Healthcare Data Prediction with Advanced Machine Learning Techniques

Mr Raja Bhargava [1], Jonnadula Pujitha[2], Munagala Anusha [3],

Morla Siva[4], Yarava Ravitejeswar Reddy[5]

#1Assistant Professor in Department of CSE,in PBR VITS,KAVALI.

#2#3#4#5 B.Tech with Specialization of Computer Science and Engineering in VISVODAYA ENGINEERING COLLEGE, Kavali.

Abstract_ : Every clinical-decision relies on the doctor's experience and knowledge. Perhaps this conventional practice may look appropriate, but it may lead to unpredictable errors, biases, and maximized costs that may affect QoS (Quality-of-Service) given to patients.Adaptable Critical Patient Caring gadget is a key subject for hospitals in growing nations like Bangladesh. Most of the sanatorium in Bangladesh lack serving suited fitness carrier due to unavailability of appropriate, effortless and scalable clever systems. The purpose of this mission is to construct an ample device for hospitals to serve quintessential sufferers with a real-time comments method. In this paper, we recommend a usual architecture, related terminology and a classificatory mannequin for staring at indispensable patient's fitness situation with laptop getting to know and IBM cloud computing as Platform as a carrier (PaaS). Machine Learning (ML) based totally fitness prediction of the sufferers is the key thought of this research. IBM Cloud, IBM Watson studio is the platform for this lookup to keep and hold our information and ml models. For our ml models, we have chosen the following Base Predictors: Naïve Bayes, Logistic Regression, KNeighbors Classifier, Decision Tree Classifier, Random Forest Classifier, Gradient Boosting Classifier, and MLP Classifier. For enhancing the accuracy of the model, the bagging approach of ensemble gaining knowledge of has been used. The following algorithms are used for ensemble learning: Bagging Random Forest, Bagging Extra Trees, Bagging KNeighbors, Bagging SVC, and Bagging Ridge. We have developed a cell utility named "Critical Patient Management System - CPMS" for real-time records and statistics view. The gadget structure is designed in such a way that the ml fashions can educate and installation in a real-time interval through retrieving the facts from IBM Cloud

and the cloud statistics can additionally be accessed thru CPMS in a requested time interval. To assist the doctors, the ml fashions will predict the situation of a patient. If the prediction based totally on the circumstance receives worse, the CPMS will ship an SMS to the obligation medical doctor and nurse for getting on the spot interest to the patient. Combining with the ml fashions and cell application, the mission may additionally serve as a clever healthcare answer for the hospitals.

1.INTRODUCTION

Basic Patient Caring or checking System is a cycle where a specialist can constantly screen more than one patient, for more than each boundary in turn in a remote place and furthermore can have authority over medication measurements [1]. Improvement and assessment of the ICU choice emotionally supportive networks would be extraordinarily worked with by these frameworks. Gadgets like essential sign screens, mechanical ventilators and dialysis machines, and some others more are utilized to help basic patients whose bodies need time to recuperate and fix. The vast majority of the machines are overseen physically by directing the patient's condition and test reports. Along these lines, we thought to mechanize the interaction and dynamic capacity with the assistance of present day innovation, particularly the auto deployable AI models and distributed computing. AI models can foresee the not so distant future state of the patients, regardless of whether their condition will increment or decline, if they need any prompt help. To sum up our models and information, we have chosen IBM Cloud as a PaaS which inside and out ranges public, private and mixture conditions [2]. As at first, we can't convey our models straightforwardly, we needed to utilize IBM Cloud, IBM Watson Studio for putting away, testing and sending our entire framework. The ml models run inside the cloud administration and furthermore prepares with the auto-conveyed information, the CPMS additionally can get to the Cloud benefits through Bluemix [3]. The most huge of this paper conveys the auto deployable AI model inside the distributed storage with significant exactness. Likewise, testing and tuning approaches and boundary picking, setting for various AI calculations.

2.LITERATURE SURVEY

2.1 Aggarwal, M., & Madhukar, M. (2017). IBM's Watson Analytics for Health Care: A Miracle Made True. In Cloud Computing Systems and

Applications in Healthcare (pp. 117-134). IGI Global.

Software tools are currently available in IoT platforms as standard solutions for handling a large amount of measured data from intelligent buildings. These solutions take into account the actual requirements of residents and optimize the technical and operational aspects of managing the indoor environment's quality. Using IBM SPSS IoT software tools to determine the occupancy times of a monitored SHC room, this paper investigates the possibilities of increasing the accuracy of CO2 predictions in Smart Home Care (SHC). The handled information were thought about at everyday, week by week and month to month spans for the spring and pre-winter periods. CO2 levels were predicted using the measured indoor and outdoor temperatures and relative humidity using the Radial Basis Function (RBF) method. The data that were processed on a daily basis yielded the predictions that were the most accurate. A wavelet transform was used to remove additive noise from the predicted signal and improve the accuracy of CO2 predictions. An intelligent building is one that is responsive to the requirements of occupants, organizations, and society. In the chosen experiments, the prediction accuracy was greater than 95%. To continuously adapt and respond, an intelligent building needs real-time information about its occupants [1].**2.2 "Rational Unified Process", URL: [online] Available:**

https://www.ibm.com/developerworks/rational/library/content/03July/1000/1251/1251_bestpractices_TP026B.pdf

.

This paper presents an outline of the Normal Bound together Process the Levelheaded Bound together Cycle is a programming interaction, conveyed through a web-empowered, accessible information base. Through the use of guidelines, templates, and tool mentors, the procedure provides software best practices for all important software lifecycle activities. Development teams can take full advantage of the Unified Modeling Language (UML), which is the industry standard, thanks to the knowledge base. Software engineering processes include the Rational Unified Process®. It gives a restrained way to deal with doling out undertakings and obligations inside an improvement association. Its objective is to guarantee the production of high-quality software that meets the requirements of its users while adhering to a predetermined timetable and budget. 11, 13] Rational®

Software created and maintains the Rational Unified Process, a process product. Customers, partners, Rational's product groups, and Rational's consultant organization are all closely involved in the development of the Rational Unified Process. This collaboration ensures that the process is constantly improved to reflect recent experiences as well as evolving and proven best practices..

2.3 Anwar Islam, Tuhin Biswas. Health System in Bangladesh: Challenges and Opportunities. American Journal of Health Research. Vol. 2, No. 6, 2014, pp. 366-374. doi: 10.11648/j.ajhr.20140206.18

The government or the public sector is heavily involved in the financing, overall policymaking, and service delivery mechanisms of Bangladesh's health system. The health system appears to be given little priority when it comes to the allocation of national resources, despite the fact that it faces numerous insurmountable obstacles. Only about 3% of GDP is spent on health services, according to the World Health Organization (WHO, 2010). However, only 34% of the total cost of health care (THE) is paid for by the government, with the remaining 66% coming from individuals' own pockets. As a result, inequality is a significant issue in the healthcare system. The paper evaluates the health system in Bangladesh's current challenges and opportunities using secondary data. Despite the fact that the health system is plagued by a variety of issues, including a lack of public health facilities, a lack of skilled workers, inadequate resource allocation, and political instability; The societal response to the determinants of health is the health system. Every society holds to a set of health-related determinants that do not always follow logic or science. The importance of human life is the fundamental tenet of a health system. The human, material, and financial resources that a society allocates for the health system are largely determined by the value that it places on human life. The availability and accessibility of services in a way that people can comprehend, accept, and use is critical to a health system's effectiveness. According to the constitution, the government of Bangladesh is obligated to "improve the nutritional and public health status of the people" and "supply the basic medical requirements to all segments of the people in the society" [1]. In its early stages, Bangladesh's health system primarily focused on providing curative services for the health of mothers, children, and newborns. Since the 1990s, as modern science and technology

advanced and non-governmental organizations like the United Nations played a larger role, health systems have gradually placed equal emphasis on health promotion and prevention services.

3.PROPOSED SYSTEM

To automate the method and predict illnesses greater precisely laptop mastering strategies are gaining reputation in lookup community. Machine Learning strategies facilitate improvement of the Genius into a machine, so that it can operate higher in the future the use of the realized experience. Machine studying strategies software on digital fitness report dataset should supply treasured data and predication of fitness risks.

3.1 IMPLEMENTATION

In this paper author is describing concept to automate abnormal health condition using machine learning algorithms such as Support Vector Machine (SVM), KNearest Neighbours (KNN), Decision Tree, Naïve Bayes and Ensemble Algorithm. In this project author is proposing following modules

1) IBM Cloud: This module can be used to store and run ML algorithms and whenever patient mobile sense patient vitals then it will send to IBM cloud and IBM cloud will apply machine learning algorithms on received patient vitals to detect patient condition, if condition is not stable then it will send SMS message to doctor about patient condition. Here to implement this module we need to purchase IBM cloud space using CREDIT CARD details and for students its difficult to manage this payment so I am building this cloud as a dummy cloud which can run in single or other laptop running in LAN. For example you can run dummy cloud in one laptop and can run client from other laptop connecting in LAN. For SMS services also we need to pay money to purchase SMS so we are avoiding this SMS service.
2) Dataset module: using this module we will upload dataset into dummy cloud
3) Preprocess module: using this module we will replace missing or alphabets values to numerical values as 0 or 1.
4) Machine Learning module: using this module we train dataset with multiple machine learning algorithms and evaluate their performance and whatever algorithm performing well will use that algorithm to predict patient condition.
5) Mobile/Client Module: In this module author is saying patient smart phone will sense his body temperature, blood pressure and other vitals and then send to IBM cloud for monitoring. Here we don't have any sensors so we are uploading test

data from client application and then client will send that test data to dummy cloud and dummy cloud will apply machine learning algorithms and then predict patient condition and send result back to client.

To develop this project we have designed two applications

1) Cloud Application: In this application we can upload dataset and then pre-process dataset and apply machine learning to build train model. This application accept vitals from client/mobile application and then apply machine learning algorithms to predict patient condition and send predicted value back to client application.
2) Client Application: This application upload file which contains patient vitals and send this vitals to cloud application and get result back.

4.RESULTS AND DISCUSSIONS

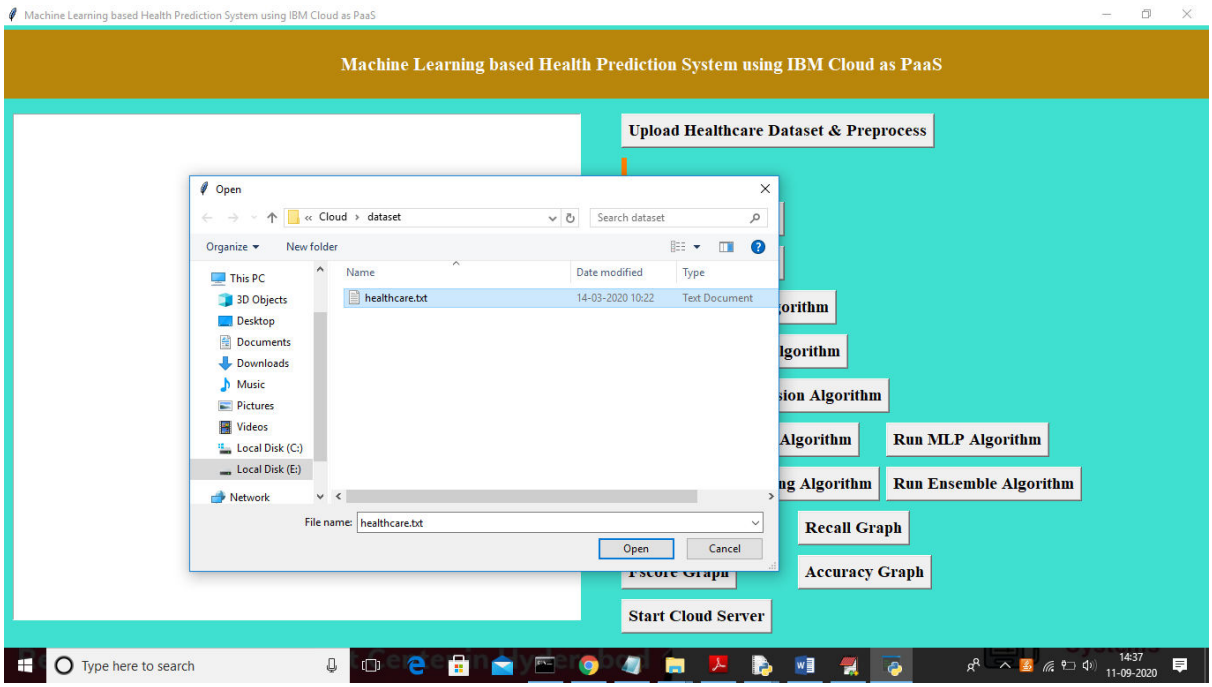
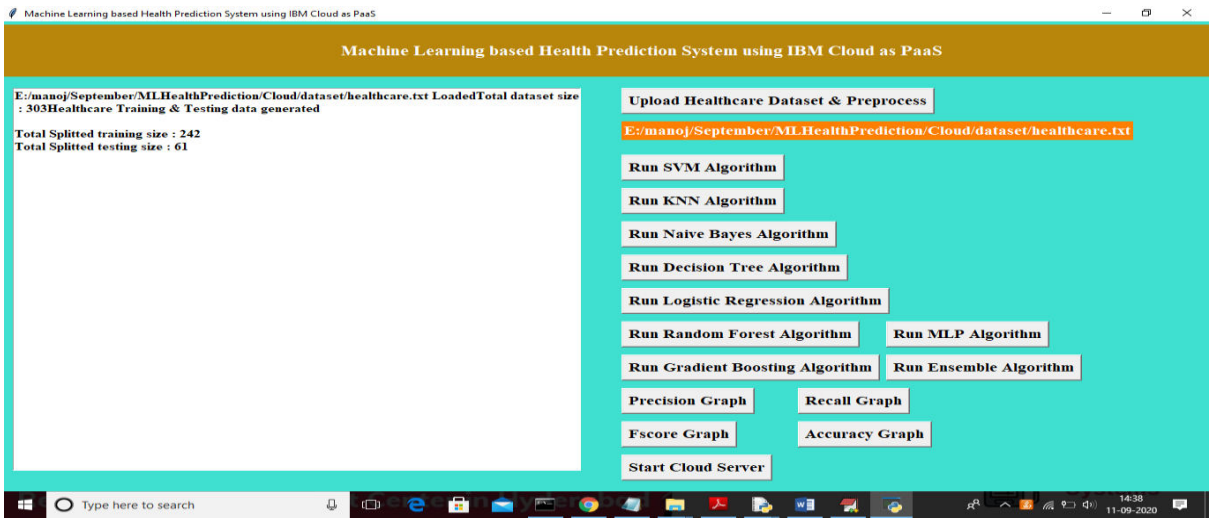


Fig 4.1 In above screen uploading health care dataset and after uploading dataset will get below screen



In above screen dataset contains total 303 records and application using 80% dataset records for training and 20% for testing. Now dataset train and test dataset ready and now click on 'Run SVM Algorithm' button to apply SVM on train dataset and then evaluate its performance on test data to calculate prediction accuracy

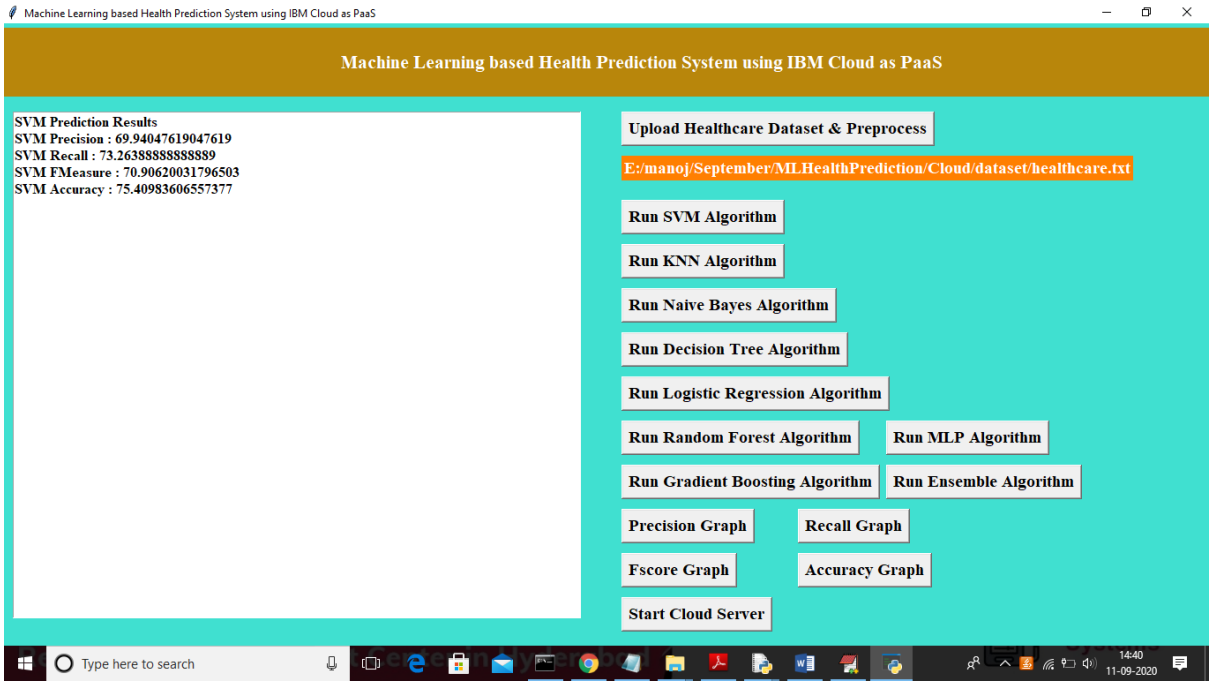


Fig 4.2 In above screen SVM prediction accuracy on 20% test dataset is 75% and we can see precision, FMeasure and Recall values also. Now click on 'Run KNN Algorithm' button to generate KNN model

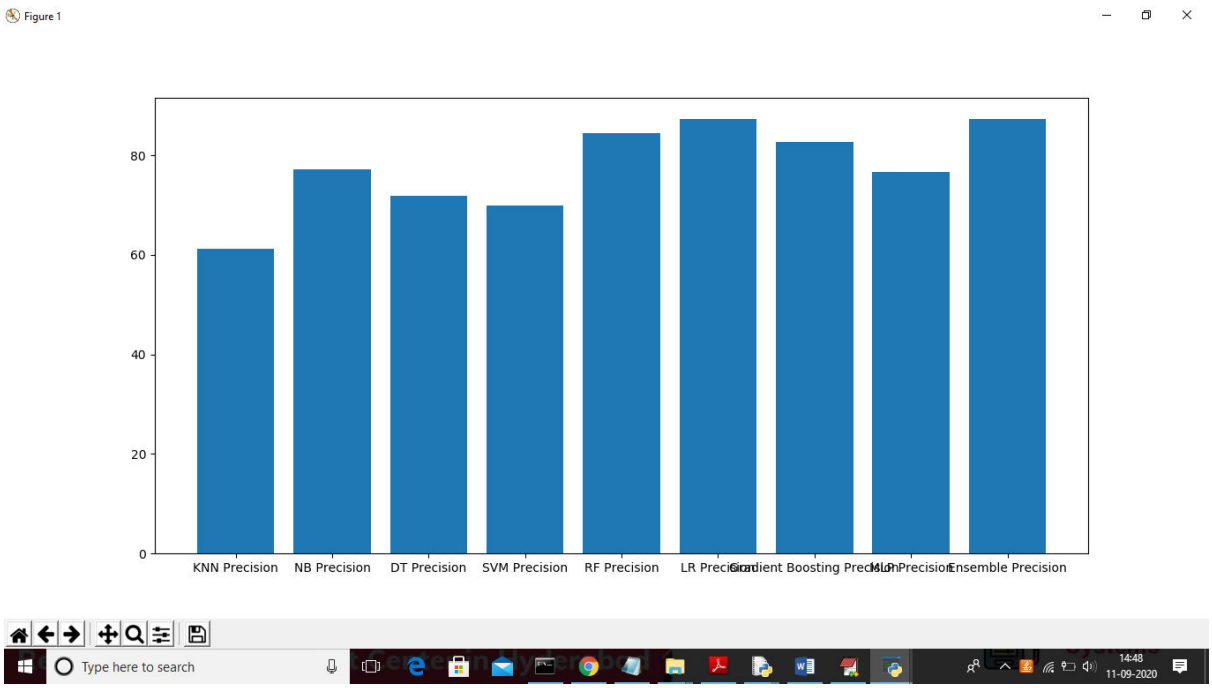


Fig 4.3 In above screen x-axis represents algorithm names and y-axis represents precision of those algorithms and from all algorithms ensemble is performing well. Now click on 'Recall Graph' button to get below graph of recall

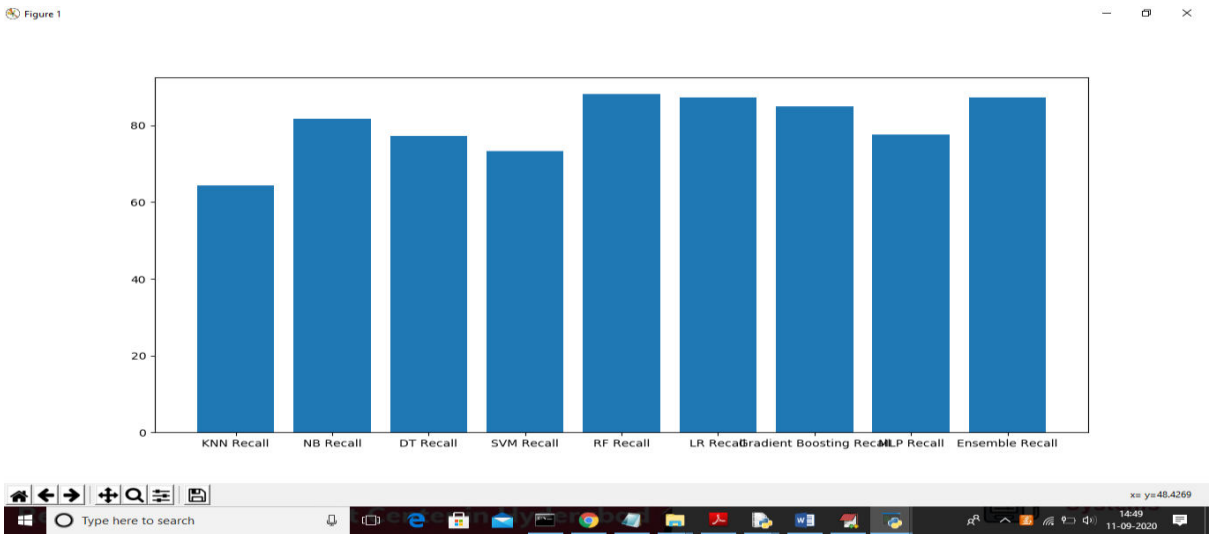


Fig 4.4 Now click on 'FScore Graph' button to get below FMeasure graph

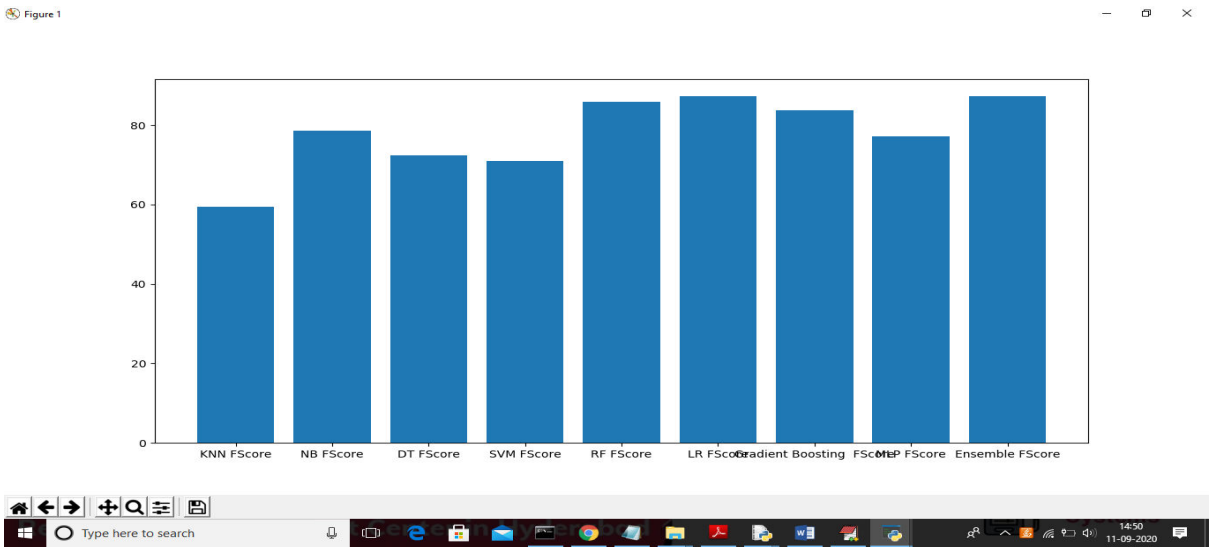


Fig 4.5 Now click on "Accuracy Graph' button to get below accuracy graph

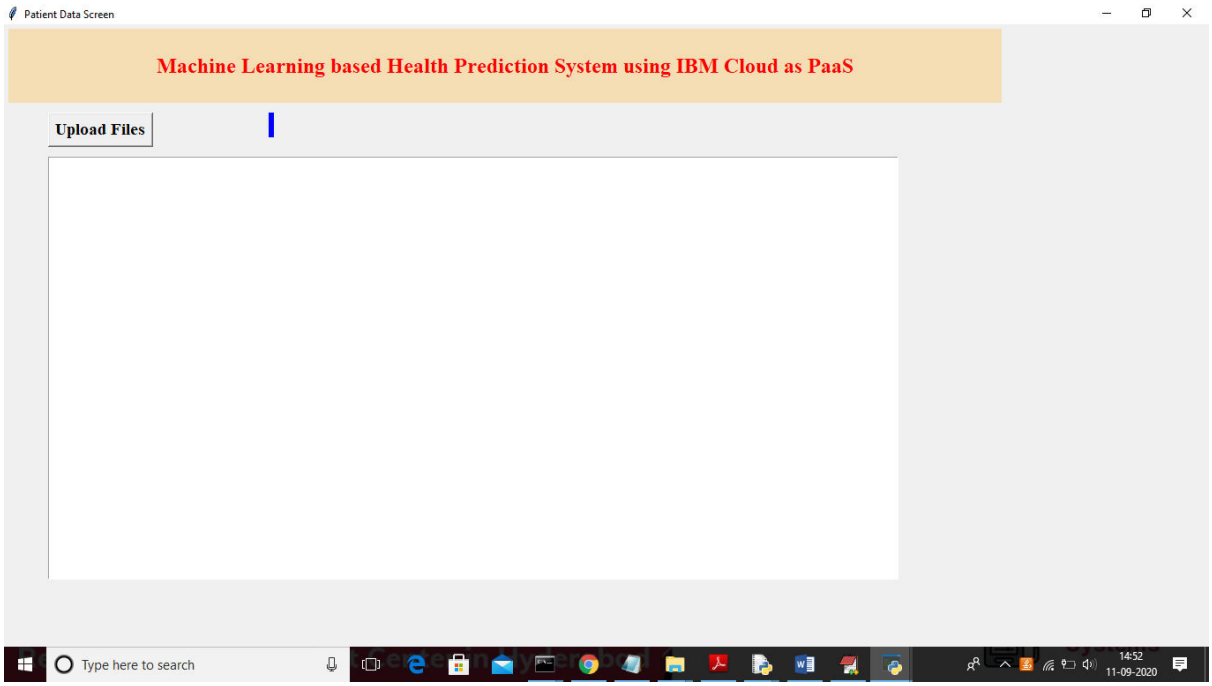


Fig 4.6 In above screen client can click on 'Upload Files' button to upload file with patient vitals and this vitals will send to cloud server

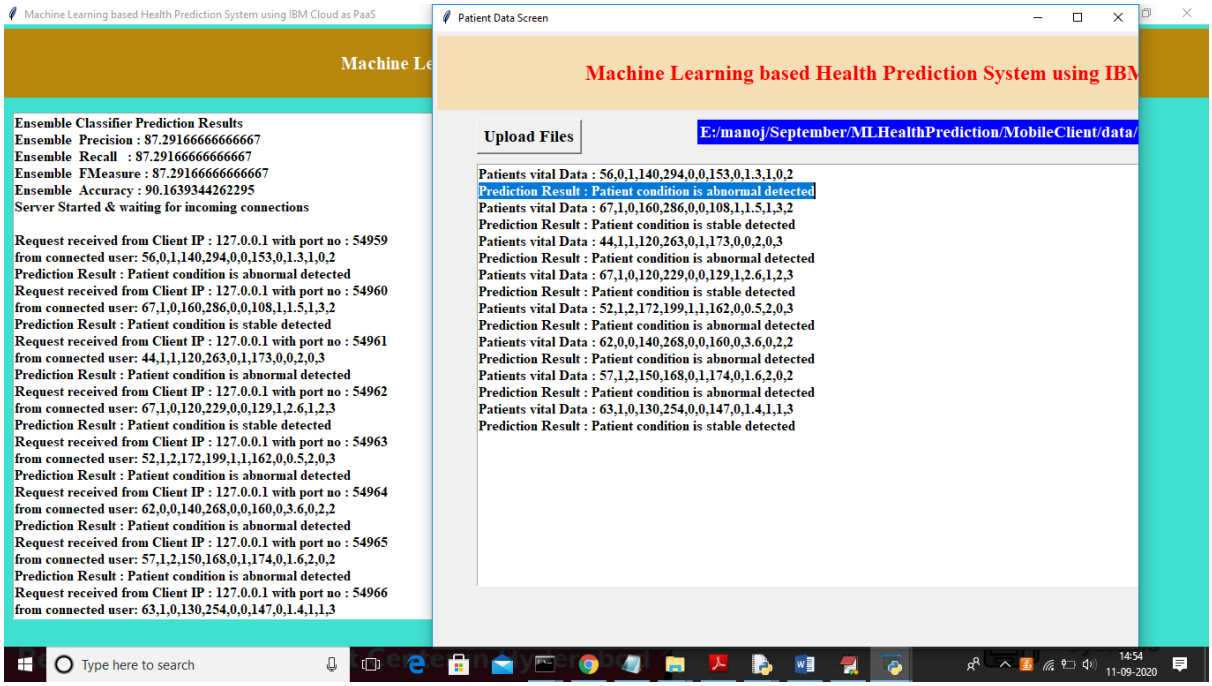


Fig 4.7 In above screen data sent to server and server sent result back and in above client page first line contains patient vitals and second line displaying patient predicted condition based on vitals by machine learning algorithms. In above screen in first record we can see machine learning has predicted patient condition is abnormal.

Similarly u can upload any vitals to predict patient conditions

5.CONCLUSION

To supply higher remedy we require in addition developed improvements for minimal price. We started this project to draw out a first rate effect in the emergency clinics to serve the patient. We utilized a element of the existed techniques and advances to supply every other structure in the scientific health center and nursing area. A massive element of the ml fashions exactness differed from 80% to 92%. The least precision received is 80%. A full-size discovering of this assignment is the becoming employments of computing device getting to know fashions for scientific sufferers and all out statistics controls. The IBM Cloud confirmed superb promising things to do with the aid of maintaining over 90% fulfillment rate. Out and out the results we received from our task and trials are displaying warranty to upward jab this gadget in considerable scope for metropolitan and low prudent aspect human beings groups. With the help of this task, a digital professional can be set up to serve men and women higher and display screen sufferers with appropriate consideration. This is likewise a dynamic companion for the professional as a clever clinical care system. As we have set up this mission with now not many boundaries of the real portions, we can in addition advance this task extra via including full boundaries to gauge the human physique courses. Later on, we are looking to introduce an implanted gadget to take a stay perusing from Ventilator, Medicine Pump, Heart Monitor, and different ICU machines. This will likewise increase the ordinary working exactness of this task.

6.REFERENCES

[1] Gardner R.M., Shabot M.M. (2006) Patient-Monitoring Systems. In: Shortliffe E.H., Cimino J.J. (eds) Biomedical Informatics. Health Informatics. Springer, New York, NY

[2] Aggarwal, M., & Madhukar, M. (2017). IBM's Watson Analytics for Health Care: A Miracle Made True. In Cloud Computing Systems and Applications in Healthcare (pp. 117-134). IGI Global.

[3] "Rational Unified Process", URL: [online] Available: https://www.ibm.com/developerworks/rational/library/content/03July/1000/1251/1251_bestpractices_TP026B.pdf .

[4] Anwar Islam, Tuhin Biswas. Health System in Bangladesh: Challenges and Opportunities. American Journal of Health Research. Vol. 2, No. 6, 2014, pp. 366-374. doi: 10.11648/j.ajhr.20140206.18

[5] P. Griffiths, A. R. Saucedo, P. Schmidt, G. Smith. Vital signs monitoring in hospitals at night. (n.d.). Retrieved from https://www.nursingtimes.net/clinical-archive/assessment-skills/vitalsigns-monitoring-in-hospitals-at-night/5089989.article. [6] An Embedded, GSM based, Multiparameter, Realtime Patient Monitoring System and Control – An Implementation for ICU Patients. Kumar, R., & Rajasekaran, M. P. (2016, January). An IoT based patient monitoring system using raspberry Pi. In 2016 International Conference on Computing Technologies and Intelligent Data Engineering (ICCTIDE'16) (pp. 1-4). IEEE.

[7] Nejkar, V. A., Nimbhorkar, S. R., Paliwal, J. K., & Shrivastav, A. A. (2018). Smart Nanny an IoT Based Baby Monitoring System. iManager's Journal on Computer Science, 6(1), 28. [8] Ruiz, V. M., Saenz, L., Lopez-Magallon, A., Shields, A., Ogoe, H. A., Suresh, S., & Tsui, F. R. (2019). Early Prediction of Critical Events for Infants with Single Ventricle Physiology in Critical Care Using Routinely Collected Data. The Journal of Thoracic and Cardiovascular Surgery.

[9] Lin, K., Hu, Y., & Kong, G. (2019). Predicting In-hospital Mortality of Patients with Acute Kidney Injury in the ICU Using Random Forest Model. International Journal of Medical Informatics.

[10] Teres, D., Lemeshow, S., Avrunin, J. S., & Pastides, H. A. R. R. I. S. (1987). Validation of the mortality prediction model for ICU patients. Critical care medicine, 15(3), 208-213.

Author's Profiles

Mr Raja Bhargava working as Assistant Professor in Department of CSE, PBR Visvodaya Institute of Technology and Science KAVALI.

Team Members

JONNADULA PUJITHA B.Tech with Specialization of Computer Science and Engineering in Visvodaya Engineering College, Kavali.

MUNAGALA ANUSHA B.Tech with Specialization of Computer Science and Engineering in Visvodaya Engineering college, Kavali.

MORLA SIVA B.Tech with Specialization of Computer Science and Engineering in Visvodaya Engineering College,Kavali.

YARAVA RAVITEJESWAR REDDY B.Tech with Specialization of Computer Science and Engineering in Visvodaya Engineering College, Kavali.