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Improving Diabetic Patient Care Through Fuzzy Logic: A Comprehensive Approach

| Chapter | First Online: 20 May 2025

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Applications of Fuzzy Logic in Decision Making and Management Science

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Part of the book series: Information Systems Engineering and Management ((ISEM,volume 29))

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Abstract

Diabetes mellitus continues to pose a significant global health challenge, requiring creative strategies to improve patient care and treatment. This paper introduces a thorough framework that utilizes fuzzy logic to enhance the care of diabetic patients. Fuzzy logic, known for its capacity to manage imprecise and uncertain data, provides a promising solution for managing the intricate and ever-changing nature of diabetes care. The proposed approach encompasses various aspects of diabetic patient care, including risk assessment, treatment optimization, and lifestyle management. By integrating fuzzy logic with patient-specific data such as demographic information, medical history, and real-time physiological parameters, the framework facilitates personalized and adaptive interventions tailored to individual patient needs. Key components of the framework include fuzzy rule-based systems for decision support, fuzzy clustering techniques for patient stratification, and fuzzy inference systems for treatment adjustment. Furthermore, the framework continuously incorporates feedback mechanisms to refine and improve patient outcomes. Through a combination of simulation studies and real-world applications, this paper demonstrates the efficacy and feasibility of the proposed approach in enhancing diabetic patient care. By providing clinicians with intuitive decision support tools and By providing personalized self-management strategies, this extensive framework based on fuzzy logic has the potential to transform diabetes care, ultimately This leads to enhanced health results and a higher quality of life for patients worldwide.

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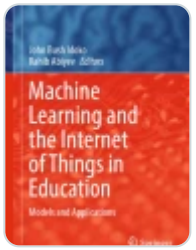

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References

1. Zadeh, L.A.: Fuzzy sets. Inf. Control 8(3), 338–353 (1965)

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2. Klir, G.J., Yuan, B.: Fuzzy Sets and Fuzzy Logic: Theory and Applications. Prentice Hall (1995)

Google Scholar

3. Ross, T.J.: Fuzzy Logic with Engineering Applications. Wiley (2004)

Google Scholar

4. Mamdani, E.H.: Application of fuzzy algorithms for control of simple dynamic plant. Proc. IEE **121**(12), 1585–1588 (1974)

Google Scholar

5. Jang, J.-S.R., Sun, C.-T.: Mizutani, ENeuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence. Prentice Hall (1997)

Google Scholar

6. Pedrycz, W., Gomide, F.: An Introduction to Fuzzy Sets: Analysis and Design. MIT Press (1998)

Google Scholar

7. AlDahoul, N., Omar, K., Singh, P.: Fuzzy logic based controller for insulin dosing in type 1 diabetes. Int. J. Adv. Comput. Sci. Appl. **5**(5), 83–89 (2014)

Google Scholar

8. Zhang, Y., Li, J.: Optimization of type-2 fuzzy logic systems for diabetes diagnosis using genetic algorithms. Int. J. Fuzzy Syst. **26**(1), 963–978. https://doi.org/10.1007/s40815-024-01036-5. (2024)

9. Kahn, S.E., Cooper, M.E., Del Prato, S.: Pathophysiology and treatment of type 2 diabetes: perspectives on the past, present, and future. The Lancet **368**(9549), 1768–1775 (2006)

Google Scholar

10. Inzucchi, S.E., Bergenstal, R.M., Buse, J.B., Diamant, M., Ferrannini, E., Nauck, M., Matthews, D.R.: Management of hyperglycaemia in type 2 diabetes, 2015: a patient-centred approach. Update to a position statement of the American diabetes association and the European association for the study of diabetes. Diabetologia **58**(3), 429–442 (2015)

Google Scholar

11. Franz, M.J., Boucher, J.L., Rutten-Ramos, S., VanWormer, J.J.: Lifestyle weight-loss intervention outcomes in overweight and obese adults with type 2 diabetes: a systematic review and meta-analysis of randomized clinical

trials. J. Acad. Nutr. Diet. **110**(5), 748–759 (2010)

Google Scholar

12. Wang, X., Zhang, Y., Sun, W., Tang, J., Cao, X., Wei, X.: (2016)

Google Scholar

13. Khaled, A., Abdullah, M.: (2017)

Google Scholar

14. Chen, J., Smith, R., Liu, Y., Wang, Q.: (2019)

Google Scholar

15. International Diabetes Federation. IDF Diabetes Atlas. 10th ed. Brussels, Belgium: International Diabetes Federation (2023)

Google Scholar

16. American Diabetes Association. Standards of Medical Care in Diabetes. Diabetes Care **47**(Suppl. 1), S1–S230 (2024)

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About this chapter

Cite this chapter

Dwivedi, S., Afaq, S.A., Faisal, M., Ghosh, I., Banerjee, S. (2025). Improving Diabetic Patient Care Through Fuzzy Logic: A Comprehensive Approach. In: Jana, S., Basu Mallik, B., Sarkar, A., Jana, C. (eds) Applications of Fuzzy Logic in Decision Making and Management Science. Information Systems Engineering and Management, vol 29. Springer, Cham. https://doi.org/10.1007/978-3-031-77719-6_18

.RIS .ENW .BIB

DOI
https://doi.org/10.1007/978-3-031-77719-6_18

Published
20 May 2025

Publisher Name
Springer, Cham

Print ISBN
978-3-031-77718-9

Online ISBN
978-3-031-77719-6

eBook Packages
Intelligent Technologies and Robotics
Intelligent Technologies and Robotics (R0)

Keywords

Diabetic patient care | Fuzzy logic | Glucose monitoring | Insulin dosing | Dietary recommendations | Risk stratification

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