ANALYSIS OF DIABETES DIAGNOSIS USING ARTIFICIAL INTELLIGENCE

Yagnasri Ashwini,School of Engineering, Anurag Universisity.

Dr.G.Vishnu Murthy,School of Engineering

ABSTRACT:

Diabetes mellitus, a frequent metabolic status characterized by high blood sugar levels, represents a global health challenge. Early and accurate diagnosis is necessary for effective handling and prevention of complications. Recently, artificial intelligence (AI) has emerged as a valuable resource to increase the clinical process of diabetes. This review article compiles original research articles that focus on the use of artificial intelligence in predicting diabetes mellitus. The selected articles were thoroughly examined and those relevant to disease diagnosis or prediction were included in the analysis. Eventually, 34 articles were included in the study. Various artificial intelligence algorithms and models, such as Support Vector Machine, Decision Tree, Naïve Bayes, k-Nearest Neighbors, Random Forest, Logistic Regression, and Artificial Neural Networks, have proven to be the most effective forecast models for diabetes. Early diagnosis of diseases is beneficial for the prevention and handling of chronic conditions. Such predictions can be achieved using artificial intelligence. AI can significantly increase the accuracy of diabetes diagnosis by assessing the most widespread risk factors associated with diabetes mellitus.

Keywords: type 2 diabetes; artificial intelligence; machine learning; ML; AI; deep learning.

INTRODUCTION:

Diabetes mellitus, a frequent metabolic status characterized by high blood sugar levels, represents a global health challenge. Early and accurate diagnosis is necessary for effective handling and prevention of complications. Recently, artificial intelligence (AI) has emerged as a valuable resource to increase the clinical process of diabetes. This review article continues to move on to artificial intelligence. Trying to meet it within a strict definition reduces the goals of this analysis. We propose a more expanding approach to AI by using the Char-Caturtha bees established by Russell and Norvig. This structure distinguishes AI with a horizontal axis such as human intelligence (descriptive perspective) versus rational intelligence (standard perspective), and as an argument like trade with the vertical axis. As a result, the IV provides the system for the organization and connection of various elements associated with AI, while also including techniques such as assistance, which usually do not use AI techniques as machine learning. Diabetes is defined by the blood sugar level produced by different underlying conditions. We will focus on three primary types: Type 1 diabetes (T1D), an autoimmune position that destroys insulin-producing cells, resulting in insulin deficiency; Type 2 diabetes (T2D), a progressive disorder characterized by increasing insulin resistance and reducing insulin secretions; and gestational diabetes, which occurs during pregnancy and is usually solved after birth. Poorly controlled diabetes increases the risk of complications and mortality.

Although the American Diabetes Association (ADA), a fourth type, accepts secondary diabetes, this review will focus on T1D and T2D as they are the most common forms.AI provides a promising approach to predict drug responses due to many important factors. Traditional methods for assessing drug responses often depend on limited data sets and simple regression models, which

cannot capture the complex interaction between factors affecting the results of the treatment. In addition, these traditional approaches focus on a limited selection of variables, possibly individual patients ignore their reactions on significant insights and treatment in the profile.

However, with the progression of AI, especially through machine learning algorithms, it is an important opportunity to use extensive data sets, including electronic health records (EHR), genomic information and real patient data. Artificial intelligence (AI) facilitates more intensive analysis at the same time by assessing different variables and confused factors. By analyzing data in an overall way and highlighting complex patterns in a series of information sources, AI can increase our understanding of the drug response mechanism. AI usually includes a wide range of technologies and functions aimed at creating a system capable of performing functions associated with human intelligence. In the healthcare system, AI applications have been employed in patient data, future conversation, clinical decision -making, diagnosis and handling of personal medicine. AI includes different techniques, including machine learning (ML) and deep learning (DL), two remarkable things. ML focuses on developing systems as a teacher of data, recognizing patterns and making informed decisions. On the other hand, DL is a special form of ml that draws inspiration from the structure and function of the brain, especially nerve networks. These models learn from data autonomously and can be compatible with different properties. Leading methods that lead to predictive modeling are artist conditional techniques, such as Random Forest (RF) and Shield Boosting Machines. These get a stronger overall prediction to getting predictions from many models overall. They reduce overfeating and increase reliability by taking advantage of the diversity of individual models. Different basic students are achieved through training on different data or appointing separate algorithms before integrating their predictions.

Diabetes is a versatile condition characterized by various causes, different manifestations and many complex factors. Efficient management monitoring and treatment strategies require an expansion matrix. Artificial Intelligence (AI) presents a promising avenue: 1. Innovative data source: Portable technology provides personal information to suit individual requirements and demographics. 2. Scalable infrastructure: Cloud computing supports the analysis of extensive data sets. 3. Progress in machine learning: Advanced algorithms facilitate the development of new equipment for diabetes research and control.

Researchers examine AI applications through hard work:

- Identification of risk factor: Identify predetermined persons for diabetes.
- Diagnosis: Increase the accuracy and speed of detection of diabetes.
- Understand pathophosiology: to gain insight into the disease system and its progress.
- Disease management: Prepare personal treatment strategies and monitoring methods. There are important achievements such as diabetes retinopathy and AI-operated detection of a dense loop insulin delivery system for type 1 diabetes. Nevertheless, the current literature mainly emphasizes optimal landscapes with high-quality structured data.

Many challenges remain:

1) Data quality and adequacy: Limited studies address these important concerns, although some AI techniques (e.g. deep education) require much more data than others.
2) Data Representation: Many studies depend on genetic sequencing and clinical information; consumer units induce inquiries about the possibility of equal results when using data.
3) Unnecessary data: Some studies try to analyze unnecessary information, such as doctors, that can gain valuable insight.
4) Unbalanced data: Learning from data sets with uneven class distribution is a challenge. Evaluation matrix such as AUC, sensitivity and specificity may require change for unbalanced data sets.
5) Model Transplicity: Research often uses small, located datasets and questions about the purpose of the model designed for other populations.

Related Works:

Recently, various techniques have been used to predict the disease, including the decision-making trees, innocent Baysian classifications, Support Vector Machines, random forest, many linear regressions, artificial nervous networks, boosting and posing algorithms, logistics regression and K-nickels. The initial stage of diseases is important for the prevention and handling of chronic conditions such as diabetes, cancer, heart disease and chronic kidney disease. Therefore, the purpose of this study is to review and evaluate the existing literature on the development of diabetic risk prediction models using artificial intelligence in India. In this research, the original articles focusing on artificial intelligence were collected to predict diabetes mellitus type 2. A systematic discovery was performed in databases such as PubMed, Medline, Google Scholar and Science Direct. The search using 'artificial intelligence', 'risk of diabetes', 'diabetes prediction of single n' and 'prediction model for diabetes'. The articles collected were carefully examined and relevant studies were included in the analysis.

The study included articles that met the following criteria: 1) Published in colleagues implemented magazines, 2) 18 years participants from both sexes, and 3) use artificial intelligence to predict type 2 diabetes. A total of 700 abstract and original articles were reviewed globally, resulting in 34 articles in the final study. In this literature review, we identified Pubmed, Scopus, Google Scholar and 659 science articles. Then 305 articles were excluded based on their titles. A total of 354 essence was assessed, which led to a boycott of 218 articles based on his abstraction. Finally, 136 full articles were reviewed, with 102 articles excluded due to function, and predicting algorithms and statistical results. Finally, this research analyzed 34 Indian articles focusing on the development of the prediction algorithm for type 2 diabetes.

Table 1: Details of eligible articles

Sr.no.	Study (First Author)	Year	Data Source	Sample size	No. of attribute	Highest Accuracy	Highest Accuracy Model
1	Rajeeb Dey[8]	2008	Manipal Institute of Medical Sciences Hospital,	530	6	93%	ANN
2	Sonu Kumari[9]	2012	Survey	100	13	93%	ANN
3	Ms. Divya[10]	2013	PIDD	768	8	Sen=88%	ANN
4	V. Anuja Kumari[11]	2013	PIDD	460	8	78%	SVM
5	Ayush Anand[12]	2015	Self-Collected	180	6	75%	CART
6	Veena Vijayan V[13]	2015	PIDD, Self-Generated for	768,200	8,	81%	Adaboost
7	S. Selvakumar[14]	2017	PIDD	100	7	80%	KNN
8	P. Suresh Kumar[15]	2017	Diagnosis Lab located in Warangal, India	650	14	99%	RF
9	N. Yuvaraj16	2017	National Institute of Diabetes	75664	7	94%	RF
10	Vaishali R17	2017	PIDD	768	8	83%	MOE NSGA II fuzzy
11	Deepti Sisodia18	2018	PIDD	768	8	76%	NB
12	Suyash Srivastava19	2018	PIDD	768	8	92%	ANN
13	Debadri Dutta20	2018	PIDD	262	7	84%	RF
14	N. Sneha21	2019	archive.ics.uci.edu secondary data	2500	15	78%	SVM
15	Aishwarya Mujumd	2019	Data Collected, PIDD	800	10	96%	LR

16	Jatin N Bagrecha 23	2019	PIDD	768	8	84%	CNN
17	P. Prabhu24	2019	PIDD	768	8	81%	DBN
18	Huma Naz25	2020	PIDD	768	8	99%	DL
19	Neha Prerna Tiggaa26	2020	Self-collected/ generated, PIDD	952 Self, 768(PIDD)	16	93%	RF
20	Mitushi Soni27	2020	PIDD	768	8	77%	RF
21	Abdulha kim Salum	2020	PIDD	768	8	90%	SVM
22	Jitranjan Sahoo29	2020	PIDD	768	8	79%	LR
23	Naveen Kishore G30	2020	PIDD	768	8	75%	RF
24	S. Thenapp an31	2020	PIDD	768	8	97%	SVM
25	P. Nagaraj3	2021	PIDD	768	8	98%	Enhanced SVM, DNN
26	Namrata Nerkar33	2021	PIDD	768	8	85%	ANN
27	R. Usharani 34	2021	PIDD	768	8	79%	LR
28	Satish Kumar Kalagotl	2021	PIDD	639	8	80%	Stacking
29	Radhanat h Patra36	2021	PIDD	768	8	83%	KNN
30	T. Madhuba la37	2022	PIDD	768	8	79%	ANN
31	SalliahSh afi Bhat38	2022	Self-collected/ generated	403	11	98%	RF

Results

A total of 34 original research articles were identified in a literature review related to prediction of diabetes using artificial intelligence among patients with Indian diabetes. Pima Indian diabetic datasets contain data from female patients, including a sample size of n = 768, with 500 patients classified as non-matched and 268 diabetes. This dataset has 9 functions. N. Yuvraj et al. A study focusing on prediction of diabetes was published, which uses secondary data from the National Institute of Diabetes with the size of N = 75664 and 7 properties. He used different models, including support vector machine Navie bays, decision trees, random forests and neural networks to predict diabetes, which receive the highest accuracy of 94% with random forest models. Rajib de et al. By using 6 properties to develop a prediction model for type 2 diabetes mellitus, collected data from 530 patients at the Manipal Institute of Medical Sciences in Sikkim. He implemented an artificial nerve network (Ann) model and reported a prediction accuracy of 93%. Aishwarya mujumdar et al. Used many algorisms including data collected from 800 patients, including 10 functions, and randomly one classifies, decision-making classifies, extra trees classify, adbost, Perceptron, Liney Discriminating Analysis, Logistics Region, K-Nirestest Neighbors, Gausian Nayes Beyas, Posing, Posing and Gradient. He stated that the logistics regionalgorithm got the highest accuracy of 96%. Neha Preena begga et al. Developed a prediction model based on PIMA Indian datasets. The diabetes database, with a self-composed database, acquires the highest accuracy of 93% with a random forest algorithm, using 16 prophets in its model. In 2012, Sonu Kumari et al. Published a study based on a dataset with 100 patients, including 13 prophet variables, age, weight this year, weight in kilos, height in legs, weight loss, increase in thirst, increased appetite, increased appetite, nausea, fatigue, vomiting, bladder-vaginal infection and blur.

Implemented an artificial nerve network (AN) and achieved a prediction accuracy of 92.80%. Ayush Anand et al. Developed a prediction model using a dataset with 180 patients, including 6 risk counselors such as eating habits, sleep habits, physical activity, BMI and waist circumference within their classification and regression three models, which achieved accuracy of 75%. A total of 25 researchers created PIDD -based prediction models, where the AN model performs the highest accuracy of 99%. Akash Shewani et al. Used pidding with a sample size of 1547, used simulation techniques to increase sample size. Debadri Dutta et al. Apart from the number of conceptions, only 7 predictions were assessed from the PID dataset of 262 patients, recognizing the random forest model as one with the highest accuracy. Neha Preena begga et al. Their forecasting models include a total of 16, the maximum number of variables in the total risk raises. In contrast, Ayush Anand et al. And Rajib de et al. Minimum 6 risk prophets are assessed. Author V. Anuja Kumari used data from 460 patients in his forecast model, except for the lack of values

and Outlars from PIDD, and a supporting vector used 78% accuracy when using a classifies. Some researchers who worked with Pidd chose to change the lack of values through respective prophets. It was noted that pidding had the lack of values for glucose levels, blood pressure, skin fold thickness, insulin and BMI, respectively with the highest lack of values registered for insulin and skin folding thickness at 374 and 227 respectively.

Risk Prediction model development includes various factors such as glucose levels, HbA1c, sleeping hours, serum creatinine, serum calium, smoking habits and types of jobs. The most commonly used prophetic models for diabetes include supporting vector machine, degeneration wood, naivetybeau, k-nearst neighbor, random forest, logistic region and artificial neural network (Ann). A total of 34 research articles of Indian literature were identified while addressing the development of risk condition models. Rajib de et al. Posted by, as the employee Ann model for his predictions, while the latest publication appeared in 2023. A total of seven total were published in 2020, in 2023, two additional articles were published through Artificial Intelligence.

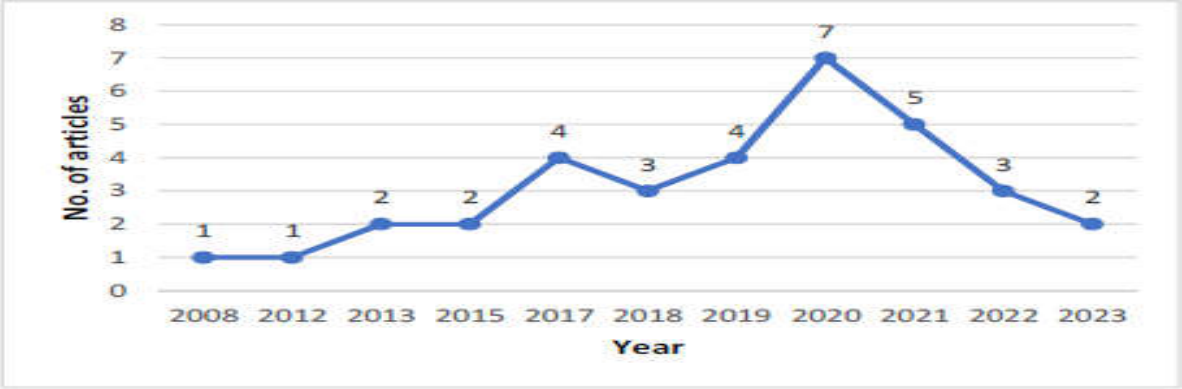

Figure 1: Year-wise publication on use artificial intelligence in prediction of type-2 diabetes

Conclusion

Prevention of initial stage disease is important for the prevention and handling of chronic diseases, and such predictions can be obtained by the use of artificial intelligence. AI can increase the accuracy of diabetes assumptions by analyzing prevailing risk factors associated with diabetes mellitus. Over the past decade, artificial intelligence has been used quickly to predict diabetes. Different researchers have used different models and algorithms for this purpose. Important factors known to contribute to diabetes include age, body mass index (BMI), high blood pressure, family history and folding thickness on the skin. It is estimated that this systematic review of diabetes mellitus prediction will also serve as a valuable resource for future research in this new field.

Reference

1. Dase RK, Pawar DD. Artificial Neural Network an Advanced Tool for Disease Diagnosis: A Review.

International Journal of Current Medical and Applied Sciences 2020; 27(1):14-18.
2. International Diabetes Federation, Diabetes around the world in 2021. Last accessed on 18 June 2023. https://diabetesatlas.org/#:~:text=Diabetes%20around%20the%20world%20in%202021%3A,%20and%20783%20million%20by%202045
3. Pradeepa R, Mohan V. Epidemiology of type 2 diabetes in India. Indian Journal of Ophthalmology 2021;69: 2932-8.
4. TIMES OF INDIA.COM. Why India is diabetes capital of the world. Times Of India. 2022, November 14. https://timesofindia.indiatimes.com/india/why-india-is-diabetes-capital-of-the-world/articleshow/95509990.cms
5. Beagley J, Guariguata L, Weil C, Motala AA. Global estimates of undiagnosed diabetes in adults. Diabetes Research and Clinical Practice 2014; 103:150-60.
6. Pima Indians Diabetes Database. Data. World. Available online at: https://data.world/data-society/pima-indians-diabetes-database (retrieved 03 Jun 2023).
7. Diabetes Key facts World Health Organisation 5 April 2023. Last accessed on 01 Sep 2023 https://www.who.int/news-room/fact-sheets/detail/diabetes
8. Dey R, Bajpai V, Gandhi G, Dey B. Application of artificial neural network (ANN) technique for diagnosing diabetes mellitus. Region 10 and the Third international Conference on Industrial and Information Systems. IEEE 2008:1-4.
9. Kumari S, Singh A. A data mining approach for the diagnosis of diabetes mellitus. 7th International Conference on Intelligent Systems and Control (ISCO) 2013; 373–375.
10. Ms. Divya, Chhabra RR, Kaur S, Ghosh S. Diabetes Detection Using Artificial Neural Networks & Back-Propagation Algorithm. International Journal of Scientific & Technology Research 2013; 2 (1):9-11.
11. V Anuja Kumari, R Chitra. Classification Of Diabetes Disease Using Support Vector Machine. IJERA 2013; 3(2): 1797-1801.
12. Vijayan VV, Anjali C. Prediction and diagnosis of diabetes mellitus — A machine learning approach. IEEE Recent Advances in Intelligent Computational Systems 2015;122–127.
13. Anand A, Shakti D. Prediction of diabetes based on personal lifestyle indicators. 1st International Conference on Next Generation Computing Technologies 2015: 673-676.
14. Selvakumar S, Kannan KS and Nachiyar GS. Prediction of Diabetes Diagnosis Using Classification Based Data Mining Techniques. International Journal of Statistics and Systems 2017; 12(2):183-88.
15. Kumar PS, Pranavi S. Performance analysis of machine learning algorithms on diabetes dataset using big data analytics. International Conference on Infocom Technologies and Unmanned Systems 2017: 508-513.
16. Yuvaraj N, Preethaa KR. Diabetes prediction in healthcare systems using machine learning algorithms on Hadoop cluster. Cluster Comput 2019; 22(S1) :1–9.
17. R. Vaishali, R. Sasikala, S. Ramasubbareddy, S. Remya, S. Nalluri. Genetic algorithm-based feature selection and MOE Fuzzy classification algorithm on Pima Indians Diabetes dataset. International Conference on Computing Networking and Informatics (ICCNI), 2017:1-5.
18. Sisodia D, Sisodia DS. Prediction of Diabetes using Classification Algorithms. Procedia Computer Science 2018; 132:1578–85.
19. Srivastava S, Sharma L, Sharma V, Kumar A et al. Prediction of Diabetes Using Artificial Neural Network Approach. Engineering Vibration, Communication and Information Processing Springer Nature Singapore Pte Ltd;2019: 679–87.
20. Dutta D, Paul D and Ghosh P. Analysing Feature Importances for Diabetes Prediction using Machine Learning. IEEE 9th Annual Information Technology, Electronics and Mobile Communication Conference 2018: 924-928.
21. N. Sneha, Gangil T. Analysis of diabetes mellitus for early prediction using optimal features selection. J Big Data 2019; 6(13) :1-19.
22. Mujumdar A, Vaidehi V. Diabetes Prediction using Machine Learning Algorithms. Procedia Computer Science 2019; 165: 292–9.
23. Bagrecha JN, Chaithra GS, Jeevitha S. Diabetes Disease Prediction using Neural Network.International Journal for Research in Applied Science & Engineering Technology 2019;7(4): 3888–93.
24. Prabhu P, Selvabharathi S. Deep belief neural network model for prediction of diabetes mellitus.3rd

International Conference on Imaging, Signal Processing and Communication 2019: 138-142.
25. Naz H, Ahuja S.Deep learning approach for diabetes prediction using PIMAIndian dataset. Journal of Diabetes & Metabolic Disorders 2020; 19: 391–403.
26. Tigga NP, Garg S. Prediction of type 2 diabetes using machine learning classification methods. Procedia Computer Science 2020;167: 706–716.
27. Soni M, Varma S. Diabetes Prediction using Machine Learning Techniques, IJERT 2020; 09(09): 921-25.
28. Hassan ASI Malaserene, A Anny Leema. Diabetes Mellitus Prediction using Classification Techniques. IJITEE 2020; 9(5): 2080-2084.
29. Sahoo J, Dash M, Patil A. Diabetes Prediction Using Machine Learning Classification Algorithms. International Research Journal of Engineering and Technology 2020; 07(08): 1664-69.
30. Kishore N, Rajesh V, Vamsi A, Reddy A, Sumedh K, Rajesh T. Prediction of diabetes using machine learning classification algorithms. International Journal of Scientific & Technology Research 2020; 9(01): 1805-08.
31. Thenappan S, Valan Rajkumar M, Manoharan PS. Predicting diabetes mellitus using modified support vector machine with cloud security. IETE Journal of Research 2022; 68(6): 3940–50.
32. Nagaraj P, Deepalakshmi P. Diabetes prediction using enhanced SVM and Deep Neural Network learning techniques: An algorithmic approach for early screening of diabetes. International Journal of Healthcare Information Systems and Informatics 2021; 16(4): 1–20.
33. Nerkar N, Inamdar V, Kajrolkar L, Barve R. Diabetes Prediction using Neural Network. International Research Journal of Engineering and Technology 2021; 08(02): 330-333.
34. Usharani R, Shanthini A. Neuropathic complications: Type II diabetes mellitus and other risky parameters using machine learning algorithms. Journal of Ambient Intelligence and Humanized Computing 2021:1-23.
35. Kalagotla SK, Gangashetty SV, Giridhar K. A novel stacking technique for prediction of diabetes. Computer Biology and Medicine 2021; 135:1-11.
36. Patra R, Khuntia B. Analysis and prediction of Pima Indian Diabetes Dataset using SDKNN classifier technique. ICRIET 2020; 1070(1): 012059.
37. Madhubala T, Umagandhi, Sathiamurthi. Diabetes Prediction using Improved Artificial Neural Network using Multilayer Perceptron. International Journal of Electrical and Electronics Engineering 2022; 9(12):167–79.
38. Bhat SS, Selvam V, Ansari GA, Ansari MD, Rahman MH. Prevalence and early prediction of diabetes using Machine Learning in North Kashmir: A case study of district Bandipora. Computational Intelligence and Neuroscience 2022:1-12.
39. Gupta H, Varshney H, Sharma TK, Pachauri N, Verma OP. Comparative performance analysis of quantum machine learning with deep learning for diabetes prediction. Complex & Intelligent Systems 2022; 8(4): 3073– 87.
40. Shewani A, Kaur N. Diabetes Classification and Prediction using Machine Learning Approach. IJCRT 2023;11(2): a682-87.
41. Singh Y, Tiwari M. A novel hybrid approach for detection of type-2 diabetes in women using lasso regression and artificial neural network. I. J. Intelligent Systems and Applications 2022;14(4):11–20.