Chapter 6
Use of Machine Learning and Artificial Intelligence in Diabetes

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ABSTRACT

Diabetes has become a common and endemic health problem worldwide. In the face of such a health problem, healthcare services seek help from technological developments to combat this disease. As in every field, Artificial Intelligence applications in healthcare are being discussed more and more every day. Among the most promising technological frontiers in healthcare is Machine Learning, a subset of Artificial Intelligence that can analyze vast amounts of data, identify patterns, and predict outcomes. Machine Learning has the potential to revolutionize diabetes management by providing valuable insights into patient health, informing treatment decisions, and predicting a person's risk of developing the disease in the future. Within the scope of this section, Artificial Intelligence and Machine Learning methods and their results used in research on early diagnosis, diagnosis and prediction of diabetes have been examined within the scope of literature review.

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INTRODUCTION

Diabetes is a chronic metabolic disease that develops due to insulin deficiency or disorders in the insulin action mechanism and occurs as a result of the body's inability to benefit from carbohydrates, fats and proteins at the desired level, requiring constant medical care (Göktaş and Karacaer, 2024). In 2021 Diabetes Atlas, the International Diabetes Federation (IDF) reports that 10.5% of the adult population (20-79 years old) has diabetes and almost half of them are unaware that they live with this disease. IDF estimates state that 1 in 8 adults, approximately 783 million, will live with diabetes, with an increase of 46% by 2045 (Yıldızhan and Ünlü, 2023). When the prevalence of diabetes in Turkey is examined, it is mentioned that the number of adults with diabetes, which was 3.5 million in 2011, will be 9 million in 2021 and this number corresponds to approximately 14.5% of the total adult population. It is predicted that the number of individuals diagnosed with diabetes in Turkey may reach 13.4 million in 2045 (Kır Biçer et al., 2024).

Many diagnoses in the field of medicine can be easily measured with bio-electrical signals or blood values taken from the human body as a result of developments in the field of electronics and informatics, and it allows interdisciplinary studies to be carried out in different fields. At this point, machine learning or Artificial Intelligence can establish the necessary contexts between points that have weak or high-level relationships with each other and can help to obtain new results from data sets. In this way, situations that cannot be seen directly with the eye and whose connections cannot be determined can be easily detected, patterns are established, and the process is accelerated. All these developments help many diseases and diagnoses in the field of health to be resolved in a shorter time and with a higher accuracy rate with Artificial Intelligence and Machine Learning Methods (Yılmaz et al., 2023).

Within the scope of this book chapter, some research examples covering the last 8 years (2017-2024) using Artificial Intelligence and Machine Learning Methods on the basis of Diabetes Mellitus were included and the research examples were analyzed within this framework.

Types of Diabetes Disorder

Diabetes is classified in four different types: Type 1 Diabetes, Type 2 Diabetes, Diabetes due to specific causes and Gestational Diabetes (Müjdeci and Şeker, 2024). Type 1 Diabetes is one of the most common diseases of childhood. It has a multifactorial etiology due to genetic, autoimmune, and environmental causes. It is a condition in which absolute insulin deficiency develops due to slow-going and lifelong damage to the beta (islet) cells in the pancreas. When more than 85% of beta cells are destroyed, a clinical picture occurs (Gülşen and Çelik Güzel, 2023).