AMRITA VISHWA VIDYAPEETHAM

DEEMED TO BE UNIVERSITY UNDER SECTION 3 OF THE UGC ACT, 1956

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

AMRITA VISHWA VIDYAPEETHAM

Final Year Project - 1st REVIEW

Project Title - Smart health

Group Number: B12

Guide: Dr.Geetha M

Members:

Name	Roll Number
K.Brahmini	AM.EN.U4CSE17138
Nandu M S	AM.EN.U4CSE17148
P.Krishna Harika	AM.EN.U4CSE17153
S.Rashmika	AM.EN.U4CSE17165

Literature Review:

Approved Problem Statement: To build a Smart health system which predicts the disease and books an appointment and also sets remainder

Field: Web Development and Machine Learning

Zeroth review (minutes of the meeting):

The problem statement and the project goals were finalised.

Zeroth review slides: link

Guide approval of selected papers:

#	Name	Roll Number	Paper Title	URL of the paper selected	IEEE/ACM publication	Year	How is the selected paper relevant for y project?
1	Kode Brahmini	AM.EN.U4CSE17138	An Accurate and Dynamic Predictive Model for a Smart M-Health System Using Machine Learning	https://www.sciencedirect.com/science/article/pii/S0020025520306113	Elsevier	2020	This paper presents a detailed overview of M-Health systems, their model and architecture, technologies and applications and also discusses statistical and machine learning approaches.
2	Kode Brahmini	AM.EN.U4CSE17138	A Machine Learning Approach to Classifying SelfReported Health Status in a cohort of Patients with Heart Disease using Activity Tracker Data	https://ieeexplore.ieee.org/document/8734713	IEEE	2019	This paper used machine learning algorithms to classify patient-reported outcomes (PROs) using activity tracker data in a cohort of patients with stable ischemic heart disease
3	Kode Brahmini	AM.EN.U4CSE17138	Online written consultation, telephone consultation and offline appointment: An examination of the channel effect in online health communities	https://www.sciencedirect.com/science/article/abs/pii/S1386505617302174	International Journal of Medical Informatics	2020	This research examines how online channel usage affects offline channels,how the channel effects change with doctors' online and offline reputation
4	Nandu	AM.EN.U4CSE17148	Machine Learning based Health Monitoring System	https://sci-hub.do/https://www.sciencedirect.com/science/article/pii/S2214785320323841	IMCCEN	2019	This paper is based on health monitoring using iot and disease prediction using machine learning
5	Nandu	AM.EN.U4CSE17148	Self-attention based recurrent convolutional neural network for disease prediction using healthcare data	https://sci-hub.do/https://doi.org/10.1016/j.cmpb.2019.105191	Elsevier B.V	2019	This paper deals with recurrent convolutional neural network for risk prediction of cerebral infarction disease

6	Nandu	AM.EN.U4CSE17148	Development of a data-based interactive medical expert system	https://sci-hub.do/https://www.sciencedirect.com/science/article/pii/S2405896319319445	Elsevier B.V		data-based interactive medical expert system (MES-SPC) connecting to a wearable device for collecting and identifying fetal movement signals
7	P.Krishna Harika	AM.EN.U4 CSE17153	A modified genetic algorithm for non-emergency outpatient appointment scheduling with highly demanded medical services considering patient priorities	https://www.sciencedirect.com/science/article/pii/S0360835219305753	Elsevier B.V	2019	This paper is based on the online appointment system using Genetic Algorithms in machine learning.
8	P.Krishna Harika	AM.EN.U4 CSE17153	Influence of medical domain knowledge on deep learning for Alzheimer's disease prediction	https://www.sciencedirect.com/science/article/pii/S0169260720315984	Elsevier B.V	2020	This Paper deals with the Alzheimer disease prediction at early stages using Long-Short-Term Memory (LSTM) Recurrent Neural Network (RNN) deep learning .
9	P.Krishna Harika	AM.EN.U4 CSE17153	A Smart Healthcare Monitoring System for Heart Disease Prediction Based On Ensemble Deep Learning and Feature Fusion	https://www.sciencedirect.com/science/article/abs/pii/S1566253520303055	Elsevier B.V	2019	This paper presents a smart healthcare system that is proposed for heart disease prediction using ensemble deep learning and feature fusion approaches.
10	S.Rashmika	AM.EN.U4CSE17165	Disease Prediction by Machine Learning Over Big Data From Healthcare Communities	https://ieeexplore.ieee.org/document/7912315	IEEE	2017	They have used CNN for building the model. We are going to use similar techniques to build our model.
11	S.Rashmika	AM.EN.U4CSE17165	Development of Disease Prediction Model Based on Ensemble Learning Approach for Diabetes and Hypertension	https://ieeexplore.ieee.org/document/8854986	IEEE	2019	The data processing techniques discussed in this paper is similar to our approach.
12	S.Rashmika	AM.EN.U4CSE17165	A Smartphone Application for Automated Decision Support in Cognitive Task Based Evaluation of Central Nervous System Motor Disorders.	https://ieeexplore.ieee.org/document/8606105	IEEE	2019	As they have built a mobile application we are going to build a website which will be user friendly.

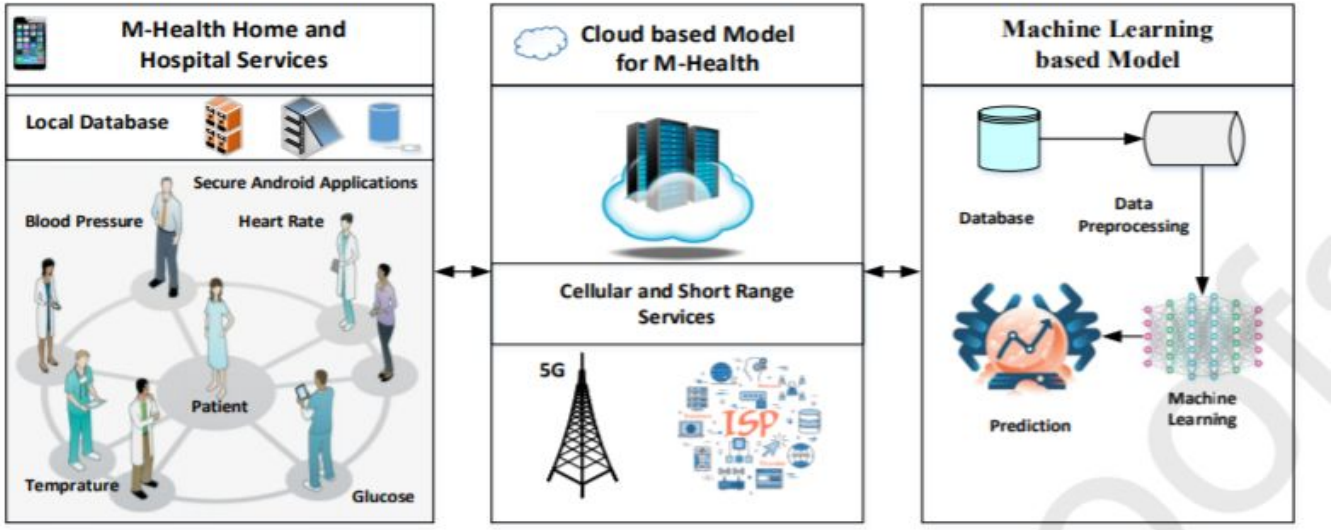
Paper title:

1. **An accurate and dynamic predictive model for a smart M-Health system using machine learning**
2. **A Machine Learning Approach to Classifying SelfReported Health Status in a cohort of Patients with Heart Disease using Activity Tracker Data**
3. **Online written consultation, telephone consultation and offline appointment: An examination of the channel effect in online health communities**
4. **Machine Learning based Health Monitoring System**
5. **Self-attention based recurrent convolutional neural network for disease prediction using healthcare data**
6. **Development of a data-based interactive medical expert system**
7. **A modified genetic algorithm for non-emergency outpatient appointment scheduling with highly demanded medical services considering patient priorities.**
8. **Influence of medical domain knowledge on deep learning for Alzheimer's disease prediction**
9. **A Smart Healthcare Monitoring System for Heart Disease Prediction Based On Ensemble Deep Learning and Feature Fusion**
10. **Disease Prediction by Machine Learning over big Data from healthcare communities**
11. **Development of Disease Prediction Model Based on Ensemble Learning Approach for Diabetes and Hypertension**
12. **A Smartphone Application for Automated Decision Support in Cognitive Task Based Evaluation of Central Nervous System Motor Disorders**

1. An accurate and dynamic predictive model for a smart M-Health system using machine learning

Key Points:

- This paper presents a detailed overview of M-Health systems, their model and architecture, technologies and applications and also discusses statistical and machine learning approaches.
- Data is collected from sensor nodes and forwarded to local databases through new technologies that enable cellular networks and then store the information in cloud storage systems.
- From cloud computing services or medical centres, the data are collected for further analysis.
- Proposed a secure Android-based architecture to collect patient data, a reliable cloud-based model for data storage.
- A predictive model able to classify cardiovascular diseases according to their seriousness is discussed



Limitations-

- The model design seems to be an excellent option for CVD prediction, based on an analysis of patient features from a dataset but couldn't predict any other serious diseases.
- This system totally depends on the internet. So if there is an internet issue, then there is no way for the doctor to know about the patient's condition.

2. A Machine Learning Approach to Classifying SelfReported Health Status in a cohort of Patients with Heart Disease using Activity Tracker Data

Key Points:

- A temporal machine learning model can be used to classify self-reported physical health in patients with SIHD using physiological indices measured by activity trackers. By constructing an HMM with feature selection and an RF classifier
- Dataset of patients with SIHD based on adjudicated clinical data, HMMs achieved significantly higher classification accuracy than treating weeks independently because they took advantage of correlations in subjects' survey scores from week to week.
- Sequential deep learning models, such as recurrent neural networks (RNNs) and long-short-term-memory (LSTM) networks have also demonstrated strong performance when dealing with sequential data

Limitations in the paper:

- In,This proposed system,they have developed A Machine Learning Approach to Classifying SelfReported Health Status in a cohort of Patients with Heart Disease using Activity Tracker Data which couldn't predict any other serious diseases.
- As Fitbits are not sold as medical devices, many of their features are not validated or regulated like other medical devices.
- Only Anxiety and Depression measured by PROMIS instruments were used in this study, which lacks precision as mental health is a broad and complicated field.

3 .Online written consultation, telephone consultation and offline appointment: An examination of the channel effect in online health communities

Key Points:

- This research examines how online channel usage affects offline channels, i.e., “Online Booking, Service in Hospitals” (OBSH), and how the channel effects change with doctors’ online and offline reputation
- The study uses data of 4,254 doctors from a Chinese online health community
- The platform automatically creates homepages for doctors based on a directory they have collected.
- developed a crawler to automatically download web pages of doctors and information about doctors from “Haodf online”
- used real data to empirically examine channel effect
- results show that when there are differences between online and offline products or service, the channel effects are also different

Limitations in the paper:

- used cross-sectional analysis, and future research can adopt longitudinal data to research dynamic changes over time
- multiple methods should be used to understand the true significance of these interesting results, such as quality study
- cost of different services should be considered in future study to analyze trend significance by varying prices
- Did not analyze the relationship between online written consultation and telephone consultation, as there is a big difference between consultation charges and the higher telephone charges to patients

4. Machine Learning based Health Monitoring System

Key Points:

- The research work aim to develop a Smart Health Monitoring System with machine learning system.It allows physicians to monitor patients at a distance and take periodic actions in case of necessity

- A set of five parameters has been identified i.e. Electrocardiogram (ECG), Pulse rate, Pressure, Temperature and Position detection by using wearable sensors. For this the system uses two circuits
- The data collected from the Arduino board are transmitted to raspberry pi and the data are sent to SQL database in DJANGO software.
- Power on the system and wear the sensors, then on the blood pressure sensor then the entire system will start working and the data is send to Django server

Limitations-

- This system totally depends on the internet. So if there is an internet issue, then there is no way for the doctor to know about the patient's condition.

5. Self-attention based recurrent convolutional neural network for disease prediction using healthcare data

Key Points:

- self-attention based RCNN model for cerebral infarction disease risk prediction
- Accuracy, f1-measure, recall, and precision are used to measure the performance of the model. Measurement matrix accuracy, f1-measure, recall, and precision are obtained
- Self-attention Mechanism: To calculate attentive vector for convolve features, we will apply attention mechanism over sequence of hidden states hi received from recurrent convolution

Limitations-

- It adds more hyperparameters to the model such as attention weights which yields the increase in training time of the model
- In practical application, we performed self-attention over convolve features from recurrent convolution. Thus, in our approach important convolve features get attention over other features instead of important text words 405 in clinical notes.

6. Development of a data-based interactive medical expert system

Key Points:

- The development of IoT-based wearable devices for automatic fetal movement signal acquisition and identification. (2) An interface collecting real-time status of pregnant women through online conversations led by doctors. (3) The construction of a self-updating knowledge base including case-based reasoning, rule-based inference and knowledge graph search to assist doctors for decision making
- MES-SPC system contains an IoT-based wearable system for automatic fetal well-being monitoring.
- Data Cleaning,Data Format Transformation,Data Anonymization

Limitations-

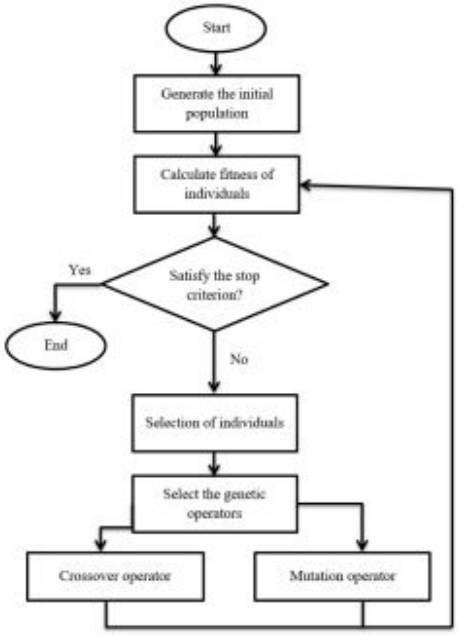
- Due to the shortage of specialist obstetricians and the scarcity of the much needed expert knowledge to guide the other medical staff, not yet considered specialists in the field of gynaecology and obstetrics, there was therefore a need to come up with a more effective supportive system for solving this problem characterised by many patients, but few specialists, even if partially, by creating an expert knowledge sharing tool. The Medical expert system (MES) would be handy in sharing the much needed expert knowledge in the diagnosis and treatment of HIP since it would be used by medical officers, clinical officers and nurses in the absence of specialists.

7. A modified genetic algorithm for non-emergency outpatient appointment scheduling with highly demanded medical services considering patient priorities.

Key Points:

- This paper presents an optimization problem concerning the booking of non-emergency outpatient appointments, where a single machine (device) and limited medical staff are supposed to fulfill the medical requirements of a large number of waiting patients.
- A new mixed integer linear programming model is formulated, characterized by two main features: (1) the method applied to calculate the duration of every single appointment is based on patients' particular therapy requirements and doctors' operating speed, where the duration of the appointments may be different; and (2) taking the priorities of patients into consideration as a key factor of scheduling in the form of the times they prefer to be booked.
- Due to the NP-hard nature of the NOASP,They used a GA(Genetic Algorithm) to solve it (especially for larger problem instances). The GA is a population-based meta-heuristic approach

- As a population based algorithm, each individual in the population – represented through a chromosome – is a candidate solution for the problem. The initial population is typically generated at random, and it evolves through selection, crossover and mutation over iterations. The algorithm continues until the stopping criterion is met. Fig. 3 depicts the general procedure of a standard GA.



- To optimize a given problem, the GA must be specifically designed for it. For this purpose, some parts of the algorithm are developed to cover and explore the solution space of the problem at hand.

Limitations in the paper:

- Multiple machines and teamwork can be considered for more advanced medical services, where patients' treatments would require more than one medical device, and a team of doctors, nurses and technicians would need to be coordinated.
- stochastic events such as patients' no-show and machine breakdown, which are inevitable aspects of an appointment scheduling system, will be investigated.

8.Influence of medical domain knowledge on deep learning for Alzheimer's disease prediction

Key Points:

- The objective of the study was to determine could diagnostics of Alzheimer's Disease (AD) from EMR data alone (without relying on diagnostic imaging) be significantly improved by applying clinical domain knowledge in data preprocessing and positive dataset selection rather than setting naïve filters.
- Data were extracted from the repository of heterogeneous ambulatory EMR data, collected from primary care medical offices all over the U.S. Medical domain knowledge was applied to build a positive dataset from data relevant to AD. Selected Clinically Relevant Positive (SCRP) datasets were used as inputs to a Long-Short-Term Memory (LSTM) Recurrent Neural Network (RNN) deep learning model to predict will the patient develop AD.
- The LSTM RNN method that used data relevant to AD performed significantly better when learning from the SCRP dataset than when datasets were selected naïvely. The integration of qualitative medical knowledge for dataset selection and deep learning technology provided a mechanism for significant improvement of AD prediction.

Limitations in the paper:

- the evaluation of different groups of drugs, measurements, and conditions and their contribution to the successful prediction of AD.
- They have only predicted for Alzheimer's disease and couldn't predict for any other diseases.

9. A Smart Healthcare Monitoring System for Heart Disease Prediction Based On Ensemble Deep Learning and Feature Fusion

Key Points:

- This paper presents a smart healthcare system that is proposed for heart disease prediction using ensemble deep learning and feature fusion approaches. First, the feature fusion method combines the extracted features from both sensor data and electronic medical records to generate valuable healthcare data. Second, the information gain technique eliminates irrelevant and redundant features, and selects the important ones, which decreases the computational burden and enhances the system performance.
- The patient physiological data are collected with the help of wearable sensors. Two types of sensor are utilized to collect the physiological data: medical and activity sensors. Medical sensors include a respiration rate sensor, These are connected to the patient's body to collect physiological data without interruption. In addition, a wearable watch is utilized to record physical activities and the heart rate.
- Extract information from unstructured EMRs through a separate module called the FRF extraction module. The unstructured EMR is assigned to the FRF extraction module to identify and extract risk factors related to heart disease.

- Data Processing , a preprocessing step is applied to represent the data effectively for heart disease prediction. Data preprocessing includes missing-data filtering, normalization, feature selection, and feature weighting.
- .the ensemble deep learning model for heart disease prediction, and then the ontology based recommendation system.

Limitations in the paper:

- The performance of feature fusion will be enhanced by using data mining techniques to produce a more refined dataset for heart disease diagnoses.
- Novel methods will be designed for feature reduction to handle huge numbers of features and large volumes of healthcare records.
- Amore sophisticated method will be investigated for removing irrelevant features and managing the missing values and noise to achieve efficient results.

10. Disease Prediction by Machine Learning over big Data from healthcare communities

Key Points:

- Data imputation: Took the data from the hospital, it had many missing values so they used a Stochastic gradient descent algorithm to fill those missing data.
- They processed the text data using CNN-based unimodal disease prediction algorithm (CNN-MDRP) which had 5 steps

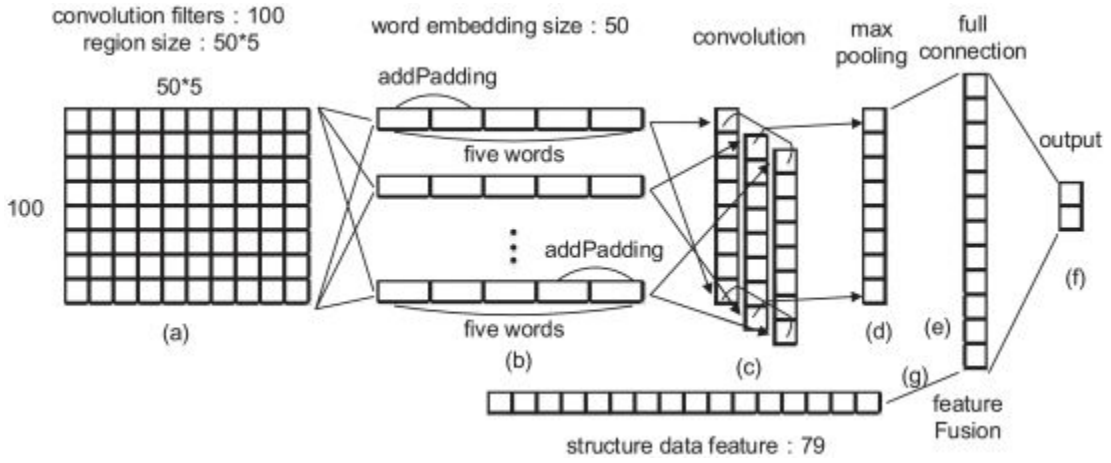
  (1) Representation of text data: They used the distributed representation of Word Embedding in natural language processing, i.e. the text is represented in the form of vectors.

  (2) Convolution layer of text CNN:

  (3) Pool layer of text CNN: They took output of convolution layer as the input of the pooling layer, They have used the max pooling (1-max pooling) operation.

  (4) Full Connection Layer of text CNN

  (5) CNN Classifier: For the classifier they choose a softmax classifier.



- 3. from the output of step 2 they used that data to predict whether the patient has high risk of disease by using CNN-Based Multimodal Disease prediction (CNN-MDRP) algorithm which has 2 steps

  (i) Training Word embedding

  (ii) Training parameters of CNN-MDRP.

Limitations in the paper:

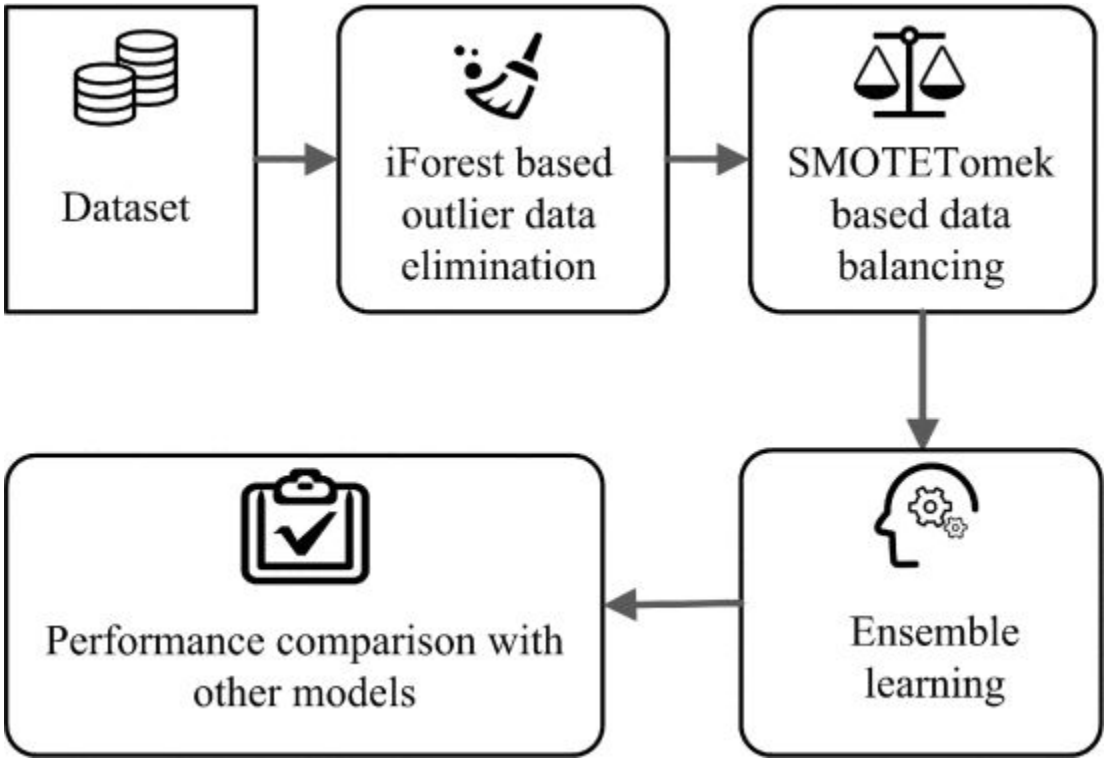
- The proposed method is only tested for chronic disease of a region. It has to be further developed for different chronic diseases across regions.

11. Development of Disease Prediction Model Based on Ensemble Learning Approach for Diabetes and Hypertension

Key Points:

- They detected and eliminated outliers using iforesrt method. The iForest works by creating an ensemble of isolation trees (iTrees) for each dataset where outliers were defined as instances with short average length in the iTrees. The iTrees is then recursively created by dividing the dataset until all instances are isolated or specific tree height is achieved.
- In the 2nd step SMOTETomek is used to balance the dataset. SMOTE over-samples the minority class to randomly generate instances and increasing minority class instances, and Tomek under-samples a class to remove noise while maintaining the balanced distributions.

- In the 3rd step Ensemble learning is used which is a type of classification method designed via combination of multiple classification algorithms into a single model to reduce bias and variance and hence improve the prediction accuracy.
- They employed ensemble learning with cross validation, which provides two classifier levels: first and second, which can help avoid overfitting. Cross-validation helps to prevent the model using the same training set for first and second level classifiers.
- They used MLP, SVM, and DT as first level classifiers and LR as the second level classifier.



Limitations in the paper:

This work did not use optimal model paraments for predicting the disease.

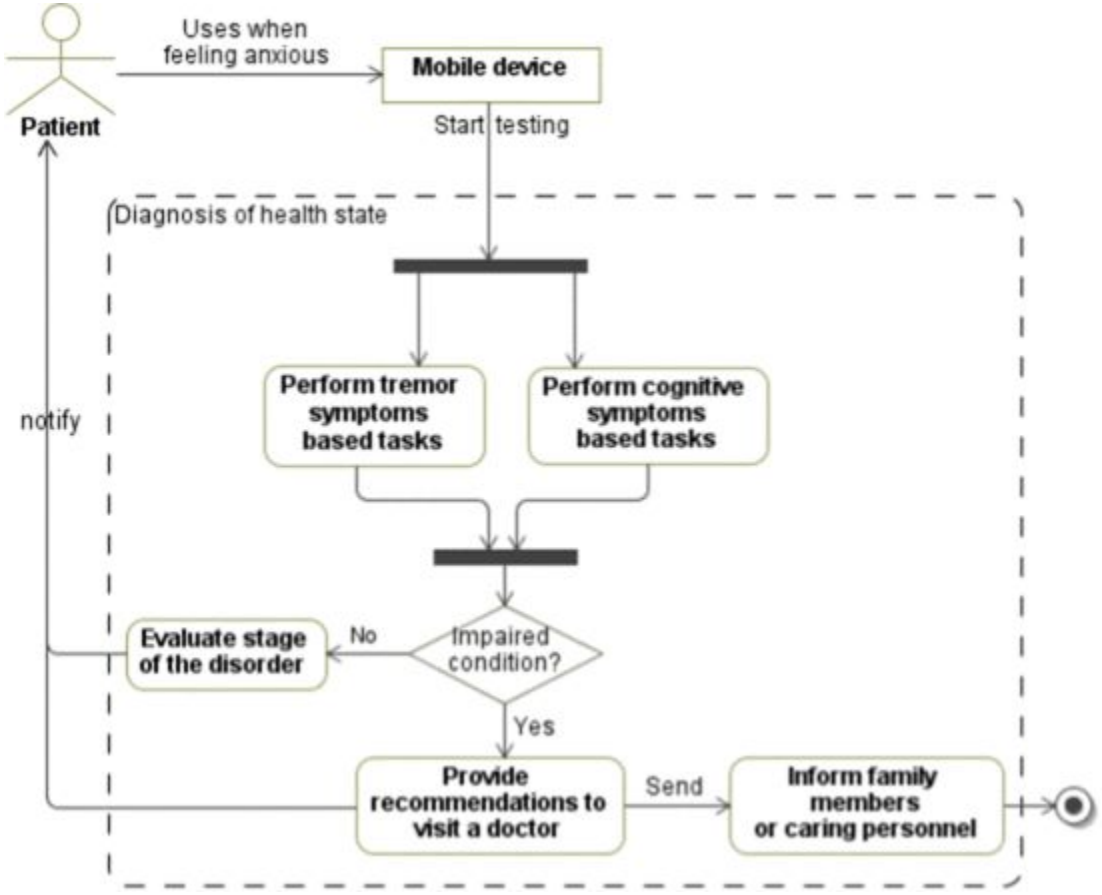
This model is only applied for type 2 diabetes and hypertension. Utility of this model needs to be studied for other diseases.

12. A Smartphone Application for Automated Decision Support in Cognitive Task Based Evaluation of Central Nervous System Motor Disorders

Key Points:

- This is a mobile application implementation for an android system, which can be used for examination of central nervous system motor disorders occurring in patients suffering from Huntington, Alzheimer or Parkinson disease. Data is extracted from the mobile application features by using core functionality and methods provided in android's application programming interface. The information is evaluated by a back-propagation neural network classifier and the result is presented to the user.
- Method:

  i) Mobile App and Classification:



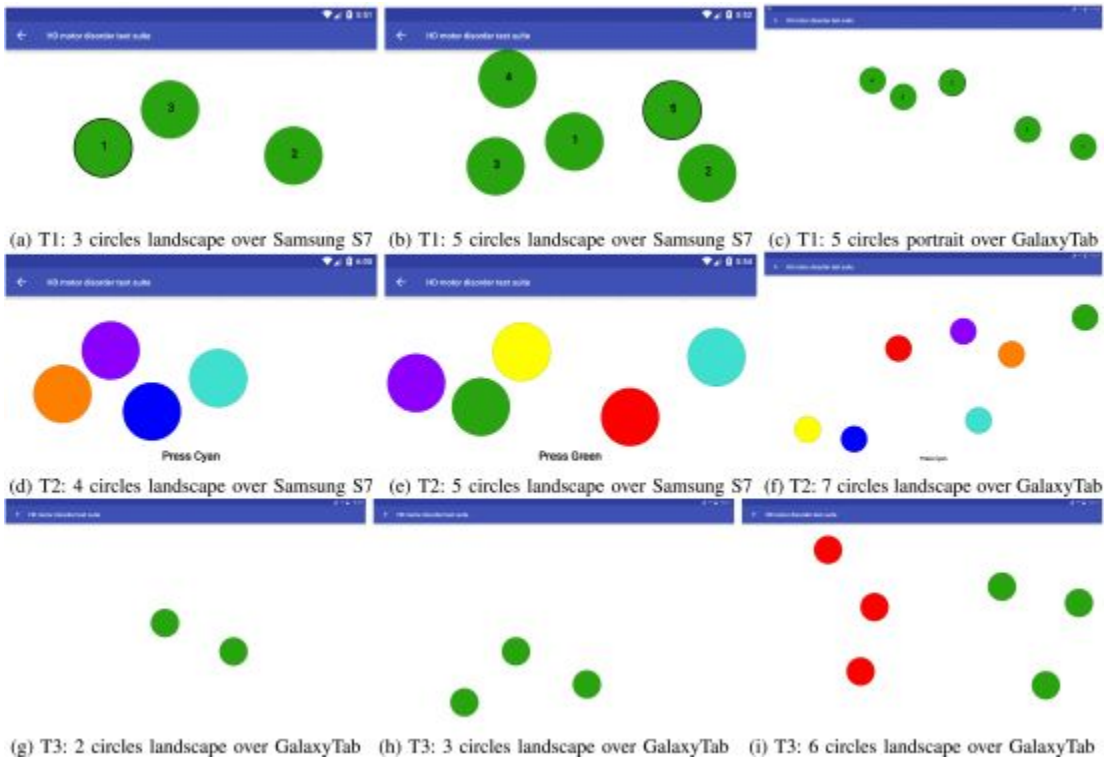
ii) Implemented Mechanism for Disorder recognition: 3 steps

T1: Signal touch, sequential

T2: Signal touch, Random Color Chooser

T3: Multi-Touch

User has to place figures on the dots so that they can read the signals



(a) T1: 3 circles landscape over Samsung S7 (b) T1: 5 circles landscape over Samsung S7 (c) T1: 5 circles portrait over GalaxyTab

(d) T2: 4 circles landscape over Samsung S7 (e) T2: 5 circles landscape over Samsung S7 (f) T2: 7 circles landscape over GalaxyTab

(g) T3: 2 circles landscape over GalaxyTab (h) T3: 3 circles landscape over GalaxyTab (i) T3: 6 circles landscape over GalaxyTab

iii) Dataset: Collected from 1928 experiments data

iv) Feature extraction: They took the reading of the user for these tests and the information is forwarded to the neural network for evaluation and prediction whether the user is potentially at high risk of fast developing HD symptoms in the nearest future.

v) Neural Network Architecture: NN is composed of fully connected layers, which are input, hidden and output. The activation function used is sigmoid function.

iv) Statistical Method

Limitations in the paper:

They developed a model for 10 inch device, this has to be customized for bigger screen for better accuracy

In the Proposed method developers used 3 simple basic tests which need to be improved by including more suitable tests.

Summarized survey of all the papers:

#	Paper Title	Student reader name	Main problem addressed in the paper	Methodology used in the paper to solve the problem	What is the limitation of the paper in solving the problem that you address?
1	An Accurate and Dynamic Predictive Model for a Smart M-Health System Using Machine Learning	K.Brahmini	This paper proposes a complete M-Health model integrated with a secure application, secure cloud modes and machine learning-based predictive analysis for further diagnosis. Focuses on providing a secure Android-based architecture to collect patient data.	The data are collected from sensor nodes and forwarded to a local database and then store the data in cloud storage services. Machine learning techniques are used for their accuracy in the prediction of disease analysis and have also been adopted for classification.	The model design seems to be an excellent option for CVD prediction, based on an analysis of patient features from a dataset but couldn't predict any other serious diseases.

2	A Machine Learning Approach to Classifying SelfReported Health Status in a cohort of Patients with Heart Disease using Activity Tracker Data	K.Brahmini	The goal of this study was to use machine learning algorithms to classify patient-reported outcomes (PROs) using activity tracker data in a cohort of patients with stable ischemic heart disease (SIHD) and demonstrates the ability of activity tracker data to classify health status over time.	Two models were built to classify PRO scores using activity tracker data. The first model treated each week independently, while the second used a Hidden Markov model (HMM) to take advantage of correlations between successive weeks. Retrospective analysis compared the classification accuracy of the two models and the importance of each feature.	In,This proposed system,they have developed A Machine Learning Approach to Classifying SelfReported Health Status in a cohort of Patients with Heart Disease using Activity Tracker Data which couldn't predict any other serious diseases.
3	Online written consultation, telephone consultation and offline appointment: An examination of the channel effect in online health communities	K.Brahmini	The paper researches how doctor services provided via online channels impact their performance offline. Investigate the role of reputation in influencing doctors' performance offline. Test how the channel effects change with doctors' online and offline reputation	1)The Research Context 2)Sample and Data Collection 3)Variables and Empirical Models Our empirical variables include : 1) the totals of doctors' OBSH, 2) whether the doctor provided online written consultation services, and 3) whether they provided telephone consultation services	Did not analyze the relationship between online written consultation and telephone consultation, as there is a big difference between consultation charges and the higher telephone charges to patients
4	Self-attention based recurrent convolutional neural network for disease prediction using healthcare data	Nandu M S	the traditional rule-based and classical machine learning methods used; which are unable to handle the unstructured clinical text and only a single method is not able to handle all challenges related to the analysis of the unstructured text	To deal with other clinical text challenges, we combine the ability of RCNN with the self-attention mechanism. Thus, self-attention gets the focus of the model on essential convolve features which have effective meaning in the clinical text by calculating the probability of each convolve feature through softmax.	!. It adds more hyperparameters to the model such as attention weights which yields the increase in training time of the model. 2. In practical application, we performed self-attention over convolve features from recurrent convolution. Thus, in our approach important convolve features get attention over other features instead of important text words 405 in clinical notes.
5	Machine Learning based Health Monitoring System	Nandu M S	In today's world it is very difficult to carry patients from home to hospitals for regular check up. There is lot of challenges like waiting in the queue, travelling time and patient may be prone to various infections moving in this polluted environment	The proposed system is applicable in real time interaction between patient side and doctor side using raspberry pi, through communication medium and also involves a camera unit which is new idea beyond existing system	So this system totally depends on the internet. So if there is an internet issue, then there is no way for the doctor to know about the patient's condition.

6	Development of a data-based interactive medical expert system for supporting pregnancy consultations: general architecture and methodology	Nandu M S	Innovations in telecommunication and online service solutions facilitate the emergence of remote medical diagnosis and treatment consultations. Using information and communication technologies (ICT's), timely e-health services to individuals are becoming a viable alternative to traditional healthcare solutions, which reduces pressure on the health system. In our scenario for pregnant women, developing an interactive medical expert system connecting to a wearable device for supporting pregnancy consultations based on fetal movement signals is essential	The three highlighted parts in our system includes: (1) The development of an IoT-based wearable device for automatic fetal movement signal acquisition and identification. (2) An interface collecting real-time status of pregnant women through online conversations led by doctors. (3) The construction of a self-updating knowledge base including case-based reasoning, rule-based inference and knowledge graph search to assist doctors for decision making.	Due to the shortage of specialist obstetricians and the scarcity of the much needed expert knowledge to guide the other medical staff, not yet considered specialists in the field of gynaecology and obstetrics, there was therefore a need to come up with a more effective supportive system for solving this problem characterised by many patients, but few specialists, even if partially, by creating an expert knowledge sharing tool. The Medical expert system (MES) would be handy in sharing the much needed expert knowledge in the diagnosis and treatment of HIP since it would be used by medical officers, clinical officers and nurses in the absence of specialists.
7	A modified genetic algorithm for non-emergency outpatient appointment scheduling with highly demanded medical services considering patient priorities	P.Krishna Harika	This paper presents an optimization problem concerning the booking of non-emergency outpatient appointments, where a single machine (device) and limited medical staff are supposed to fulfill the medical requirements of a large number of waiting patients.	A new mixed integer linear programming model is formulated, characterized by two main features: (1) the method applied to calculate the duration of every single appointment is based on patients' particular therapy requirements and doctors' operating speed, where the duration of the appointments may be different; and (2) taking the priorities of patients into consideration as a key factor of scheduling in the form of the times they prefer to be booked.They have used Genetic Algorithm(GA) approach ,GA, the chromosomes are represented by a two-dimensional matrix, , containing real values in [0 1] that determine the priority for assigning doctors and appointments to the patients.	Currently the proposed system's objective was to minimize the number of vacant appointments and the frequency of changing assigned doctors on one hand, and maximize the patients' satisfaction with their appointment time on the other hand. by using the Genetic Algorithm approach,which books online appointments for only one particular doctor but,It doesn't predict for more number of hospitals or doctors.

8	Influence of medical domain knowledge on deep learning for Alzheimer's disease(AD) prediction	P.Krishna Harika	The paper presents the study was to determine could diagnostics of AD from EMR data alone (without relying on diagnostic imaging) be significantly improved by applying clinical domain knowledge in data preprocessing and positive dataset selection rather than setting naïve filters.	Data were extracted from the repository of heterogeneous ambulatory EMR data, collected from primary care medical offices all over the U.S. Medical domain knowledge was applied to build a positive dataset from data relevant to AD. Selected Clinically Relevant Positive (SCRP) datasets were used as inputs to a Long-Short-Term Memory (LSTM) Recurrent Neural Network (RNN) deep learning model to predict will the patient develop AD and construction of the LSTM RNN deep learning model. We used the ambulatory EMR database to predict the occurrence of AD. Data are in the OMOP common data model (CDM) format	Here,In this proposed system they predicted Alzheimer's disease using LSTM and RNN deep learning models and couldn't predict any other serious diseases.
9	A Smart Healthcare Monitoring System for Heart Disease Prediction Based On Ensemble Deep Learning and Feature Fusion	P.Krishna Harika	This paper presents a smart healthcare system that is proposed for heart disease prediction using ensemble deep learning and feature fusion approaches. First, the feature fusion method combines the extracted features from both sensor data and electronic medical records to generate valuable healthcare data. Second, the information gain technique eliminates irrelevant and redundant features, and selects the important ones, which decreases the computational burden and enhances the system performance.	1. The patient physiological data are collected with the help of wearable sensors. Two types of sensor are utilized to collect the physiological data: medical and activity sensors. Medical sensors include a respiration rate sensor, These are connected to the patient's body to collect physiological data without interruption. In addition, a wearable watch is utilized to record physical activities and the heart rate. T 2. Extract information from unstructured EMRs through a separate module called the FRF extraction module. The unstructured EMR is assigned to the FRF extraction module to identify and extract risk factors related to heart disease. 3.Data Processing , a preprocessing step is applied to represent the data effectively for heart disease prediction. Data preprocessing includes missing-data filtering, normalization, feature selection, and feature weighting. 4.the ensemble deep learning model for heart disease prediction, and then the ontology based recommendation system.	In,This proposed system,they have developed a smart health monitoring system which monitors the heart rate and patient conditions.and couldn't predict any other serious diseases.

10	Disease Prediction by Machine Learning over big Data from healthcare communities	S.Rashmika	Main goal was to predict the outbreak of chronic diseases in different areas of china.	1.Took the data from hospital, it had many missing values so they used Stochastic gradient descent algorithm to fill those missing data (Data imputation) 2.they processed the text data using CNN-based unimodal disease prediction algorithm (CNN-MDRP) which had 5 steps i)Representation of text data ii)Convolution layer of text CNN iii)Pool layer of text CNN iv)Full Connection Layer of text CNN v)CNN Classifier. 3.From the output of step 2 they used that data to predict whether the patient has high risk of disease by using CNN-Based Multimodal Disease prediction (CNN-MDRP) algorithm which has 2 steps i)Training Word embedding ii)Training parameters of CNN-MDRP.	In this paper they are confined to chronic diseases in one area we are taking all diseases to consideration. And help the user in consulting the nearby doctor
11	Development of Disease Prediction Model Based on Ensemble Learning Approach for Diabetes and Hypertension	S.Rashmika	Main goal was to predict the type 2 diabetes and hypertension	The proposed Disease Prediction Method has 3 stages 1.Isolation forest (iForest) based outlier detection method to remove outlier data 2.synthetic minority oversampling technique tomek link (SMOTETomek) to balance data distribution, 3.ensemble approach to predict the diseases.	In this paper they are confined to chronic diseases we are taking all diseases to consideration. And help the user in consulting the respective doctor.

12	A Smartphone Application for Automated Decision Support in Cognitive Task Based Evaluation of Central Nervous System Motor Disorders	S.Rashmika	To predict the presence of Disease related to nervous system	This is a mobile application implementation for an android system, which can be used for examination of central nervous system motor disorders occurring in patients suffering from Huntington, Alzheimer or Parkinson disease. Data is extracted from the mobile application features by using core functionality and methods provided in android's application programming interface. The information is evaluated by a back-propagation neural network classifier and the result is presented to the user.	We are going to take the symptoms from the user and process them for prediction disease.