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Research paper

Survey on classifier algorithms for health care system in diabetes

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Abstract

Health care is huge, complex and heterogeneous platform for finding out missing values as well as predicting human diabetes with the use of data mining techniques. Diabetes mellitus is a major chronic disease which can be a challenging issue among worldwide. An effective medical diagnosis can be possible by discovering necessary information from medical dataset. The diabetes affected zone patterns can be identified with the proper implementation of data mining technique. This paper focuses about diabetes mellitus and research work carried out on data mining technique to solve diabetes mellitus. This paper also focuses on taking a various measurement points and techniques adopted by different researches, and discusses about the recent and effective algorithm to short out diabetes mellitus.

Keywords: *Diabetes Mellitus; Classification Algorithms; Health Care; Data Mining.*

1. Introduction

Introduction to Health Care with Data Mining
Health care organizations generally adopt information technology to reduce cost as well as improve efficiency and quality, and with it, research is known to be effective. It is especially used when it draws information from multiple sources of posing special problems and wealth of data available within the health care system. Data mining is the application of algorithm for extracting patterns from large volume of data. Health care data mining is the increasing research area in data mining skill. Data mining holds great shows potential for health care organization to allow health scheme to scientifically use data and investigation to get better the care and medical services and decrease the expenditure and the overall health care expenditure. In health care, it provides the benefits detection of causes and diagnosis and also helps the researchers for creation competent health policies, constructing drugs, commendation system, increasing health profiles of persons etc.
Recommendations were made to help prevent death and disability from main nutrition-related chronic diseases. These inhabitants nutrient intake and physical activity goals be supposed to contribute in the development of provincial strategies and national guidelines to reduce the burden of disease related to obesity, diabetes, and cardiovascular disease, several forms of cancer, osteoporosis and dental disease.
Among many chronically diseases such as diabetes is the one which has factor of nutrition deficiency among other factors. Diabetes leads to increased risk of all vitals disease. This can be cured by diet and food controls. These patterns can then be seen as a kind of summary of the input data, and may be used in further analysis.
Today's health care surroundings is exaggerated by several significant factors, as well as greater number of aging and older people, the progress of new technologies, advances in medical treatments and incredible increase in scientific knowledge about health and infirmity. Health care is a controlled way of medical care disturbed with the preservation of the health delivered by the health care providers or professionals in various fields including a pharmacy nursing, medicine, dentistry, psychology, physicians etc. It is mostly prejudiced by the social, economic conditions and health policies of the place and varies across different countries, individuals, groups etc. This paper focuses on survey; statistics and analysis on calculate diabetes. Decision Tree and Naïve Bayes algorithm are used to be relevant on a pre-existential data set of forecast diabetes and it consequences in statistics accurateness and presentation improvements.

2. Diabetes mellitus

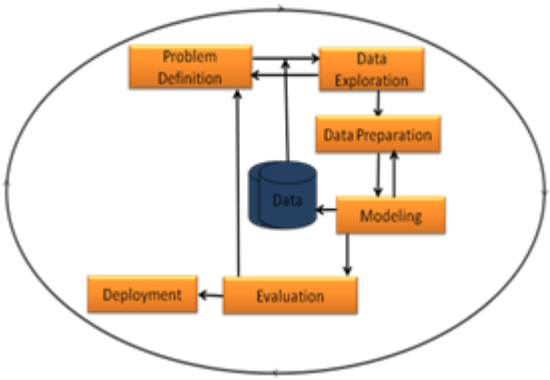
Diabetes is a common disease where there is too much sugar floating around in human blood. This occurs because either the pancreas can't produce enough insulin or the cell in human body has become resistant to insulin. It is a collection of metabolic disease characterized by high blood sugar levels that result from defects in insulin emission, or its action or both. Diabetes is a chronic situation connected with either strangely high levels of sugar in the blood or Insulin produced by the pancreas lower blood glucose. Absence or insufficient creation of insulin, or a failure of the body to appropriately use insulin causes diabetes. There are three types of it as follows Type1 Diabetes Mellitus, Type2 Diabetes Mellitus, and Gestational Type.

- Type 1 Diabetic Mellitus results from the human body collapse to create insulin. This form was previously referred to as "insulin –dependent diabetes mellitus" (IDDM) or "juvenile diabetics".
- Type 2 Diabetes Mellitus results insulin resistance, condition in which cells fail to use insulin properly, sometimes also with an absolute insulin deficiency. This form was pre-

viously referred to as non insulin-dependent diabetes mellitus (NIDD) or "adult-onset diabetes".

- Gestational diabetes is the third main form and occurs when pregnant women without a previous diagnosis of diabetes develop a high blood glucose level.

1) Data Mining on Health Care progression



Data mining is an iterative procedure that classically involves the following phases:

2) Problem definition

A data mining on health care process starts with understanding of the Healthcare problem. Data mining experts & health care experts work closely together to define the process objectives and the requirements from a health care perspective. The process objective is then translated into a data mining problem definition. In the problem definition phase, data mining tools are not yet required.

3) Data exploration

Data mining experts understand the meanings of following terms: metadata, collect, describe, explore the data, and identify quality problems of the data. A frequent exchange with the data mining experts and the Health care experts from the problem definition phase is vital. In the data exploration phase, traditional data analysis tools are required.

4) Data preparation

Data mining experts build the data model for the modeling process from the available Database and Data are preprocessed with collect, cleanse, and format the data in the pre-requisite format and also new derived attributes are created in a Data warehouse.

5) Modeling

Data mining experts decide on and are relevant a variety of mining functions can be used and also detailed different data types and data mining experts review each model like data examination and training also a recurrent replace with the health care experts is required. The modeling stage and the assessment stage are coupled. They can be recurring several times to change parameters until optimal values are achieved and high excellence model has been built.

6) Evaluation

Data mining experts estimate the model. If the model does not make happy their expectations, they go back to the modeling stage changes the parameters and rebuilt the model. At the end of the assessment stage, the data mining experts make a decision how to use the data mining consequences.

7) Deployment

Data mining experts derive the results and store them databases and data ware houses and use them for applications.

2.1. Challenges in treatment for diabetes

- Challenges in Identifying Diabetes Mellitus

Patient related challenges may be overcome by actively listening to the patients' fear about insulin Therapy and by educating patients about the importance, rationale, and evolving role of insulin in individually self –treatment regimens. Health care system related challenges may be improved through control of rising cost of insulin therapy while making it available to patients.

- Clinical associated challenges

Considerate and overcoming clinical interior, hypoglycemia, and strategies to manage weight gain and managing time concerns.

- Patient associated challenges

Corresponding complication of insulin regimen with health-related quality of life possible. Meeting patient convenient needs. Destigmatizing needles. Overcoming common misperception about insulin. Cost of insulin therapy.

- Health Care system related challenges

Challenges in diagnosis of diabetes, Physical examination challenges, obtaining clues from history and Economical perspective challenges are evaluating multifaceted therapeutic approaches in diabetic care, health economic fundamentals of cost efficiency assessment

The Researchers contribution to solve the challenges can be briefly examined with Table1, and focus on describing about the measure-ments taken for their research work. The Researchers contribution to solve the challenges can be briefly examined with Table2, and also focus on describing about the measure-ments and Applications taken for their research work.

Table 1: Measurements to Solve the Challenges in Diabetes

S.NO	AUTHOR	ALGORITHMS	TOPIC	MEASUREMENTS	DISCRIPTION
1	Ravi Sanakal, T Jayakumari	Support Vector Machine, Fuzzy C Means	Prognosis of Diabetes Using Data mining Approach-Fuzzy C Means Clustering and Support Vector Machine	The existing Support Vector Machine algorithm gives 59.5% accuracy and the Fuzzy C Means algorithm is 94.3%.	This paper gives the result of patient affected from the Diabetic Mellitus to the accuracy of Fuzzy C Means algorithms.
2	Aiswarya Iyer, S.Jeyalatha ,Ronak Sumbaly	Decision Tree, Naive Bayes	Diagnosis of diabetes using classification mining techniques	The proposed algorithm is J48 (70:30 percentage split was applied on the data set) that produces results performance result up to 76.9565% and Naïve Bayes produces 79.5%, the error rate is less in J48.	This paper show how the Decision Tree and Naïve Bayes are predict actual diagnosis of diabetes for local and systematic treatment along with presenting related work in the field.
3	Asha Gowda Karegowda, A.S. Manjunath, M.A. Jayaram	Genetic Algorithm and Back Propagation Network	Application of Genetic algorithm Optimized Neural Network Connection Weights for Medical	In Genetic Algorithm and Back Propagation Network are used individually and also various cross over type, topologies get the accuracy in GA_BPN with Decision Tree to GA-CFS 84.076%, 84.73%.	This paper gives the accuracy in GA_BPN and shows substantial improvement in classification accuracy of BPN. Significant features selected by DT and GA-

			Diagnosis of Pima Indians Diabetes		CFS further enhanced to classification accuracy of GA-BPN.
4	Tarig Mohamed ahmed	Naive Bayes, J48	Using Data mining to Develop model for classifying diabetic patient control level based on historical medical records	Proposed logistic algorithm gives accuracy to 74.4%	In this paper, a predicted model for classifying diabetic patients based on a treatment plan has been developed.
5	SriDeivannai Nagarajan, R.M.Chandrasekaran	Naïve Bayes, SVM, Decision Tree and Simple Card	Diagnosing Diabetes using data mining Techniques	The existing SVM and Simple Cart Algorithm gives the Accuracy and error rate to 99.6 and 0.4.The proposed algorithm is Potential Diabetic Classifier algorithm given Accuracy and error rate is 99.8 and 0.2 respectively.	This paper provides information about diabetes prevention, controlling and gives the accuracy and error level.
6	C.Kalaiselvi, G.M.Nasira	ANFIS,PSO,AGKNN	Predicting of heart disease and cancer in diabetic patients using data mining techniques	The existing KNN with AGKNN has higher efficiency and accuracy values and proposed method AGKNN and ANFIS with Partical Swarm Optimization algorithm gives Accuracy and error rate to 99.8 and 0.2 respectively.	This paper with ANFIS & AGKNN algorithm shows that the classification accuracy is better than existing approaches and proposed is reduced complexity with higher efficiency
7	SalimAmourDiwani, Anael Sam	KNN,J48	Diabetes forecasting using Supervised learning Techniques	The existing KNN algorithm and the proposed J48 give accuracy to 73.8 and 76.3 respectively.	This paper gives accuracy of diabetes patient using various classification algorithms.
8	Haleen, Dr.PankajBhambri	J48,Naïve Bayes	A Prediction Technique in data mining for diabetic mellitus	Various classifier algorithms are applied and compared two algorithm in J48 and Naïve Bayes algorithms the computing time 0.06&0.02 respectively and have the accuracy 73.8 and 76.3 respectively.	This paper is to concentrate data from an information set and change it into a reasonable structure for further utilize and to get the processing time and accuracy value.
9	K.G.Nandakumar, T.Chritopher	TPNN, eTPNN, sTPNN	Analysis of Liver and Diabetes dataset by using unsupervised two phase neural network technique	Three unsupervised Neural Network proposed models are TPNN,eTPNN,sTPNN.The increment process of neuron from 18 to 22 produce very less amount of variation in accuracy and the maximum achievement of accuracy, precision, recall, and F-measure of TPNN are 88%,0.92,0.537 and 0.676 respectively and sTPNN are 90%,0.96,0.548 and 0.696 respectively and eTPNN are 90%,0.92,0.533 and 0.667 respectively.	This paper is to get the accuracy of the diabetes patient using Unsupervised Neural Network techniques.
10	Dhivya Selvaraj, Mrs.Merlin Mercy	Association Rule Mining, SAM	Distributed association rule mining and summarization for Diabetes Mellitus and Its Co-Morbid Risk Prediction strategy using FUZZY Classifier	The existing algorithm is Bottom Up Summarization, and the proposed Association Rule Mining technique, Fuzzy classifier with split and merge algorithm are to get maximum iteration level accuracy in BUS 91% and SAM 97%.	This paper gives the accuracy of diabetes patients and co-morbid condition to predict and prevent the other diseases.
11	Madeeh Nayer Algedawy	KNN, Linear Discriminant Analysis	Detecting Diabetes Mellitus using Machine Learning Ensemble	Different classification algorithms and machine learning stack ensembles methods are applied to get best accuracy, precision, recall and f-measures. LDA results 77.6%, 0.795, 0.884, 0.837 respectively and KNN results 72.66%, 0.776, 0.826, 0.797 respectively finally stack ensemble method applied and get the results 94.27%, 0.963, 0.948, 0.956 respectively.	This paper gives the machine learning ensemble methods to get best accuracy, precision, recall, f-measures, it is significantly better than individual models
12	J. N. Mamman, M. B. Abdullahi ,A. M. Aibinu ,I. M. Abdullahi	K-means clustering,Classification	Diabetes Classification Using Cascaded DataMining Technique	Artificial intelligent Technique is used in K-Means clustering with ANN algorithm and ANN-K-Means to get comparative best and Low accuracy, specificity, sensitivity, and precision and results 99.20%, 90,100, 99.08 and 97.45, 91.43, 100, 96.51 respectively.	This paper provides accuracy, specificity, sensitivity and precision metrics, which are evaluated and implemented in two stage preprocessing algorithm.
13	P.Suresh kumar V. Umatejaswi	Simple K-means Algorithm	Diagnosing Diabetes using Data Mining Techniques	The Risk level accuracy is predicted and compared in Naïve Bayes and C4.5 and produced best accuracy and error rate is 90.9 %, 0.091 and 100% respectively.	This paper provides to prevent, control, and create awareness of diabetes and effect of other relevant diseases and get the accuracy

					values.
14	Rashedur M. Rahman, Farhana Afroz	Naïve Bayes, J48, ANFIS	Comparison of Various Classification Techniques Using Different Data Mining Tools for Diabetes Diagnosis	Different classification algorithms and data mining tools are applied to get the best accuracy, computing time, error rate and results are Naïve Bayes- TANAGRA, (100%), (0.001ms) respectively,, , J48- WEKA (81.33%), (0.135ms), (18.68) respectively and ANFIS- MATLAB (78.79%), (7.635error rate)respectively.	This paper compares the three algorithms and results as best TANAGRA.
15	K. R. Lakshmi, S.Prem Kumar	Partial Least Squares Regression - Discriminant Analysis (PLS-DA), K-NN	Utilization of Data Mining Techniques for Prediction of Diabetes Disease Survivability	Supervised machine learning algorithms are used to get best algorithm based on highest accuracy, lowest computing time, positive precision value, cross validation error rate, bootstrap error rate. We compared ten algorithms PLS-DA gives the following factor 74.48%, 452ms, 0.3902, 0.2552, 0.2782 respectively and the lowest value k-NN are 65.33%, 640ms, 0.4736, 0.3466, 0.3532 respectively.	This paper gives automatic classification tool(TANAGRA) and various algorithms to find the accuracy, error rate and other factors.
16	K.Saravananathan, T.Velmurugan	KNN,J48	Analyzing Diabetic Data using Classification Algorithms in Data Mining	Classification algorithms are used to get performance accuracy, error rate and found for J48, 67.15%, 0.4695 respectively and KNN minimum value 53.3945%, 0.6759 respectively.	This paper compares various classification algorithms, finds the performance, accuracy, error rate, and predicts the diabetes patient to avoid other diseases.
17	S. R. Priyanka Shetty Sujata Joshi	ID3	A Tool for Diabetes Prediction and Monitoring Using Data Mining Technique	The ID3 algorithm uses new patterns and process and given the accuracy, sensitivity, specificity, error rate Are 94%, 55%, 22%, 6%respectively?	This paper uses new patterns to give meaningful information to the patient and create awareness avoid diabetes in future gives accuracy, sensitivity, specificity and error rate.

Table 2: Measurement Taken in Various Data Mining Applications

S.NO	AUTHOR	TOPIC & YEAR	APPLICATIONS	EXISTING	PROPOSED	MEASUREMENT
1	Rashedur M. Rahman, Farhana Afroz	Comparison of Various Classification Techniques Using Different Data Mining Tools for Diabetes Diagnosis-MAR-2013	WEKA, MAT LAB, TANAGRA	C4.5	Fuzzy Logic, DT	Different classification algorithms and data mining tools are applied to get the best accuracy, computing time, error rate and results are Naïve Bayes- TANAGRA, (100%), (0.001ms) respectively,, , J48- WEKA (81.33%), (0.135ms), (18.68) respectively and ANFIS- MATLAB (78.79%), (7.635error rate)respectively.
2	SalimAmourDiwani,Anael Sam	Diabetes forecasting using Supervised learning Techniques-SEP-2014	WEKA	KNN	J48	The existing KNN algorithm and the proposed J48 gives accuracy to 73.8 and 76.3 respectively.
3	Aiswarya Iyer, S.Jeyalatha ,Ronak Sumbaly	Diagnosis of diabetes using classification mining techniques-JAN-2015	WEKA	SVM	J48, DT, Naïve Bayes	The proposed algorithm is J48 (70:30 percentage split was applied on the data set) that produces results performance result up to 76.9565% and Naïve Bayes produces 79.5%, the error rate is less in J48.
4	C.Kalaiselvi, G.M.Nasira	Predicting of heart disease and cancer in diabetic patients using data mining techniques-JULY-2015	MAT LAB7.14	KNN, AGKNN	AGKNN, ANFIS with PSO	The existing KNN with AGKNN has higher efficiency and accuracy values and proposed method AGKNN and ANFIS with Partical Swarm Optimization algorithm gives Accuracy and error rate to 99.8 and 0.2 respectively.
5	SriDeivannai Nagarajan, RM.Chandrasekaran	Diagnosing Diabetes using data mining Techniques-NOV-2015	WEKA	SVM, Simple Cart algorithm	Naïve Bayes, DT	The existing SVM and Simple Cart Algorithm gives the Accuracy and error rate to 99.6 and 0.4.The proposed algorithm is Potential Diabetic Classifier algorithm given Accuracy and error rate is 99.8 and 0.2 respec-

						tively.
6	Tarig Mohamed ahmed	Using Data mining to Develop model for classifying diabetic patient control level based on historical medical records-MAR-2016	WEKA	SVM	Naïve Bayes,Logistic,J48	Proposed logistic algorithm gives accuracy to 74.4%
7	K.G.Nandakumar, T.Chritopher	Analysis of Liver and Diabetes dataset by using unsupervised two phase neural network technique-JULY-2016	MAT LAB	TPNN	TPNN, eTPNN, sTPNN	Three unsupervised Neural Network proposed models are TPNN,eTPNN,sTPNN.The increment process of neuron from 18 to 22 produce very less amount of variation in accuracy and the maximum achievement of accuracy, precision, recall, and F-measure of TPNN are 88%,0.92,0.537 and 0.676 respectively and sTPNN are 90%,0.96,0.548 and 0.696 respectively and eTPNN are 90%,0.92,0.533 and 0.667 respectively.
8	Ravi Sanakal T Jayakumari	Prognosis of Diabetes Using Data mining Approach-Fuzzy C Means Clustering and Support Vector Machine-May-2014.	MAT LAB	Support Vector Machine	Fuzzy C Means	The existing Support Vector Machine algorithm gives 59.5% accuracy and the Fuzzy C Means algorithm is 94.3%.
9	J. N. Mamman, M. B. Abdullahi ,A. M. Aibinu ,I. M. Abdullahi	Diabetes Classification Using Cascaded Data Mining Technique –April-2015	WEKA	ANN K-Means	K-means clustering ANN	Artificial intelligent Technique is used in K-Means clustering with ANN algorithm and ANN-K-Means to get comparative best and Low accuracy, specificity, sensitivity, and precision and results 99.20%, 90,100, 99.08 and 97.45, 91.43, 100, 96.51 respectively.
10	P. Suresh Kumar, V. Umatejaswi	Diagnosing Diabetes using Data Mining TechniquesJUNE-2017	WEKA	K-Means	Naïve bayes,C4.5	The Risk level accuracy is predicted and compared in Naïve Bayes and C4.5 and produced best accuracy and error rate is 90.9 %, 0.091 and 100% respectively.

Table 3: Iii.Algorithm Used in Existing Research Works

ALGORITHM	OPERATION	STATUS	ALTERNATIVE	RESULTS
Fuzzy Logic set, DT[13]	Accuracy, Sensitivity	Efficiency	C4.5	100/78.79
J48[6]	Accuracy	Detection	KNN	73.8/76.3
Naïve Bayes, J48[7]	Performance	Detection	DT	76.30/73.69
Particle Swarm optimization[5]	Accuracy, Sensitivity	Detection	ANFIS	99.8
Naïve Bayes,J48[2]	Accuracy	Avoid	SVM	79.56/76.95
Naïve Bayes[4]	Accuracy	Avoid	SVM	99.2/99.6
Naïve Bayes, Logistic[3]	Accuracy	Detection	KNN	74.4/56.7
TPNN, eTPNN, sTPNN[8]	Accuracy, Sensitivity	Detection	ANN	88/90/90
FCM[1]	Accuracy	Detection	SVM	59.5/95.7
ANN-K-Means[15]	Accuracy	Avoid	K-Means ANN	99.20/97.5
Naïve bayes, C4.5[12]	Accuracy	Detection	K-Means	90.9/100

Various algorithms and applications which are used by many research experts are précised in the above table 3 to get best algorithm for finding the accuracy, specificity, and error rate in diabetes patient's results and the best are J48, Naïve Bayes, and AGKNN algorithms.

3. Discussion

It is obvious from the literature that the Accuracy, sensitivity, specificity, error rate, was decided by the dataset taken from diabetic patients. Efficient algorithms, Tools or Simulation models improve the Accuracy of the classification and prediction. Majority of the research works in health care system had been used the 'WEKA Tools' for their implementation; subsequently they obtained the better results followed by the implemented using MATLAB. Naïve bayes was frequently used and popular algorithm to classify and predict in the ground of health care. The Next most used algorithm is J48. The high level of accuracy has been produced using Naïve bayes algorithm.

4. Conclusion

In order to scrutinize the better classification algorithm to predict diabetes in health care system, related research papers have been gathered. This study shows that the best part of using Tools and algorithms. In this respect we concluded that the WEKA Tools and Naïve Bayes algorithm gives the better accuracy in the countryside of health care system. A further study is under progress to implement with actual dataset of researchers research work. Appearance of comprehensive algorithms and tools will be presented in upcoming paper.

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