

DESIGN OF BREATH ANALYSIS TO PREDICT DIABETIC USING NEURO FUZZY LOGIC

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ABSTRACT: Diabetes is an extremely basic ailment these days among the general population of all age gatherings and has turned into a noteworthy medical issue. With the ascent in instances of diabetic patients there is a need of a solid and exact framework that can determine the diabetes to have an extraordinary precision at its beginning time. The medicinal determination of infection includes the examples of recognizable side effects and the consequence of finding reports of test. Be that as it may, different expenses and dangers are related with these tests. Different strategies and diverse frameworks have been proposed by the analysts to analyze the diabetes, however the precision and productivity of the forecast of diabetes isn't so noteworthy. Human breath investigation is an extremely encouraging strategy for ailment location due to non-obtrusiveness and basic symptomatic techniques, particularly for diabetes mellitus whereby a day by day observing of blood glucose is required. For this analysis many types of parameters of acetone levels are taken into consideration and classified according to the label type 1 and type 2 diabetic. This exploration has done to propose a snappier and more productive method for diagnosing the ailment, prompting auspicious treatment of patients. My research work vitally concentrated on analyzing diabetic in patient by using Neuro Fuzzy logic with determination of blood glucose implemented using Matlab to obtain more accuracy level with the result of 96%. The research hopes to propose a quicker and more efficient technique of diagnosing the disease leading to timely treatment of the patients.

Key Words: Diabetes, Neuro Fuzzy, Blood glucose

1. INTRODUCTION TO DATA MINING

Data sizes are for the most part developing from everyday. The need to see huge, complex, data improved informational collections has now expanded in all the shifted fields of innovation, business and science. With these a lot of information, the capacity to remove valuable learning covered up in these a lot of information and to follow up on the learning is winding up progressively critical in the present focused world. The way toward applying PC based data framework (CBIS), including new systems, for finding learning from information is called information mining. Information mining is the way toward dealing with expansive informational indexes to distinguish designs and build up connections to tackle issues through information investigation. Information mining devices enable endeavors to foresee future patterns.

1.1 DATA MINING PROCESS

Information mining standards have been around for a long time, be that as it may, with the appearance of enormous information, it is significantly more predominant. Huge information caused a blast in the utilization of more broad information mining procedures, halfway on the grounds that the span of the data is significantly bigger and on the grounds that the data will in

general be more changed and broad in its exceptionally nature and substance. With vast informational collections, it is not any more enough to get moderately basic and direct insights out of the framework. With 30 or 40 million records of point by point client data, realizing that two million of them live in one area isn't sufficient.

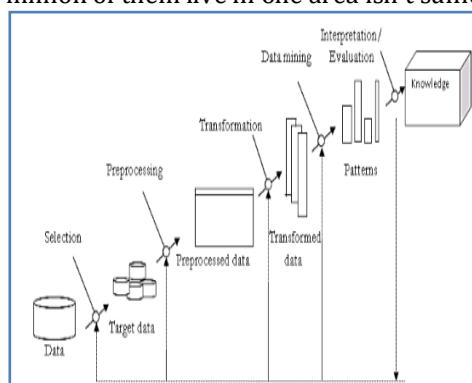


Figure 1: Data Mining Process

The steps in the process are:

1. Business Understanding: Understand the venture goals and necessities from a business point of view, and afterward convert this learning into information mining issue definition and a starter plan intended to accomplish the targets.

2. Data Understanding: Start by gathering information, at that point get comfortable with the information, to recognize information quality issues, to find first experiences into the information, or to identify fascinating subsets to shape speculations about shrouded data.
3. Data Preparation: Includes all exercises required to develop the last informational index (information that will be bolstered into the demonstrating device) from the underlying crude information. Undertakings incorporate table, case, and trait determination and additionally change and cleaning of information for displaying devices.
4. Modeling: Select and apply an assortment of demonstrating strategies, and adjust device parameters to ideal qualities. Commonly, there are a few methods for similar information mining issue type. A few procedures have particular prerequisites on the type of information. Hence, venturing back to the information planning stage is regularly required.
5. Evaluation: Thoroughly assess the model, and audit the means executed to develop the model, to be sure it appropriately accomplishes the business goals. Decide whether there is some vital business issue that has not been adequately considered. Toward the finish of this stage, a choice on the utilization of the information mining results is come to.
6. Deployment: Organize and present the consequences of information mining. Organization can be as basic as producing a report or as mind boggling as actualizing a repeatable information mining process.

2. PROPOSED SYSTEM

Diabetes is a sickness which is influencing Diabetes is where the body is unequipped for legitimate use of glucose and one that, if not appropriately oversaw, can prompt basic sickness. The majority of research is occurring here. In this paper, we proposed a model to take care of the issues in existing framework in applying information mining methods to be specific bunching and arrangements which are connected to analyze the sort of diabetes and its seriousness level for each patient from the information gathered. With the ascent of data innovation and its proceeded with coming into the medicinal and human services part, the instances of diabetes and

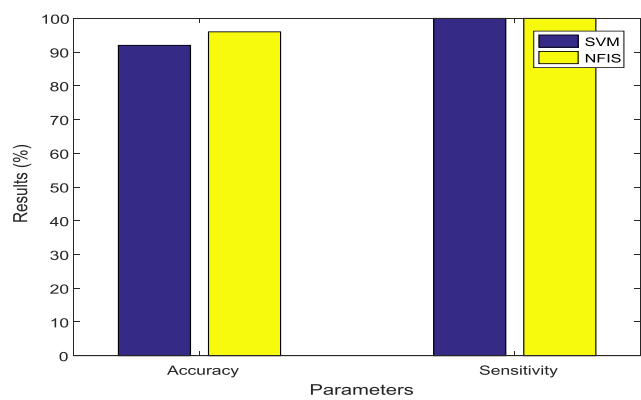
also their manifestations are very much reported. In this paper Neuro-fuzzy rationale calculations, have been utilized to make the model for determination. Neuro-fuzzy derivation framework for analysis of diabetes infection. By dissecting the acetone, acetone is a breathed out unpredictable natural exacerbate that has been utilized as a biomarker for diabetes mellitus, particularly in sort 1 diabetes mellitus. The acetone that is created goes through the blood and is discharged through pee, sweat as well as breathed out breath. For the breathed out breath, it as been discovered that the segment coefficient is 330 sections in the blood for each one section that leaves with lapsed air. It has been discovered that evaluation of acetone focus in human breath, utilizing breath investigation method.

3. RESULTS AND DISCUSSION

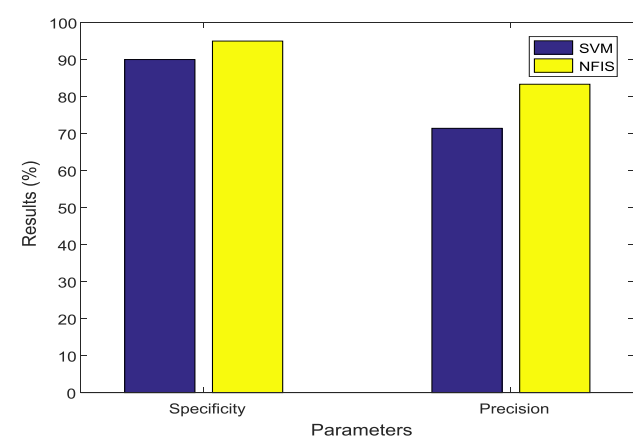
The capacity to analyze diabetes early assumes a critical job for the patient's treatment procedure. For the reason for experimental dataset is downloaded from UCI machine learning dataset store of Diabetes. The dataset URL is archive.ics.uvi.edu/ml/dataset the World Health Organization proposed the nine characteristics. In the wake of choosing the information parameter, the following stage is to set up the preparation dataset. The readied dataset will go about as contribution for the fluffy standard based framework to prepare the framework for the finding of diabetes and produce the outcome. The datasets utilized in this paper is appeared in the Table 1.

Fuzzy Input Variables	Linguistic Variables	Fuzzy Triangular numbers
Glucose	Low	[56 100 125]
	Medium	[68.2 117 145]
	high	[109.9 146 198]
INS	Low	[0 55.11 87.67]
	Medium	[63.63 98.42 191.6]
	high	[95.34 188.3 586]
BMI	Low	[18 22 30.8]
	Medium	[31.01 37.01 45.01]
	high	[36.43 44.43 67]
DPF	Low	[0.085 0.5322 1.132]
	Medium	[0.547 1.03 1.717]
	high	[1.09 1.476 2.4]
Age	Young	[25 25 26]
	Medium	[25 26 27]
	Old	[26 27 30]
Urine	Low	[0.5 50 800]
	Medium	[500 1300 2000]
	high	[1500 2500 5000]
DM	Very Low	[0 0.1 0.2]
	Low	[0.1524 0.2524 0.3]
	Medium	[0.287 0.3333 0.3997]
	High	[0.355 0.623 0.762]
	Very High	[0.731 0.831 1]

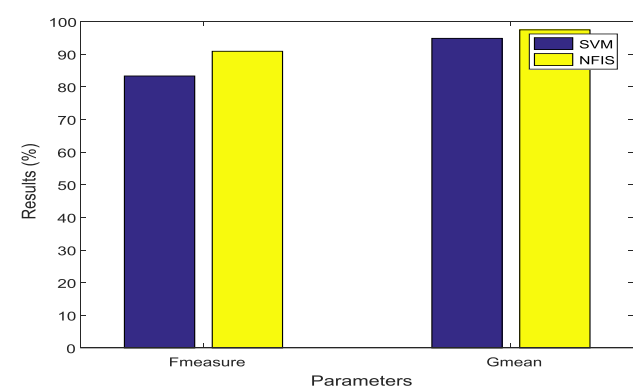
ACCURACY COMPARISON



PRECISION COMPARISON



RECALL COMPARISON



CALCULATION

SL.NO	EXISTING	PROPOSED
1.Accuracy	92	96
2.Sensivity	100	100
3.Specification	90	95
4.Precision	71.4286	83.3333
5.FMeasure	83.3333	90.9091
6.Gmean	94.8683	97.4679

CONCLUSION AND FUTURE WORK

Diabetes is an infection that happens when the insulin generation in the body is lacking or the body can't utilize the delivered insulin in a legitimate way accordingly, this prompts high blood glucose. The body cells separate the sustenance into glucose and this glucose should be transported to every one of the cells of the body. Diabetes is a noteworthy issue influencing a great many individuals today and whenever left unchecked can make tremendous ramifications on the wellbeing of the populace. In these theory Neuro fluffy rationale calculations, has been actualized for analysis of diabetics. Neuro-fluffy surmising framework for finding of diabetes illness gives a superior investigating model. By examining the acetone, acetone is a breathed out unstable natural intensify that has been utilized as a biomarker for diabetes mellitus, particularly diabetes. The acetone that is created goes through the blood and is discharged through pee, sweat or potentially breathed out breath. For the breathed out breath it has been discovered that the parcel coefficient in the blood for each one section that leaves with lapsed air. It has been discovered that measurement of acetone fixation in human breath, utilizing breath examination method. The advantage applying neuro fluffy rationale is that exactness of expectation rate will be higher than a large portion of the proposed framework for anticipating the event of diabetes. In future it is wanted to accumulate the data from various regions over the world and make a more exact and general farsighted model for diabetes end. Future examination will in like manner center on social affair data from a later era and find new potential prognostic components to be fused. The work can be broadened and enhanced for the computerization of diabetes examination.

REFERENCES

1. Baylis, P., 1999. Better health care with data mining. SPSS White Paper, UK, pp. 1–8.
2. Beale, T., Heard, S., Kalra, D. & Lloyd, D., 2006. OpenEHR architecture overview. The OpenEHR Foundation.
3. Bellazzi, R. & Zupan, B., 2008. Predictive data mining in clinical medicine: current issues and guidelines. *Int J Med Inform*, Feb, 77(2), pp. 81–97.
4. Canlas Jr, R. D., 2009. Data Mining in Healthcare: Current Applications and Issues. [MS in Information Technology thesis].
5. Hall, M. et al., 2009. The WEKA data mining software: an update. *ACM SIGKDD explorations newsletter*, 11(1), pp. 10–18.
6. Chen, H., Fuller, S. S., Friedman, C. & Hersh, W., 2006. Medical informatics: knowledge management and data mining in biomedicine. s.l.: Springer.
7. Houston, A. L. et al., 1999. Medical data mining on the internet: Research on a cancer information system. *Artificial Intelligence Review*, 13(5–6), pp. 437–466.
8. K. G. M. M. Alberti and P. f. Zimmet, "Definition, diagnosis and classification of diabetes mellitus and its complications. part 1: diagnosis and classification of diabetes mellitus. Provisional report of a who consultation," *Diabetic medicine*, vol. 15, no. 7, pp. 539–553, 1998.
9. B. Tripathy, H. B. Chandalia, and A. K. Das, *RSSDI textbook of diabetes mellitus*. JP Medical Ltd, 2012.
10. Evans JMM, Newton RW, Ruta DA, MacDonald TM & Stevenson RJ 1999 Frequency of blood glucose monitoring in relation to glycaemic control: observational study with diabetes database, *BMJ* 319, 83-86.
11. Righettoni M, Schmid A, Amann A, Pratsinis SE, 2013, Correlations between blood glucose and breath components from portable gas sensors and PTR-TOF-MS, *Journal Of Breath Research*, 7(3), 037110.
12. Saraoğlu HM, Koçan M, Determination of diabetic blood glucose value from breath odor using QCM sensor based electronic nose, Paper no. 5479766 from 2010 15th National Biomedical Engineering Meeting, Antalya, 21-24 April (2010).
13. Saraoglu HM, Selvi AO, Ebeoglu MA, Tasaltin, C, 2013, Electronic Nose System Based on Quartz Crystal Microbalance Sensor for Blood Glucose and HbA1c Levels From Exhaled Breath Odor, *IEEE Sensors Journal*, 13(11) 4229-4235.
14. S. F. Bamsaoud, S. Rane, R. Karekar, and R. Aiyer, "Nano particulate sno 2 based resistive films as a hydrogen and acetone vapour sensor," *Sensors and Actuators B: Chemical*, vol. 153, no. 2, pp. 382–391, 2011.
15. Wang, C.; Sahay, P. Breath analysis using laser spectroscopic techniques: Breath biomarkers, spectral fingerprints, and detection limits. *Sensors* **2009**, 9, 8230–8262.
16. Kalpana, M.; Kumar, A.S. Fuzzy expert system for diabetes using fuzzy verdict mechanism. *Inter. J. Adv. Netw. Appl.* **2011**, 3, 1128–1134.
17. Mishra, P.; Singh, D.; Rana, N.; Sengar, S. Clinical decision support system for diabetes disease diagnosis. *Int. J. Eng. Res. Appl.* **2014**, EE19, 105–110.
18. Hische, M. et al, Decision trees as a simple-to-use and reliable tool to identify individuals with impaired glucose metabolism or type 2 diabetes mellitus. *Eur. J. Endocrinol.* 2010.
19. Allam, F.; Nossair, Z.; Gomma, H.; Ibrahim, I.; Abdelsalam, M. Blood glucose regulation using a neural network predictor with a fuzzy logic controller.

20. Ke Yan, David Zhang, "Design of a Breath Analysis System for Diabetes Screening and Blood Glucose Level Prediction" DOI 10.1109/TBME.2014.2329753, IEEE.
21. Lokender Yada , "Non-Invasive Biosensor for Diabetes Monitoring", IDOSI Publications, 2014 DOI: 10.5829/idosi.wjms.2014.11.1.83126.
22. Tejashri N. Giri, "Prognosis of Diabetes using Neural Network, Fuzzy Logic, Gaussian Kernel Method", IJCA Volume 124 – No.10, August 2015.
23. Valentine Saasa, "Sensing Technologies for Detection of Acetone in Human Breath for Diabetes Diagnosis and Monitoring", MDPI, Diagnostics 2018, 8, 12; doi:10.3390/diagnostics8020012.
24. Catherine Todd, "Towards Non-Invasive Extraction and Determination of Blood Glucose Levels", Bioengineering 2017, 4, 82; doi:10.3390/bioengineering4040082.
25. Karabpour SAMIRA, "A New Artificial Intelligence Method for Prediction of Diabetes Type2", Bulletin de la Société Royale des Sciences de Liège, Vol.85, 2016, p. 376 – 391.
26. Valentine Saasa, "Sensing Technologies for Detection of Acetone in Human Breath for Diabetes Diagnosis and Monitoring", MDPI, Diagnostics 2018, 8, 12.
27. Anand Thati, "Breath Acetone-Based Non-Invasive Detection Of Blood Glucose Levels", IJSSIS Published: June 1, 2015
28. P. Suresh Kumar, " Diagnosing Diabetes using Data Mining Techniques", International Journal of Scientific and Research Publications, Volume 7, Issue 6, June 2017.
29. Faroz Borkar, " Diabetes Detection System Using E-Nose: A Literature Survey", IJRESM, Volume-1, Issue-10, October-2018
30. C. Walton, "The use of a portable breath analysis device in monitoring type 1 diabetes patients in a hypoglycaemic clamp: Validation with SIFT-MS data", 2013.
31. S. Kumari and A. Singh, "A Data Mining Approach for the Diagnosis of Diabetes Mellitus", Proceedings of Seventh international Conference on Intelligent Systems and Control, 2013, pp. 373- 375.
32. C. M. Velu and K. R. Kashwan, "Visual Data Mining Techniques for Classification of Diabetic Patients", 3rd IEEE International Advance Computing Conference (IACC), 2013.
33. Sankaranarayanan.S and Dr Pramananda Perumal.T, "Predictive Approach for Diabetes Mellitus Disease through Data Mining Technologies", World Congress on Computing and Communication Technologies, 2014, pp. 231-233.
34. Mostafa Fathi Ganji and Mohammad Saniee Abadeh, "Using fuzzy Ant Colony Optimization for Diagnosis of Diabetes Disease", Proceedings of ICEE 2010, May 11-13, 2010.
35. T.Jayalakshmi and Dr.A.Santhakumaran, "A Novel Classification Method for Diagnosis of Diabetes Mellitus Using Artificial Neural Networks", International Conference on Data Storage and Data Engineering, 2010, pp. 159-163.
36. Me.R.Vijayamadheswaran,Dr.M.Arthanari" Detection of Diabetic Retinopathy Using Radial Basis Using Radial Basis Function" International journal innovative technology and creative engineering vol 1,pp 40-47, Jan 2011
37. K.Rajeshwari,VVaithiyanthan "Fuzzy Based Modeling for Diagnostic Decision Support Using Artificial Neural Network" IJCSNS April 2011
38. Ali adeli,MehdiNeshat "A Fuzzy Expert System for Heart Disease Diagnosis" IMECS ,vol 1,March 2010
39. Bum JuLee,Boncho Ku "Prediction of Fasting Plasma Glucose Status Using Anthropometric Measures For Diagnosing TYPE 2 Dibetes"IEEE journal of Biomedical and Health informatics vol 18 March 2014
40. K kalaiselvi G. m Nasira "A new approach of diagnosis of Diabetes and prediction of cancer using ANFIS",IEEE
41. A.M.Aibinu,M.J.E Salami and A.A.Shafie, "application of modeling Technique to diabetes Diagnosis" IEEE trans Biomed engineering,pp 194-198.2010
42. AdemKarahoca,dilekKarahoca and Ali Kara "Diagnosis of diabetes using Adaptive Neuro fuzzy interference" IEEE trans 2009 .
43. Chang shing Lee and Mei-Hui Wang "a fuzzy Expert system for diabetes decision support application",IEEE trans vol 41,pp 139-153,2011.
44. Asha Gowdak aregowda,M.A.Jayaram , "Integrating Decision tree and ANN for categorizationof diabetes data" International Conference on Computer Aided Engineering December 13-15,2007 Chennai, India.
45. Humar K R Novruz "design of hybrid system for the diabetes and heart diseases" expert system with application 2008.
46. R.deepa ,S.Vaishnavi, " A Survey on Data Mining Methods and Its Applications" in International Journal of Advance Engineering and Research Development.
47. R.deepa ,S.Vaishnavi "A Paper on Hadoop File System(HDFS), Big data and Map Reduce" in International Journal of Creative Research Thoughts.