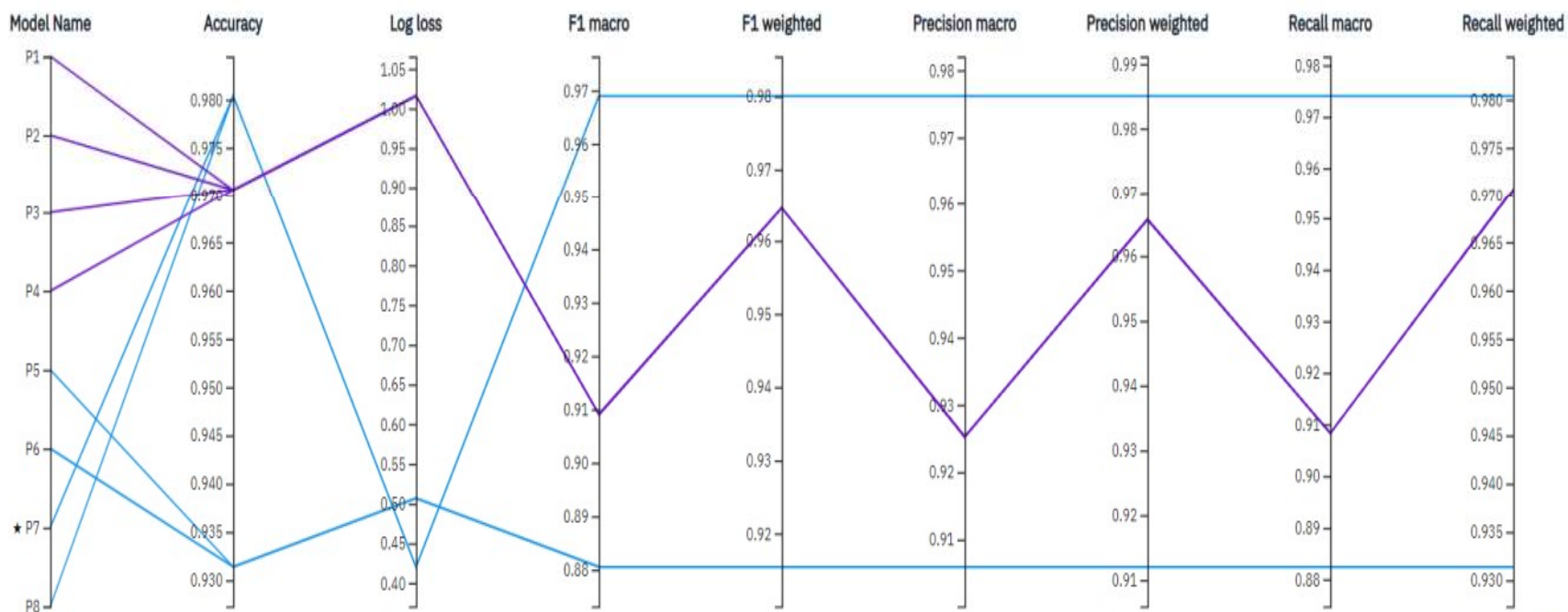
Prediction column: status



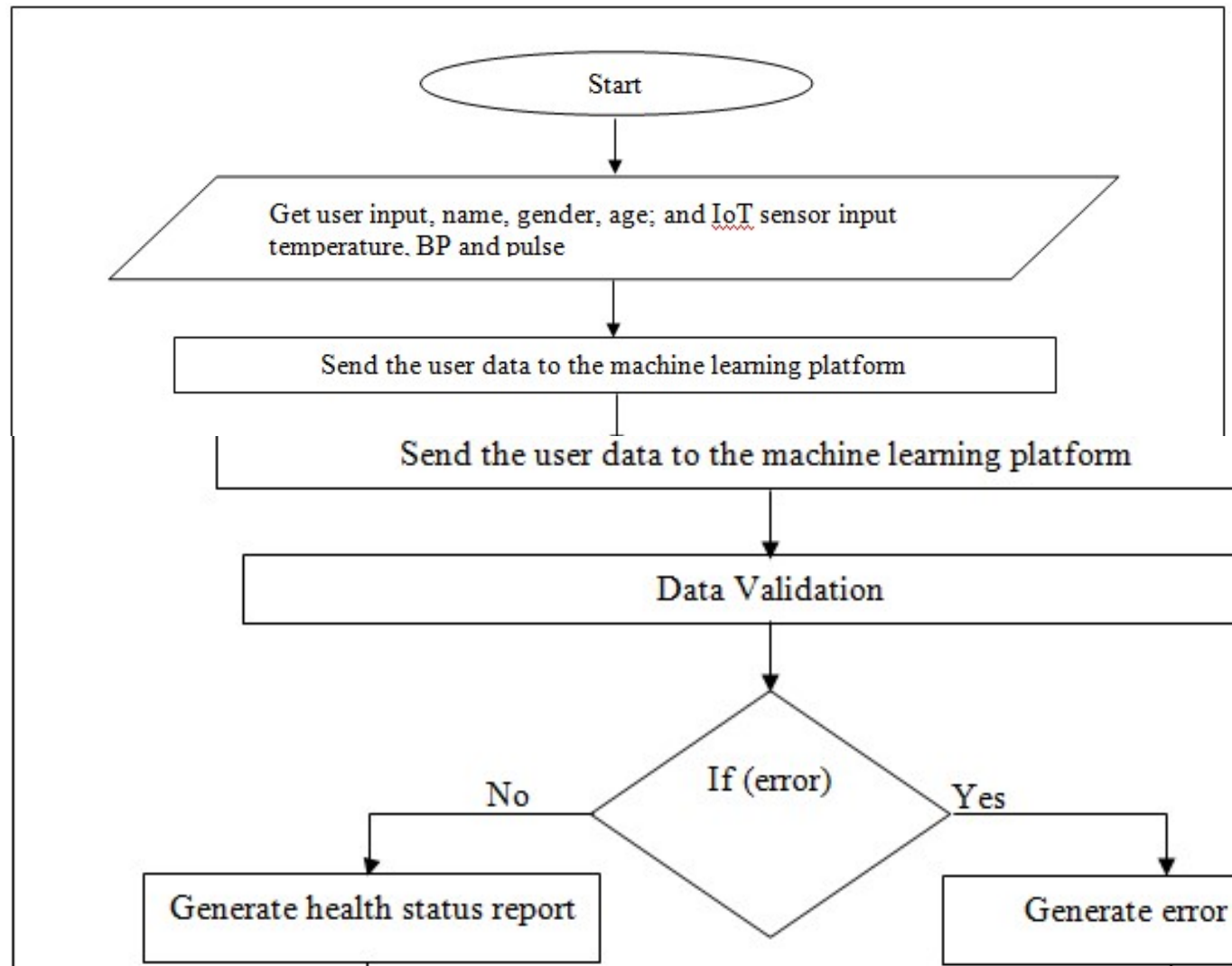
Comparative analysis of different pipelines of Holdout

Metric chart ⓘ

Prediction column: status



Flowchart



Result Analysis

- Input
 - Form input
 - Sensor input
- Output

Form Input

Health Monitoring System

Health data

Name *

Prithvi

Name *

Prithvi

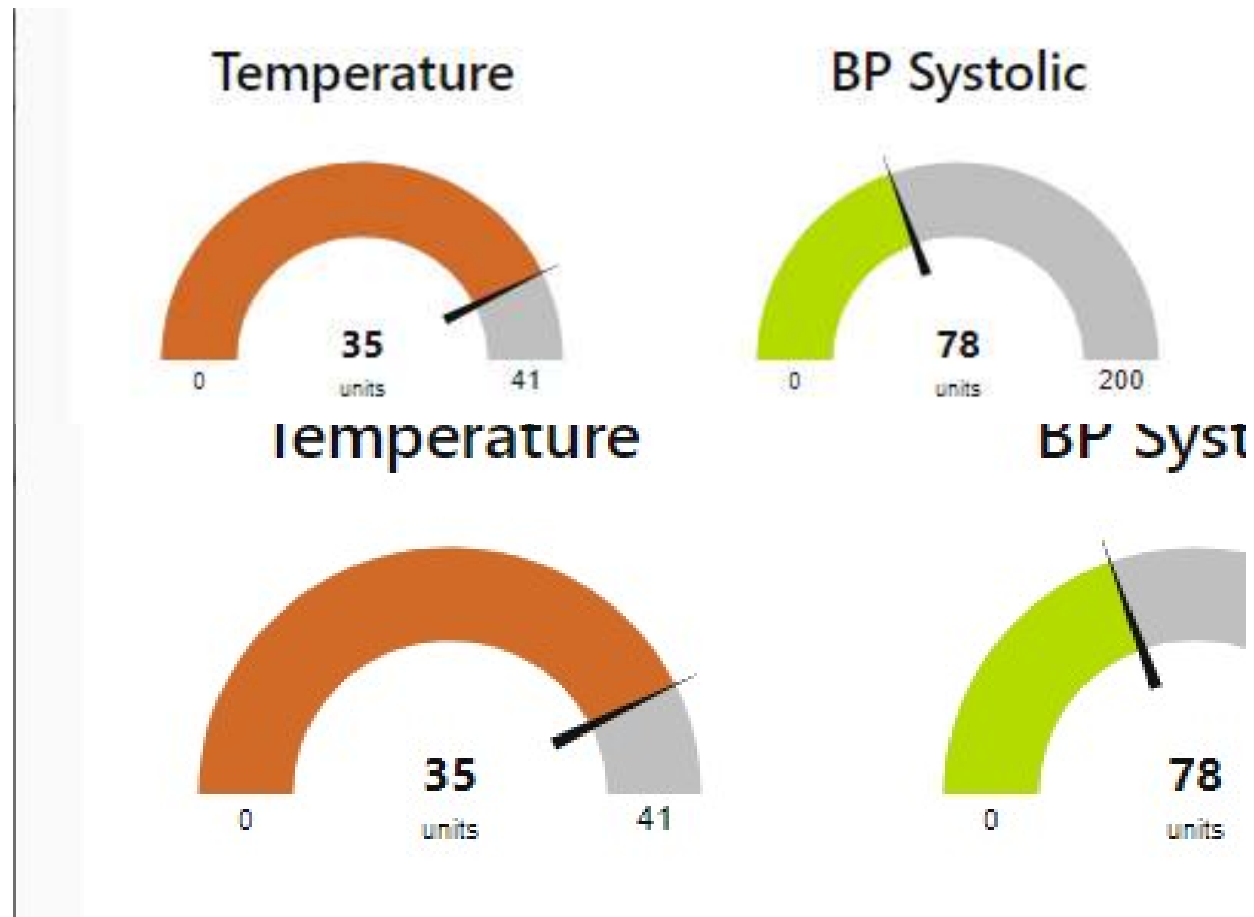
Gender *

male

age *

--

Sensor Input



Output

Health Monitoring System

Health data

Name *

Prithvi

Gender *

male

age *

50

SUBMIT

CANCEL

age

50

SUBMIT

CANCEL

Prediction {"name":"Prithvi","gender":"male","age":"50","Temperature":35,"Systolic":78,"Diastolic":45,"Pulse":50}

Temperature

03541

units

BP Systolic

078200

units



PROJECT EXPERIENCE ▾ CHALLENGES ▾ INTERSHIP

The influence of teachers extend
beyond the classroom, well into the future

GuruCool

GuruCool

A unique initiative exclusive for faculty

Registrations Closed

28th Sept 2020
(Last Date)



LOGIN

REGISTRATION

Email

Password

[Forgot Password?](#)

Password

[Forgot Password?](#)



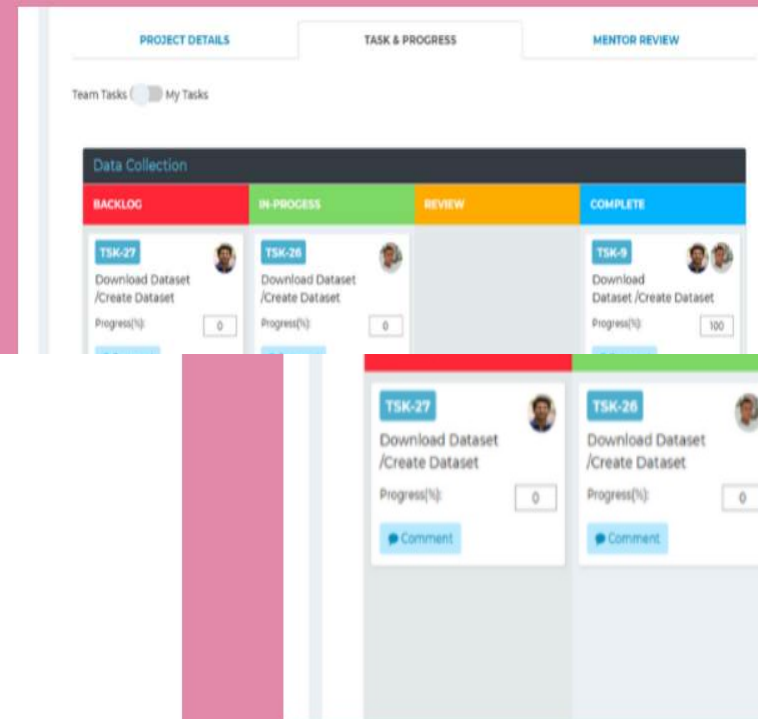
I'm not a robot



reCAPTCHA
[Privacy](#) - [Terms](#)

By registering you agree to our [Terms of Use](#), [Privacy Policy](#) and [Data Collection Statement](#).

Login



AN INTERNSHIP WITH INDUSTRY

Another step towards a successful career. Get review
completions from mentor, that helps y

DASHBOARD

INTERNSHIPS

CHALLENGES

CERTIFICATES / BADGES

CHANGE PASSWORD

BADGES

CHANGE PASSWORD

BADGES

PROJECTS

GUIDED PROJECTS

TRANSACTIONS

INTERNSHIPS

0

CAREER READINESS FACTOR (CRF)

0

SKILL INDEX

0

Internships

Sno.	Application ID	Internship Title	Start Date	Internship Status
------	----------------	------------------	------------	-------------------

Internships

Sno.	Application ID	Internship Title	Start Date	In
No Internships found ..				

Advantages

- Quick access by means of the mobile devices.
- Avoid contagious diseases, since this platform avoids rush.
- Daily or hourly status of a patient can be maintained for observation. This facility can be helpful to keep track of the patients who are in critical condition.
- Utilization of sensors decreases the possibility of human mistake.
- Ensures better care and treatment.
- Reduces medical expenses by reducing the travelling frequency.
- Lessens the involved space of the room and improves overall performance

Disadvantages

- Some of the diseases require privacy and confidentiality. If the database got exposure to the public, then it violates the right to privacy of a person.
- We cannot replicate the healthcare system, no matter how efficient this system is, sometimes the person has to consult the health care professional.

Applications

- handhold devices
- wearable
- Web based monitoring

Conclusion and future work

- The health care system has to be improvised with the evolution and revolution of engineering and technology.
- This will create a positive environment to use the ICT in health care system.
- In this system the overall accuracy 95.9%, which holds good in the prediction but has to be improved.
- This can hamper the right to privacy in some extent which has to be taken care.

References used

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- Mohd. Hamim, Sumit Paul, Syed Iqramul Hoque, Md. Nafiur Rahman, Ifat-Al-Baqee, "IoT Based Remote Health Monitoring System for Patients and Elderly People", International Conference on Robotics, Electrical and Signal Processing Techniques (ICREST), 978-1-5386-8014-8/19, IEEE, 2019

Thank You...