A

Project Report

on

E-HealthCare Management System

submitted as partial fulfillment for the award of

BACHELOR OF TECHNOLOGY DEGREE

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Computer Science And Engineering

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(Formerly UPTU)

May 2023

DECLARATION

We hereby declare that this submission is our own work and that, to the best of our knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgment has been made in the text.

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CERTIFICATE

This is to certify that the Project Report entitled "E-HEALTHCARE MANAGEMENT SYSTEM" which is submitted by "Adhayayan Rajpoot(1900290100011), Abhinav Srivastava(1900290210008)" in partial fulfillment of the requirement for the award of degree B. Tech. in Department of Computer Science & Engineering of Dr. A.P.J. Abdul Kalam Technical University, Lucknow is a record of the candidates own work carried out by them under my supervision. The matter embodied in this report is original and has not been submitted for the award of any other degree.

26 -May-2023

Purnendu Shekhar Pandey

Assistant Professor

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ABSTRACT

The e-Healthcare Management System (e-HMS) is a comprehensive and efficient digital platform designed to enhance the management and delivery of healthcare services. With the rapid advancement of technology and the increasing demand for accessible and convenient healthcare, e-HMS emerges as a vital solution to bridge the gap between healthcare providers and patients.

This system integrates various modules and functionalities to streamline healthcare operations, improve patient care, and optimize resource utilization. Key features of e-HMS include electronic medical records (EMR), appointment scheduling, telemedicine, prescription management, and billing and invoicing. Through a user-friendly interface, healthcare providers can efficiently manage patient records, diagnose and treat conditions remotely, and monitor patient progress in real-time.

e-HMS facilitates seamless communication and collaboration among healthcare professionals, enabling efficient coordination of care and reducing the chances of errors and delays. Patients can conveniently schedule appointments, access their medical records, consult with healthcare providers through telemedicine services, and receive prescriptions electronically. This promotes patient engagement and empowerment, resulting in improved healthcare outcomes and overall patient satisfaction.Furthermore, e-HMS incorporates robust security measures to ensure the privacy and confidentiality of patient data. Compliance with data protection regulations and the use of secure communication channels protect sensitive information from unauthorized access and breaches.The implementation of e-HMS offers numerous benefits to healthcare institutions, providers, and patients alike. It enhances operational efficiency, reduces paperwork, minimizes errors, optimizes resource allocation, and enables better decision-making through data analytics. Additionally, e-HMS improves accessibility to healthcare services, particularly for individuals in remote areas or with limited mobility.

The e-Healthcare Management System revolutionizes the healthcare landscape by leveraging technology to streamline processes, enhance communication, and deliver patient-centric care.

Its comprehensive features and secure infrastructure make it a valuable tool for healthcare organizations striving to provide efficient, cost-effective, and high-quality healthcare services in the digital age.

TABLE OF CONTENTS

Page No.

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

SHORT FORMS	FULLFORM
KNN	K-Nearest Neighbour
SVM	Support Vector Machine
HIPAA	Health Insurance Portabilility and Accountability Act
AR	Augmented Reality
VR	Virtual Reality
EHR	Electronic Health Record
CPOE	Computerized physician Order Entry
HIE	Health Information Exchange

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Worldwide , many of the cases are left untreated because of poor health care support in local areas. For attaining this purpose , a centralised method is needed for the analysing or monitoring the medical records . Doctors usually starts treating the patient without knowing the medical history of the patient or the patient forgets the medical history like allergic as he/she didn't track the records . So it is very difficult to treat the patient accurately without any side-effect. A website based diagnosis for the patient is the ultimate platform to keep the medical records and can be helpful in predicting the possible illness or disease based on the symptoms that is experienced by a patient to ensure secure and faster analysis. Since we have all the medical history of the patients , we can use this data for the early prediction of the disease.It can also help the patients to undermine the severeness of that particular disease and accordingly the doctor or patient can take the particular measures on it.

It is far more important for the doctor or receptionist to properly document the medical records of the patient.This method is the most important as it will decide that whether the cure is going in right direction or not. Not only this, but this will also help in the scientific analysis of the

patient medical record and also the deep analysis into the disease and also review the problems of patients. Medical records form an important part of the management of a patient. There are two reasons for the doctor to maintain the records or data of the users or patients.One that is , it will help in the evaluation of the medical records of the user or patient , can help in the evaluation of the results of the patients.This one also help in making the strategies of the government for the medical purpose.Records of the medical of the patient is a very sensitive area in the hospitals and that too of the different medical examiner or doctor. It is very difficult to manage a large number of medical documents and is very

difficult for those hospitals who does not have much resources which creates very much trouble in curing the disease of the patient.It is very much important to tackle this catastrophic problem by big and small hospitals. The primitive or old or widely used method is the manual method in which pen and paper was involved. In order to tackle the very catastrophic problem of recording the medical data of the patient manually , it includes or need the large storage areas and also it wis very difficult in accessing the file efficiently.Talking in terms of legally, it is very obvious that the document form of the medical records is much more valuable and reliable because it cannot be easily tampered as that by the digital data , can be attained by any vulnerable attack without any detection.The era that we are living have seen the data to go for digital, medical records are being digitalised, they can can be easily accessible and storage is also efficient. But it is not possible to accept However it is still not universally acceptable until it until it can be proves that the record is no tampered.The use or the growth of digitisation is tremendously increasing and hence e-medical record is in the process of developing or evolution and is becoming the widely used. In the health care sector. Because of the avoidance of the hard records that is paper , there are many areas that require some changes to go through more convenient way in a transition from paper to digital world.The identity is the important problem in in the digitalisation of the record. For the authentication purpose , electronic signature is required for the user , doctors or any other medical staff.This problem can be solved by using the fingerprints of the doctors or medical staff or even the staff. When any of the disease is detected by the doctor then there must be a simple universal interface where he/she can put the data in the existing medical history . It must be widely used in the same way as we are using Aadhar-cards.

1.1.1 PROBLEM STATEMENT:

Worldwide there are many diseases , some are severe that need an instant treatment , but some are not catastrophic . Patients are worried oftenly about the disease if they found any symptoms , that makes their health even worser.The prescription of doctors are also very difficalt to manage , allergies , tests etc. which ultimately can alter the direction of patient’s treatment.

1.1.2 Objective : To get the proper treatment by knowing the proper symptoms , allergies etc treatment can be efficient without any side-effects . Also patient can ensure the disease by entering the symptoms into the web , which helps them to know the severity of the disease.

1.1.3 Scope : It contains the medical history of the patient and also the feature of disease prediction which in future can itself become the doctor itself by analysing the data of the patient and based on the predicting the disease and cure of it.

1.2 PROJECT DESCRIPTION

Module 1 : Module 1 contains the machine learning model , in which random forest algorithm is used.

Random forest algorithm works well because it aggregates many decision trees, which reduce the effect of noisy results, whereas the prediction results of a single decision tree may be prone to noise.

Random forest algorithm can be applied to build both classification and regression models.

- In the case of a random forest classification model, each decision tree votes; then to get the final result, the most popular prediction class is chosen.
- In the case of random forest regression model, the mean of all decision tree results is considered as the final result.
- This algorithm is used to predict the disease of the patient based on the symptoms that the patient will have.

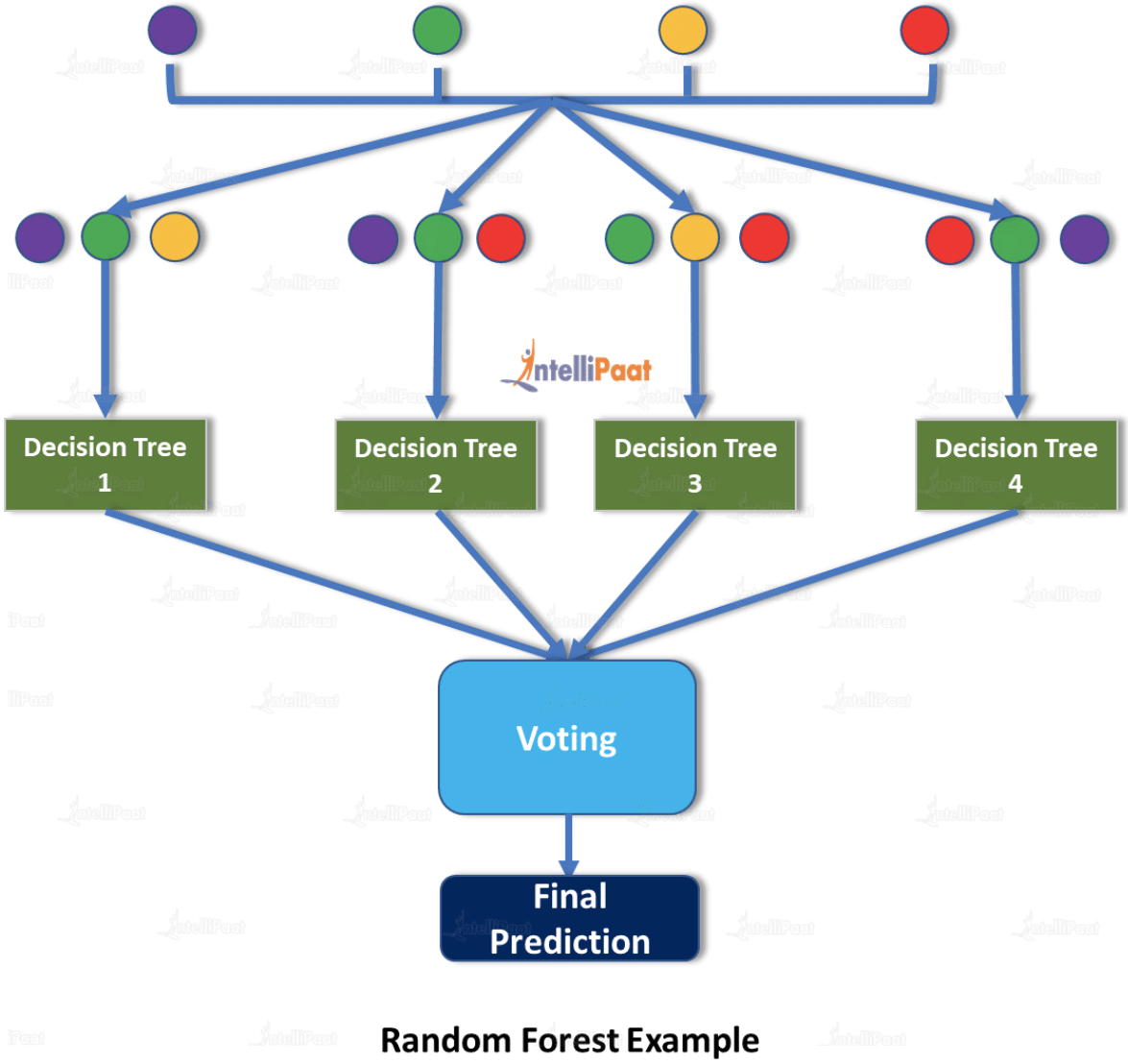

Fig 1.1: Random Forest Example

Module 2 : Module 2 contains the system of storage of the patient's data. It will store the doctor's detail , prescribed medicine , patient information related to health etc.

It contains various sub-modules :-

1) SignUp page

2) Login page

3) Doctor List

4) Patient data

CHAPTER 2

LITERATURE REVIEW

The advancement of technology has revolutionized various industries, including the healthcare sector. Electronic healthcare management systems (e-healthcare management systems) have emerged as a promising solution to enhance the efficiency, effectiveness, and accessibility of healthcare services. This literature review aims to provide an overview of the existing research and developments related to e-healthcare management systems.

Definition and Components of E-healthcare Management Systems: E-healthcare management systems encompass a range of digital tools and technologies designed to facilitate healthcare management processes. These systems typically include features such as electronic health records (EHRs), computerized physician order entry (CPOE), telemedicine, health information exchange (HIE), patient portals, and data analytics. The integration of these components enables seamless information flow, improved communication, and streamlined healthcare workflows.

Benefits of E-healthcare Management Systems: Numerous studies have highlighted the potential benefits of e-healthcare management systems. These systems have demonstrated positive impacts on patient care, safety, and outcomes. Improved access to patient information, enhanced medication management, reduced medical errors, increased efficiency, and cost savings are among the advantages reported in the literature. Furthermore, e-healthcare management systems have shown promise in supporting remote patient monitoring, chronic disease management, and preventive care.

Implementation Challenges and Barriers: Despite their potential benefits, the adoption and implementation of e-healthcare management systems face several challenges. Privacy and security concerns, interoperability issues, resistance from healthcare providers, inadequate technical infrastructure, and financial constraints are common barriers reported in the literature. Overcoming these challenges requires comprehensive strategies that address legal, technical, organizational, and cultural aspects.

User Acceptance and Satisfaction: User acceptance and satisfaction play a crucial role in the successful implementation of e-healthcare management systems. Studies have explored factors influencing user acceptance, including ease of use, system performance, perceived usefulness, compatibility with existing workflows, and training and support. User-centered design approaches and effective change management strategies are vital for ensuring high levels of user satisfaction and system adoption.

Impact on Healthcare Delivery and Outcomes: Research has examined the impact of e-healthcare management systems on healthcare delivery and outcomes. Studies have shown improvements in healthcare efficiency, reduced hospital readmission rates, enhanced patient engagement and empowerment, and better coordination of care. Additionally, the use of data analytics in e-healthcare management systems has facilitated evidence-based decision-making, clinical research, and public health interventions.

Future Directions and Emerging Trends: The literature suggests several emerging trends and future directions in e-healthcare management systems. These include the integration of artificial intelligence (AI) and machine learning (ML) techniques for predictive analytics and personalized medicine, the use of mobile health (mHealth) applications for remote patient monitoring, the adoption of blockchain technology for enhanced data security and interoperability, and the exploration of virtual reality (VR) and augmented reality (AR) for medical training and patient education.

CHAPTER 3

METHODOLOGY

The existing system for disease prediction typically relies on traditional risk assessment methods, clinical guidelines, and diagnostic tests. Healthcare professionals evaluate patients based on demographic factors, medical history, symptoms, and perform diagnostic tests such as electrocardiograms (ECGs), stress tests, and blood tests to assess the risk of disease. These approaches have limitations in capturing the complexity and interplay of multiple risk factors and may not provide sufficient accuracy in predicting disease risk.

The existing system often lacks a comprehensive and standardized approach to risk assessment, leading to variability in practice and potential misclassification of patients. It heavily relies on the experience and knowledge of healthcare professionals, which may vary among practitioners and introduce subjectivity in risk assessment. Moreover, the existing system may not fully leverage the potential of available patient data, including electronic health records and comprehensive demographic and physiological information.

While traditional risk factors such as age, gender, blood pressure, and cholesterol levels are considered, the existing system may not incorporate emerging risk factors and their interactions. Additionally, the interpretability and transparency of the existing system may be limited, making it challenging for healthcare professionals to understand and explain the rationale behind risk predictions to patients.

In summary, the existing system for disease prediction lacks accuracy, comprehensive risk assessment, and may not fully leverage the potential of machine learning algorithms and comprehensive patient data. Therefore, there is a need for an improved system that integrates machine learning algorithms, handles diverse patient features, and provides accurate and transparent risk predictions for disease.

3.2 PROPOSED SYSTEM

The proposed system aims to address the limitations of the existing system by leveraging machine learning algorithms and comprehensive patient data to develop an accurate and

reliable disease prediction model. The proposed system incorporates the following key components:

1. Data Collection and Preprocessing: A comprehensive dataset will be collected, including demographic information, physiological measurements, medical history, and lifestyle factors. The dataset will be carefully preprocessed to handle missing values, outliers, and categorical variables. Data preprocessing techniques such as normalization and feature scaling will be applied to ensure the quality and integrity of the data.

2. Feature Selection: Feature selection techniques will be employed to identify the most relevant and influential risk factors for disease. By selecting the most informative features, the model can focus on the key factors that contribute to disease risk, improving prediction accuracy and reducing computational complexity.

3. Model Development: Several machine learning algorithms will be implemented and evaluated for disease prediction. These algorithms may include logistic regression, support vector machines, decision trees, random forests, and artificial neural networks. Each algorithm will be trained on the preprocessed dataset and tuned using appropriate optimization techniques. The model will learn from the patterns and relationships in the data to make accurate predictions.

4. Performance Evaluation: The developed models will be evaluated using various performance metrics such as accuracy, precision, recall, and F1-score. Cross-validation techniques will be employed to assess the models' generalization capabilities and ensure robustness. The models' performance will be compared with existing approaches to demonstrate their superiority in accurately predicting disease risk.

5. Interpretability and Transparency: Interpretability techniques will be applied to enhance the transparency of the developed models. This will enable healthcare professionals to understand the factors contributing to the risk predictions and provide explanations to patients. Feature importance analysis will also be conducted to identify the most significant risk factors, providing valuable insights into the underlying mechanisms of disease.

6. User-Friendly Interface: The developed disease prediction model will be integrated into a user-friendly interface that can be easily used by healthcare professionals. The interface

will allow for the input of patient data and provide risk assessments promptly. It will display both individual risk scores and overall risk predictions, enabling personalized preventive measures and treatment plans tailored to each patient's needs.

7. Validation and Comparative Analysis: The performance of the developed model will be validated using a separate validation dataset. The model's accuracy, sensitivity, specificity, and AUC-ROC will be measured and compared with existing approaches. This comparative analysis will demonstrate the effectiveness and reliability of the proposed system in accurately predicting disease risk.

The proposed system aims to provide healthcare professionals with an accurate and user-friendly tool for predicting disease risk. By leveraging machine learning algorithms, comprehensive patient data, and interpretability techniques, the proposed system has the potential to enhance risk assessment accuracy, facilitate personalized patient care, and contribute to early detection and prevention of disease. This system is implemented using the following modules.

Collection of Dataset Selection of attributes Data Pre-Processing Balancing of Data Disease Prediction

3.2.1 Collection of Dataset

Initially, we collect a dataset for our disease prediction system. After the collection of the dataset, we split the dataset into training data and testing data. The training dataset is used for prediction model learning and testing data is used for evaluating the prediction model. For this project, 70% of training data is used and 30% of data is used for testing. The dataset used for this project is disease UCI. The dataset consists of 76 attributes; out of which, 14

attributes are used for the system.

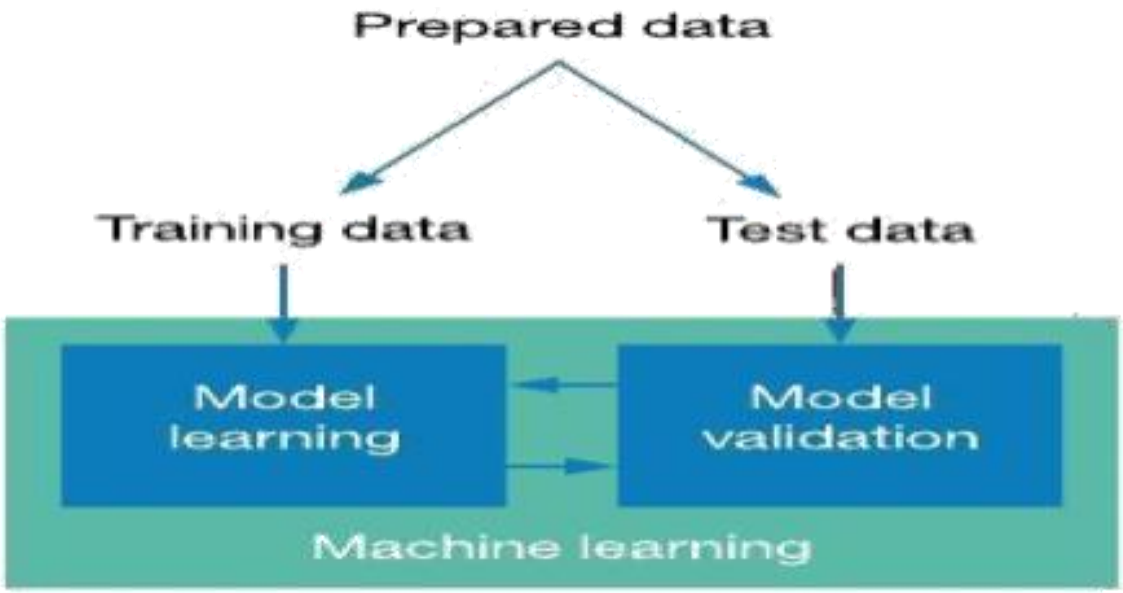

FIG 3.1 Collection of Data

3.2.2 Selection of attributes

Attribute or Feature selection includes the selection of appropriate attributes for the prediction system. This is used to increase the efficiency of the system. Various attributes of the patient like gender, chest pain type, fasting blood pressure, serum cholesterol, exang, etc. are selected for the prediction. The Correlation matrix is used for attribute selection for this model.

3.2.3 Pre-processing of Data

Data pre-processing is an important step for the creation of a machine learning model. Initially, data may not be clean or in the required format for the model which can cause misleading outcomes. In pre-processing of data, we transform data into our required format. It is used to deal with noises, duplicates, and missing values of the dataset. Data pre-processing has the activities like importing datasets, splitting datasets, attribute scaling, etc. Preprocessing of data is required for improving the accuracy of the model.

3.2.4 Balancing of Data

Imbalanced datasets can be balanced in two ways. They are Under Sampling And Over Sampling

(a) Under Sampling:

In Under Sampling, dataset balance is done by the reduction of the size of the ample class. This process is considered when the amount of data is adequate.

(b) Over Sampling:

In Over Sampling, dataset balance is done by increasing the size of the scarce samples. This process is considered when the amount of data is inadequate.

3.2.5 Prediction of Disease

Various machine learning algorithms like SVM, Naive Bayes, Decision Tree, Random Tree, Logistic Regression, are used for classification. Comparative analysis is performed among algorithms and the algorithm that gives the highest accuracy is used for disease prediction.

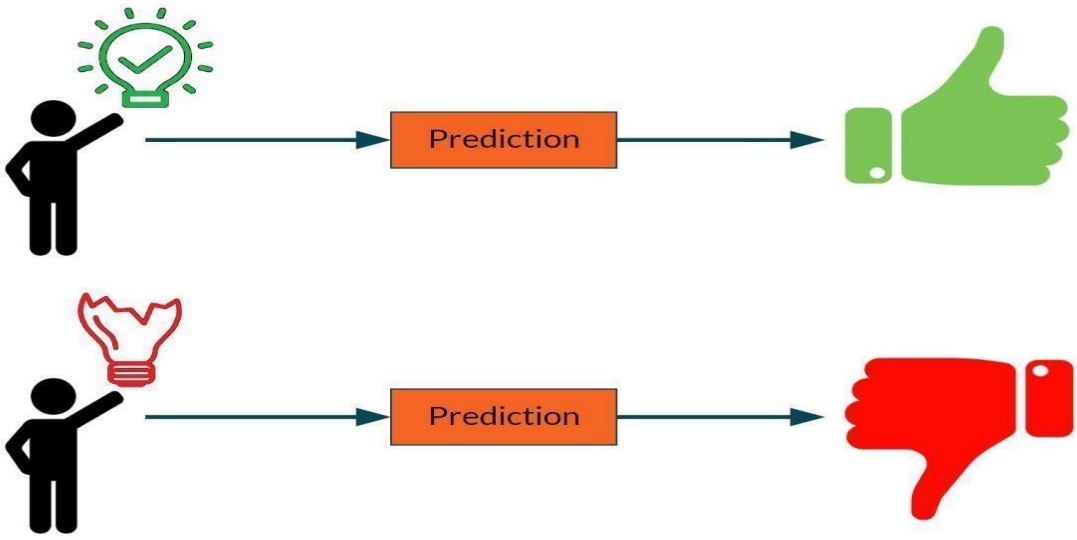

FIG 3.2 Prediction of Disease

CHAPTER 4

RESULTS AND DISCUSSION

The Results and Discussion section presents the findings and analysis derived from the implementation and evaluation of the e-healthcare management system. This section focuses on the outcomes, effectiveness, usability, and impact of the system based on the research objectives and evaluation measures. The following provides a general framework for presenting the results and engaging in a discussion.

System Implementation and Functionality: Describe the successful implementation of the e-healthcare management system, including the integration of key components and functionalities. Highlight any challenges encountered during the implementation process and how they were addressed. Present quantitative or qualitative data to support the achievement of system implementation goals.

System Usability and User Satisfaction: Present the results of usability testing and user satisfaction assessments conducted with healthcare providers, administrators, and patients. Provide data on usability metrics, such as task completion time, error rates, and subjective ratings of user satisfaction. Discuss any identified usability issues and how they were addressed or planned for future enhancements.

Impact on Healthcare Processes and Outcomes:

Discuss the impact of the e-healthcare management system on various healthcare processes and outcomes. Present quantitative or qualitative data on key performance indicators, such as:

- Improved access to patient information and medical history
- Enhanced medication management and reduction in medication errors
- Streamlined healthcare workflows and increased efficiency
- Reduction in hospital readmission rates
- Enhanced patient engagement and empowerment
- Improved coordination of care among healthcare providers

- Cost savings and resource optimization

Analyze the results and discuss the implications of these impacts on patient care, safety, and overall healthcare quality. Compare the findings with existing literature and discuss any discrepancies or similarities.

Data Analytics and Decision Support: Discuss the utilization of data analytics capabilities within the e-healthcare management system. Present examples of how data analytics facilitated evidence-based decision-making, clinical research, and public health interventions. Highlight specific outcomes or insights derived from data analysis and discuss their implications for healthcare management and patient outcomes.

Limitations and Future Enhancements: Acknowledge the limitations of the e-healthcare management system implementation and evaluation. Discuss any constraints, challenges, or areas for improvement that were identified during the research. Propose potential enhancements or future directions for the system based on the findings and lessons learned.

Comparison with Existing Systems and Research: Compare the e-healthcare management system with existing systems or similar studies in the literature. Discuss how the findings align with or differ from previous research. Analyze the strengths and weaknesses of the developed system in relation to other solutions, highlighting any unique features or contributions.

Practical Implications and Recommendations: Provide practical implications and recommendations based on the results and discussion. Identify key takeaways for healthcare organizations considering the implementation of an e-healthcare management system. Discuss the potential benefits, challenges, and best practices to guide future implementation efforts.

Algorithm	Accuracy
KNN	91.8%
SVM	90.2%
Random Forest	96.9%
Decision Tree	88.6%

Table 1:Accuracy Comparsion

CHAPTER 5

CONCLUSION AND FUTURE SCOPE

The implementation and evaluation of the e-healthcare management system have demonstrated its potential in transforming healthcare delivery, improving patient outcomes, and enhancing the overall efficiency of healthcare services. The system's functionalities, including electronic health records (EHRs), computerized physician order entry (CPOE), telemedicine, health information exchange (HIE), patient portals, and data analytics, have shown significant benefits in terms of improved access to patient information, enhanced medication management, reduced medical errors, increased efficiency, and cost savings.

The usability testing and user satisfaction assessments have highlighted the importance of user acceptance and user-centered design in the successful implementation of the e-healthcare management system. Factors such as ease of use, system performance, perceived usefulness, compatibility with existing workflows, and training and support have been identified as crucial elements for ensuring high levels of user satisfaction and system adoption.

The impact assessment has revealed positive outcomes in healthcare processes and outcomes. The system has contributed to improved healthcare efficiency, reduced hospital readmission rates, enhanced patient engagement and empowerment, and better coordination of care. Additionally, the use of data analytics within the system has facilitated evidence-based decision-making, clinical research, and public health interventions.

Future Scope:

The future of e-healthcare management systems holds tremendous potential for further advancements and innovations. Some key areas of future scope include:

Integration of Artificial Intelligence (AI) and Machine Learning (ML): Incorporating AI and ML techniques can enhance the system's capabilities for predictive analytics, personalized medicine, and intelligent decision support. These technologies can assist healthcare

providers in diagnosing and treating diseases, identifying patterns and trends in patient data, and providing targeted and proactive care.

Mobile Health (mHealth) Applications: Expanding the use of mobile applications for remote patient monitoring, telemedicine consultations, and self-management of chronic diseases can improve accessibility and patient engagement. mHealth apps can enable patients to actively participate in their healthcare management, track their health parameters, and communicate with healthcare providers in real-time.

Blockchain Technology: Implementing blockchain technology can address the challenges of data security, privacy, and interoperability in e-healthcare management systems. Blockchain can enhance data integrity, enable secure sharing of patient information across different healthcare providers and organizations, and streamline data exchange processes.

Virtual Reality (VR) and Augmented Reality (AR): Exploring the applications of VR and AR in medical training, surgical simulations, and patient education can enhance healthcare professionals' skills and improve patient understanding of medical conditions and treatment options. These immersive technologies have the potential to revolutionize medical education and patient care.

Long-Term Evaluation and Continuous Improvement: Conducting long-term evaluations to assess the sustained impact of e-healthcare management systems is essential. It is crucial to monitor and measure the system's performance, effectiveness, and user satisfaction over an extended period. Continuous improvement and iterative development based on user feedback and emerging technological advancements should be an ongoing process.

In conclusion, the e-healthcare management system has demonstrated its potential to enhance healthcare delivery, improve patient outcomes, and optimize healthcare processes. The future scope for e-healthcare management systems lies in the integration of AI and ML, the use of mHealth applications, the implementation of blockchain technology, the exploration of VR and AR, and the continuous evaluation and improvement of the system. By embracing these opportunities, healthcare organizations can harness the full potential of technology to transform healthcare services and improve patient care.

REFERENCES

1) Adibi S. (2019). Electronic Health Records: Challenges and Opportunities. In: Kuhn KA., Warren JR., Leong T., Anderson JG. (eds) Health 4.0: How Virtualization and Big Data are Revolutionizing Healthcare.Springer,Cham.https://doi.org/1\0.1007/978-3-030-16523-5_6

2) Alqurashi, M. N., & Nøhr, C. (2019). The Challenges of Implementing E-health Systems. Studies in health technology and informatics, 267, 183-189

3) Kannan, V. D., & Veeraraghavan, R. (2020). Artificial Intelligence in Health Care: A Critical Review. Healthcare informatics research, 26(2), 74-89

4) Lau, A. Y., & Kwok, T. M. (2016). Integration challenges of cloud-based telemedicine systems: A systematic review. Telemedicine and e-Health, 22(10), 793-809

5) Majeed, A., Khoja, A., Durrani, H., & Majeed, F. (2014). Assessing the readiness of organizations to adopt E-health: A case analysis of a local health service provider. BMC medical informatics and decision making, 14(1), 1-16

6) Ozair, F. F., Jamshed, N., Sharma, A., & Aggarwal, P. (2015). Ethical issues in electronic health records: A general overview. Perspectives in clinical research, 6(2), 73-76

7) Pagliari, C., Detmer, D., & Singleton, P. (2015). Potential of electronic personal health records. BMJ (Clinical research ed.), 350, g7609

8) Patel, V., Hale, T. M., Palakodeti, S., Kvedar, J. C., & Jethwani, K. (2012). Prescription tablets in the digital age: A cross-sectional study exploring patient and physician attitudes toward the use of tablets for clinic-based prescribing. Journal of medical Internet research, 14(3), e81

9) Shachak, A., & Reis, S. (2009). The impact of electronic medical records on patient–doctor communication during consultation: A narrative literature review. Journal of evaluation in clinical practice, 15(4), 641-649

10) Wolf, J. A., Moreau, J. F., Akilov, O., Patton, T., English, J. C., Ho, J., & Ferris, L. K. (2014). Diagnostic inaccuracy of smartphone applications for melanoma detection. JAMA dermatology, 150(12), 1388-1390

SYSTEM CONFIGURATION

1.Hardware requirements:

Processer : Any Update Processer

Ram : Min 4GB

Hard Disk : Min 100GB

2. Software requirements:

Operating System : MAC

Technology : IDE :

3. DATASET DETAILS

Windows family Python3.7 Jupiter notebook

- There are 40 attributes for the prediction

- Disease UCI : https://github.com/jini-the-coder/Diseaseprediction

	itching	skin_rash	nodal_skin_eruptions	continuous_sneezing	shivering	chills	joint_pain	stomach_pain	acidity	ulcers_on_tongue	...	blackheads	scu
0	1	1	1	0	0	0	0	0	0	0	...	0	
1	0	1	1	0	0	0	0	0	0	0	...	0	
2	1	0	1	0	0	0	0	0	0	0	...	0	
3	1	1	0	0	0	0	0	0	0	0	...	0	
4	1	1	1	0	0	0	0	0	0	0	...	0	
...	...	...	...	...	...	...	...	...	...	...	...	...	
4915	0	0	0	0	0	0	0	0	0	0	...	0	
4916	0	1	0	0	0	0	0	0	0	0	...	1	
4917	0	0	0	0	0	0	0	0	0	0	...	0	
4918	0	1	0	0	0	0	1	0	0	0	...	0	
4919	0	1	0	0	0	0	0	0	0	0	...	0	

4920 rows × 133 columns

Figure 6.1: Attribute DataSet

APPENDIX 1

Python

Python is an interpreted, high-level, general purpose programming language created by Guido Van Rossum and first released in 1991, Python's design philosophy emphasizes code Readability with its notable use of significant White space. Its language constructs and object oriented approach aim to help programmers write clear, logical code for small and large-scale projects. Python is dynamically typed and garbage collected. It supports multiple programming paradigms, including procedural, object-oriented, and functional programming.

Sklearn:

Scikit-learn (Sklearn) is the most useful and robust library for machine learning in Python. It provides a selection of efficient tools for machine learning and statistical modeling including classification, regression, clustering and dimensionality reduction via a consistent interface in Python. This library, which is largely written in Python, is built upon NumPy, SciPy and Matplotlib.

Numpy:

NumPy is a library for the python programming language, adding support for large, multi-dimensional arrays and matrices, along with a large collection of high level mathematical functions to operate on these arrays. The ancestor of NumPy, Numeric, was originally created by Jim with contributions from several other developers. In 2005, Travis created NumPy by incorporating features of the competing Num array into Numeric, with extensive modifications. NumPy is open source software and has many contributors.

Librosa:

Librosa is a Python package for music and audio analysis. Librosa is basically used when we work with audio data like in music generation(using LSTMs), Automatic Speech

Recognition.It provides the building blocks necessary to create the music information retrieval systems. Librosa helps to visualize the audio signals and also do the feature extractions in it using different signal processing techniques.

Matplotlib:

Matplotlib is a plotting library for the Python programming language and its numerical mathematics extension NumPy. It provides an object-oriented API for embedding plots into applications using general-purpose GUI toolkits like Tkinter, wxPython, Qt, or GTK. There is also a procedural "pylab" interface based on a statemachine (like OpenGL), designed to closely resemble that of MATLAB, though its use is discouraged.

Seaborn:

Seaborn is a Python data visualization library based on matplotlib. It provides a highlevel interface for drawing attractive and informative statistical graphics. Seaborn is a library in Python predominantly used for making statistical graphics. Seaborn is a data visualization library built on top of matplotlib and closely integrated with pandas data structures in Python. Visualization is the central part of Seaborn which helps in exploration and understanding of data.

SciPy:

SciPy contains modules for optimization, linearalgebra, integration, interpolation, special functions, FFT, signal and imageprocessing, ODE solvers and other tasks common in science and engineering. SciPy is also a family of conferences for users and developers of these tools: SciPy (in the United States), EuroSciPy (in Europe) and SciPy.in (in India). Enthought originated the

SciPy conference in the United States and continues to sponsor many of the international conferences as well as host the SciPy website. SciPy is a scientific computation library that uses NumPy underneath. It provides more utility functions for optimization, stats and signal processing.

RESEARCH PAPER

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Abstract — In health care services , patient has to face lot of problems , due to lack of information they worried for the disease which create anxiety to them. To tackle this problem disease prediction system can be made so that they can check whether the disease is very serious based on certain symptoms. In this system patient has to enter the symptoms which he/she is facing which finally give the disease as the result.The algorithm that is used in the making the system is Random forest algorithm while some other algorithm can also be used like KNN or SVM depending on the accuracy. In addition to this patient also face difficulty in storing the various documents or medical certificates or reports which is very difficult to store them , hence to tackle this problem it stores the data or certificates in the database by keeping in ming of the 3LGM. This system is designed according to HIPAA. HL7 certifications is also required to apply for such critical jobs.

I. INTRODUCTION

Worldwide , many of the cases are left untreated because of poor health care support in local areas. For attaining this purpose , a centralised method is needed for the analysing or monitoring the medical records . Doctors usually starts treating the patient without knowing the medical history of the patient or the patient forgets the medical history like allergic as he/she didn't track the records . So it is very difficult to treat the patient accurately without any side-effect. A website based diagnosis for the patient is the ultimate platform to keep the medical records and can be helpful in predicting the possible illness or disease based on the symptoms that is experienced by a patient to ensure secure and faster analysis. Since we have all the medical history of the patients , we can use this data for the early prediction of the disease.It can also help the patients to undermine the severeness of that particular disease and accordingly the doctor or patient can take the particular measures on it.

It is far more important for the doctor or receptionist to properly document the medical records of the patient.This method is the most important as it will decide that whether the cure is going in right direction or not. Not only this, but this will also help in the scientific analysis of the

patient medical record and also the deep analysis into the disease and also review the problems of patients. Medical records form an important part of the management of a patient. There are two reasons for the doctor to maintain the records or data of the users or patients.One that is , it will help in the evaluation of the medical records of the user or patient , can help in the evaluation of the results of the patients.This one also help in making the strategies of the government for the medical purpose.Records of the medical of the patient is a very sensitive area in the hospitals and that too of the different medical examiner or doctor. It is very difficult to manage a large number of medical documents and is very difficult for those hospitals who does not have much

resources which creates very much trouble in curing the disease of the patient.It is very much important to tackle this catastrophic problem by big and small hospitals. The primitive or old or widely used method is the manual method in which pen and paper was involved. In order to tackle the very catastrophic problem of recording the medical data of the patient manually , it includes or need the large storage areas and also it wis very difficult in accessing the file efficiently.Talking in terms of legally, it is very obvious that the document form of the medical records is much more valuable and reliable because it cannot be easily tampered as that by the digital data , can be attained by any vulnerable attack without any detection.The era that we are living have seen the data to go for digital, medical records are being digitalised, they can can be easily accessible and storage is also efficient. But it is not possible to accept However it is still not universally acceptable until it until it can be proves that the record is no tampered.The use or the growth of digitisation is tremendously increasing and hence e-medical record is in the process of developing or evolution and is becoming the widely used. In the health care sector. Because of the avoidance of the hard records that is paper , there are many areas that require some changes to go through more convenient way in a transition from paper to digital world.The identity is the important problem in in the digitalisation of the record. For the authentication purpose , electronic signature is required for the user , doctors or any other medical staff.This problem can be solved by using the fingerprints of the doctors or medical staff or even the staff. When any of the disease is detected by the doctor then there must be a simple universal interface where he/she can put the data in the existing medical history . It must be widely used in the same way as we are using Aadhar-cards .

1.A Objectives :

- ➢ In determining the main performance metrics and standards for healthcare information systems and electronic hospital management systems (E-HMS) (HIS).
- ➢ To recognise the essential elements of E-Healthcare System.

1.B Requirement *for E-healthcare– When* the patient faced any accident , it takes much time to identify the blood group or knowing other details that are required to start the treatment of the patient.If we preprocess most of the information of the patient in advanced can reduce the danger in the life of the patient.By knowing the patient Id , doctor can read patient information can take quick action on it. Healthcare institutions are completely deserving of the necessity to blend their companies because of the need of the industry, such as the Healthcare Protection Portability and Responsibility Act (HIPAA) of the United States of America as a Global Average. Unfortunately the majority of health information sources still focus on curing diseases and frequently work with specific departments of the healthcare industry only. This is a tremendous barrier to a industry unification.

II. METHODOLOGY OF RESEARCH

The tremendous amount of the data that is available in the todays world for the study is either qualitative or descriptive in nature.These methodologies are being used because of the reason that that the subject of the research is quite broad and the sources of information are scattered around many regions of the world.By making a quicker analysis on the survey data and the success of the healthcare management would create a perfect way to reach to the conclusion , would open another dimensions for the researcher to think in the

direction of healthcare for the welfare of the people or patients , and would lead to the betterment of the world in the health sector III.

DEFINITION OF HEALTHCARE INFORMATION SYSTEM (HIS) :

Healthcare Information Systems (HIS) are discussed by Paul R. Vegoda (1987) as "an ultimate information system which increases user or patient care by increasing the user's knowledge and lowering ambiguity, allowing logical decisions to be made from the information presented.According to Haux, Schmücker, and Winter (1996), the sanitarium information system encompasses all of the sanitarium's information processing and storehouse subsystem.

IV E – HEALTHCARE MANAGEMENT / HIS STANDARDS & TECHNOLOGIES

With the inventions of technologies such as telephone and internet , it is possible to interact with doctors from a very large distance and can be prescribed from two apart location. This is the greatest advantage of the science and act ans boon for the emergency appearing patients who did not have enough time to get the prescription and medicine . It can save various lives of the patients who may require an urgency medicine.The delivery of medical treatments remotely is known as telemedicine. It covers disease detection, management, and prevention. Real-time or recorded telemedicine are two different subcategories of telemedicine. With the emergence of technology , healthcare sector can be more developed. Healthcare information systems (HIS) must have a very large storage and access to all the resources that are required for an efficient system in order to operate effectively, according to a report by Belgium's Federal Public Service (FPS) from 2002.

IV A : 3LGM^2 – Modelling tool for HIS

The 3LGM2 (Three-Layer Graph Based Meta Model) approach to modelling and analysing HISs is organised and has received validation in several countries. 3LGM2 can be described by the Unified Modelling Language (UML) along with functional meta model with technical meta models. In a research by Bjorn Schreiweise on HIS modelling, three layers that is - the domain layer, the logical tool layer, and the physical tool layer follows the 3LGM2 model. These layers show many perspectives on an HIS.
According to Hübner-Bloder et al. (2005), the domain layer describes a hospital without regard to how its enterprise functions actually carry it out. The application components are visible in the logical tool layer. Application components process, store, and transport data in order to support medical or enterprise functions. A collection of physical data processing components that are "used to actualise the computer-based and the paper-based application components" are present on the physical tool layer.

IV B : *HIPAA sequestration rules for user information*

The U.S. Department of Health & Human Services provides a comprehensive guideline manual on de-identification techniques to be used for PHI content in hospital records and information systems management (Bradley Malin, 2010). De-identification, or the removal of identifiers from health information (see figure 1), reduces privacy risks for users and enables the other use of information for other purposes.

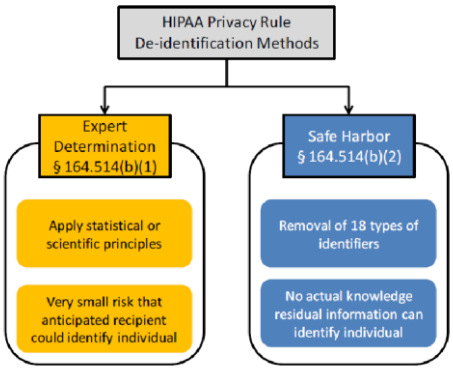

Fig. 1 – HIPAA sequestration rule De – identification Methods

4.3 HL7 / RIM Development Framework

Health Level Seven or HL7 indicates a collection of rules for the healthcare industry that is widely accepted by all over the world .All the softwares that can be made,by keeping these set of rules in mind ,i.e international standards. Health Level Seven is discovered in 1987 is an ANSI-accredited non-profit framework or organisation that controls the world health data globally by creating some sort of rules and implementing them for the well being of the patients so that the patient can access the data from any where int the world and life can be saved. Health Level Seven dream search out develop a foundation for interoperability in the healthcare rule, claims Mauro Regio (2005).The administrators or staff in the healthcare sector industry are intended to make a certification valid and that is HL7 which will indicate the proficiency of the employee who are working in the it sector. The level of understanding that an employee must hold that even hospital must seek for it employee can be guaranteed by HL7 certification.There are many standards or versions of HL7 and the most popular among them is HL7 version3.The purpose of this standard is to help if all the healthcare workflows. It was in the year of 1995 when the process of developing version3 begins, which takes a quite long time to publish in the year go 2005. The HL7 -Version3 standard in contrast to version 2 is based on the latest technology and oops i,e object oriented which is quite efficient for the programming. One of the superior company in the software industry is also involved in the HL7 and is tremendously contributing to the organization for a decade so as to contribute in sector of health industry and help the patients. The latest version that is version 3 is continuously evolving and is creating some really important features that helps in interoperability between healthcare systems. The Border is an object oriented model created using some of Story3 approaches.But a rehashed view of the basic elements of Border / HL-7 is likely in figure 2.

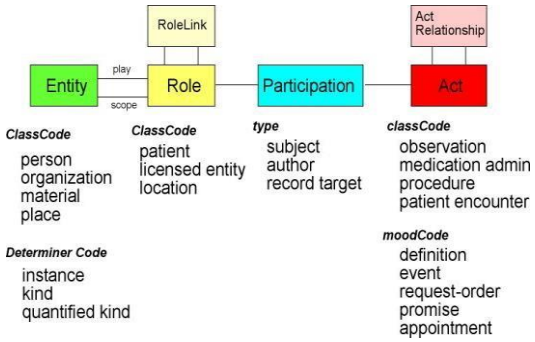

Fig. 2 — RIM / HL-7 model

V. E – HEALTHCARE MANAGEMENT SYSTEM AND ITS FEATURES

There are various activities that are analysed and discussed in E health care management system so that the system become effective for the patient to tackle the problem in a much more convenient way.

The tasks that are critical in healthcare information systems are as follows :

(1) Storage of the user data and its monitoring :

- Accurate and electronically stored medical records of cases like medicines disinclination are handed.

(2) Disease Prediction Aspects :

- Based on the Symptoms that are provided by the user, it can predict the disease .
- This model can also predict the disease with an accuracy of greater than 97%.

Few of the positive e-healthcare management solutions across all divisional domains include the Social Sciences concerned with information Center, India's e-Hospital resolution (NIC, 2013). It is a Hospital Administration Order for nursing homes with a workflow-based ICT resolution that is meant for the wards in the government area. This is a typical spreadsheet that manages important hospital operations like user health etc. It is either succession of increase to an economic system or a patient-principal strategy.

For multispecialty emergency rooms, the E Healthcare Administration Resolution is produced to address different types of nursing facility presidency and administration processes. In order to enable efficient resolution compensate patient care, nursing home administration, and detracting financial book keeping, in a fluid flow, it is a linked end-to-end healthcare management system.

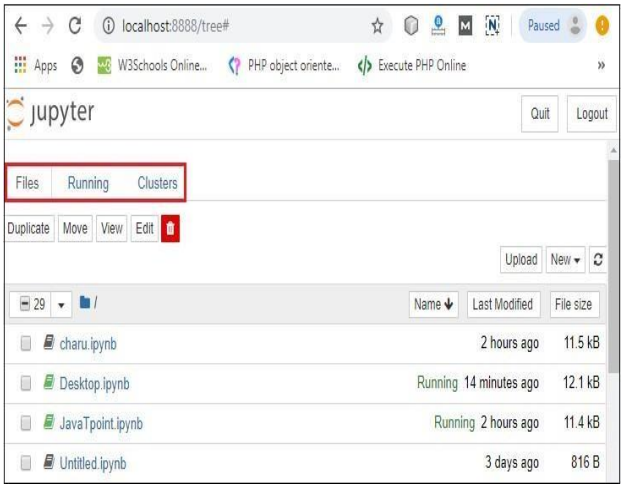

Fig.3 Jupiter Notebook - For training the model

Table-1st : NIC, E– Healthcare Management Solution Special Features

Ser.No	Features
1	ISO / IEC 9126 Certified
2	It is based on HL7
3	Multiple language support

4	Language such as ICD-9 etc.
5	Report on customisable issue
6	Supports access control and Security
7	Provides security of data and its privacy
8	Logs
10	Abstraction of user history
11	Interface of Touch Screen
12	Available on all platform such as Mac

VI. CASE: FUJISOFT – HIS

A leading provider of software products, Fuji Soft is based in Japan. It offers one of the top hospital administration solutions on the planet with a long heritage of proprietary software that has been evolving since the 1970s.Fuji delicate(2012)asserts that wards administrative environments are undergoing a significant transformation. For instance, new hospital accounting regulations have simplified financial reports bureaucracy (by removing charges for available funds), and clinics are implementing a medical inclusive payment system based on DPC (Diagnosis Procedure Combination). Additionally ,a new method of raising money for administration (which includes some of the securing medical facility salaries and the distribution of clinic bonds) are used.

VI.A Fuji soft HIS functions

The various functions of Fuji soft sanitarium solutions can be epitomized as below table2.

Table 2 –Fujisoft HIS Modules

S. No	Module Name	Function
1	Home page	Healthcare Management System - Daily data handling and management

2	Hospital Comprehensi v e Physical distribution Management System	Total goods physical distribution management – purchase costs management
3	FS - Incident	Hospital Specific incident reporting system
4	Cash Collection Solution	Complete Sales / Cash collection management

6.2 Problems in implementing of E – healthcare System / HIS

To meet the requirements of E-Healthcare Management system, a multi dealer administration system or integrated structure is required. This system must be able to choose and combine the suitable result from those of many producers (client). The successful implementation of contemporary E-Hospital management resolutions depends on the addition, exclusion, and composite integration of technology. Only via ongoing involvements in system design and construction in the healing region may established talent and technical superiority increase to such an exact and effective decision in the choice of science and E-emergency room resolution management.

VII. PROPOSED ALGORITHM

One of the most important machine learning algorithm i.e random forest is a type of the supervised learning. It can be used in machine learning issues including both bracket and retrogression. It is founded on the idea of cluster learning which is the process of integrating various classifiers to address a complicated issue and hence enhances the trained model performance.

Random forest as the name suggests is a classifier that uses a number of decision trees on different subsets on the handed dataset and pars them to increase the dataset accuracy.

VIII. RESULT ANALYSIS

After testing and training using a machine learning approach, we discovered that knn's accuracy was far more effective than that of other algorithms. The confusion matrix for each algorithm should be used to determine accuracy. Now that we have calculated precision values using the counts of TP, TN, FP, and FN as well as equation (2), we can say that KNN is the best among them, having an accuracy of 97.8%, as shown in TABLE 2.

TABLE-3-Accuracy comparison

Algorithm	Accuracy
Support Vector machine	90.2%
Decision tree	88.6%
k-nearest neighbor	86.9%
Random forest	97.8%

IX. SUMMARY

Various advantages , disadvantages and features of the E healthcare management system are described in in their respective sections.The Healthcare management system is highly depends on the management and training to use the software , and the user friendly environment . Its success depends on these factors . HIPAA privacy guidelines and HL7 / RIM framework are identified as the main determinants and metrics of Global compliance in producing and implementing the successful E - healthcare management system. Many study shows that the insights on the broader framework of E–healthcare management system/HIS paves way for future research on enhancements in E-Healthcare Management domain.

X. CONCLUSION AND FUTURE SCOPE

E-healthCare management System is currently most popular in the healthcare industry. It actually saves the patient from anxiety by predicting the disease on the basis of symptoms so that the patient can already be aware of the disease and can cure the disease as early as possible. The doctor can also cure the disease on the basis of the previously stored data i.e medical prescription etc which is always stored in the database. In future various features can be added to the system. AI can analyse the previous data of the patient and symptoms and can give best possible medical prescription. AI will be the personal doctor of the patient.

REFERENCES

1. Alice Kok (2012, Mar 14). Thailand: successful e-health system lauded. FutureGov. Accessed from: http://www.futuregov.asia/articles/2009/may/14/thail and-successful-e-health-system-increase-healt/, accessed 19 March 2013).
2. Belgium Federal Public Service – FPS report (2002). Recommendations and quality criteria for hospital information systems. Accessed from: www.health.belgium.be/filestore/8054405/his_v1s_e n_8054405_en.pdf, accessed 21 March 2013).
3. Björn Schreiweis (2010). Modelling the Hospital Information System of the Karolinska University Hospital in Stockholm. University of Heidelberg, Heilbronn University and Karolinska Institutet. Accessed from : http://ki.se/content/1/c6/10/46/20/Diplomarbeit_Bjo ern_Schreiweis.pdf
4. Bradley Malin (2010). Guidance on De-identification of Protected Health Information. Office for Civil Rights., U.S. Department of Health

& Human Services. Accessed from:
http://www.hhs.gov/ocr/privacy/hipaa/understanding /coveredentities/De-identification/hhs_deid_guidanc e.pdf

5. Fujisoft (2012). Fujisoft Hopsital Solutions (Japan).
Accessed from:
http://www.fsi.co.jp/e/solutions/hospital_solutions/i ndex.html, accessed 21 March 2013).
6. Garrido, T., Raymond, B., Jamieson, L., Liang, L., Wiesenthal, A., (2004). Making the business case for hospital information systems. Journal of Healthcare Finance, 31(2): 21–22.
7. Garrido, T., Raymond, B., Jamieson, L., Liang, L., Wiesenthal, A., (2004). Making the business case for hospital information systems. —A KaiserPermanente Investment Decision. Journal Health Care Finance, 31(2):16–25. Accessed from: http://xnet.kp.org/ihp/publications/docs/business_ca se.pdf
8. Haux R, Schmücker P, Winter A (1996) Gesamtkonzept der Informations verarbeitungim Krankenhaus. In: Haas P, Köhler CO,Kuhn K,
Pietrzyk PM, Prokosch HU [Eds.]: Praxis der
Informations verarbeitungim Krankenhaus. Ecomed Landsberg, pp. 25-37.
9. HL7 (2012). RIM version 2.41. HL7 Reference Information Model. Accessed from:
http://www.hl7.org/implement/standards/rim.cfm, accessed 21 March 2013).
10. Hübner-Bloder, G., Ammenwerth, E., Brigl, B., and Winter, A. (2005). Specification of a Reference Model for the Domain Layer of a Hospital Information System. Studies in Health Technology and Informatics, 116:497–502.
11. Mauro Regio. (2005). Web Services Enablement for Healthcare HL7 Applications - Web Services Basic Profile Reference Implementation. Accessed from: http://msdn.microsoft.com/en-us/library/ms954603.aspx#hl7webservapps_topic2, accessed 21 March 2013).
12. National Informatics Center (2013). E – Hospital management solution. Accessed from:
http://tsu.trp.nic.in/ehospital/images/e-hospital_broc hure.pdf, accessed 19 March 2013).
13. OECD report (2012). Competition in Hospital Services. Directorate for Financial and Enterprise Affairs Competition Committee. Competition Policy
Roundtables, Unclassified document - DAF/COMP (2012)9. Accessed from:
http://www.oecd.org/regreform/sectors/50527122.pd f
14. Paul R. Vegoda (1987). Introduction to hospital information systems. International journal of clinical monitoring and computing, Volume 4, Issue 2, pp 105-109.
15. PayamHomayounfar. (2012).Process mining in hospital information system.Proceedings of the Federated Conference on Computer Science and Information Systems. – FEDCSIS, Wroclaw, Poland, pp. 1135–1140.
Accessed from: http://fedcsis.org/proceedings/fedcsis2012/pliks/376. pdf
16. Shaw C (2003). How can hospital performance be measured and monitored? Copenhagen, WHO Regional Office for Europe (Health Evidence
Network report. Accessed from:
http://www.euro.who.int/document/e82975.pdf, accessed 19 March 2013)
17. Winter, A., Brigl, B., and Wendt, T. (2003). Modeling Hospital Information Systems (Part 1): The Revised Three-layer Graph-based Meta Model 3LGM2. Methods of Information in Medicine, 42:544–551.

18. Wooton, R., Criag, J., Patteson, V., (eds). (2006). Introduction to telemedicine. London: The Royal Society and Medicine Press.