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Artificial Intelligence Applications Used in the Prevention and Management of Complications of Diabetes Mellitus

Diyabetes Mellitus Komplikasyonlarının Önlenmesi ve Yönetiminde Kullanılan Yapay Zeka Uygulamaları

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ABSTRACT

Diabetes mellitus is a chronic endocrine-metabolic disease that requires regular medical follow-up and can cause microvascular and macrovascular complications due to carbohydrate, fat, and protein metabolism disorders caused by insulin deficiency or insulin resistance. Although most complications are preventable, their incidence is increasing every year. Technological advancements, particularly artificial intelligence, are increasingly employed in the prevention of diabetic complications, risk prediction, diagnosis, and treatment. The integration of these technologies contributes to reducing the incidence of complications and mitigating associated morbidity and mortality. Nurses are primarily responsible for diabetes care and monitoring the self-management skills of individuals with diabetes. The use of technological developments, such as artificial intelligence, will be a facilitating method for nurses in diabetes care and follow-up. However, the heavy workload of nurses makes it difficult for them to keep up with technological developments and acquire knowledge. In this review study, we discuss artificial intelligence applications used in the prevention and management of diabetes mellitus complications based on this background.

Keywords: Artificial intelligence; diabetes mellitus; nursing.

ÖZ

Diyabetes mellitus, insülin eksikliği veya insülinin etkisindeki bozukluklar sonucu karbonhidrat, yağ ve protein metabolizmasının bozulmasıyla mikrovasküler ve makrovasküler komplikasyonlara neden olabilen, düzenli tıbbi takip gerektiren, kronik bir endokrin-metabolik hastalıktır. Komplikasyonlarının çoğu önlenebilir olmasına rağmen görülme sıklığı her yıl artmaktadır. Teknolojik gelişmelerden yapay zeka; diyabetin komplikasyonların önlenmesinde, risk/tanı tahmininde ve tedavisinde kullanılmaktadır. Bu gelişmelerden yararlanılması diyabetin komplikasyonlarının önlenmesine, görülme sıklığının azaltılmasına, morbidite ve mortalitenin azaltılmasına katkı sağlamaktadır. Hemşireler, diyabet bakımında ve diyabetli bireylerin öz yönetim becerilerinin izlenmesinde temel sorumluluğa sahiptir. Yapay zeka gibi teknolojik gelişimlerden yararlanılması hemşirelerin diyabet bakım ve takibinde kolaylaştırıcı bir yöntem olacaktır. Ancak hemşirelerin iş yükünün fazla olması teknolojik gelişmeleri takip etmelerini ve bu konuda bilgi edinmelerini zorlaştırmaktadır. Bu derleme çalışmasında, diabetes mellitus komplikasyonlarının önlenmesi ve yönetiminde kullanılan yapay zeka uygulamaları ele alınmıştır.

Anahtar Kelimeler: Diyabetes mellitus; hemşirelik; yapay zeka.

Introduction

Diabetes mellitus is a chronic disorder characterized by hyperglycemia resulting from absolute or relative insulin deficiency or resistance to insulin in peripheral tissues, which affects not only carbohydrate but also fat and protein metabolism. The disease requires continuous medical follow-up, and the prevention of both acute and chronic complications is of critical importance in its management (TEMD, 2024). In recent years, artificial intelligence (AI) applications have been increasingly employed in the prevention, early diagnosis, risk prediction, and treatment of acute and chronic complications (Hoşgör and Güngördü, 2022). In the future, AI-supported methods are expected to supplement conventional expert-dependent manual assessments, providing faster and more reliable results (Taha et al., 2017). Diabetes nurses, who are primarily responsible for the management and care of diabetes, are also involved in all artificial intelligence applications used in the diagnosis and treatment of diabetes complications. This review discusses current artificial intelligence applications reported in the literature that are used in the prevention and management of diabetes mellitus complications.

Acute Complications of Diabetes and Artificial Intelligence Applications

Acute complications of diabetes include hypoglycemia, diabetic ketoacidosis (DKA), and hyperosmolar hyperglycemic state (HHS). Hypoglycemia is characterized by a sudden drop in blood glucose, has high mortality, and requires rapid intervention (Fox et al., 2020). DKA is a serious condition that develops due to insulin deficiency, especially in individuals with type 1 diabetes, and is characterized by hyperglycemia, metabolic acidosis, and ketosis. HHS is a life-threatening complication defined by severe hyperglycemia, hyperosmolarity, and dehydration, most commonly observed in elderly patients with type 2 diabetes (Umpierrez et al., 2024).

AI technologies provide significant opportunities for the prevention, early diagnosis, and management of acute diabetic complications, while also supporting patients' adherence to lifestyle modifications in diabetes care. AI-based systems are particularly used for insulin dosage adjustment during activities such as exercise, thereby personalizing treatment and reducing complication risks (Gupta et al., 2021). In addition, AI has been integrated into mobile applications, enabling individuals to monitor and manage episodes of hypoglycemia and hyperglycemia more effectively. Beyond blood glucose prediction, AI facilitates behavioral change in the prevention of acute complications, such as nutrition and exercise for blood glucose regulation (Hochberg et al., 2016).

Another application area of AI use in acute complications is clinical decision support systems. These AI-based systems allow patients to monitor their response to treatment and complication risks more effectively. These systems create personalized treatment plans by analyzing patients' clinical data and play an important role in predicting disease progression and potential complications (Gupta et al., 2021). Furthermore, AI supports healthcare professionals and improves patient care processes through advanced approaches such as big data analysis, machine learning, and deep learning.

Artificial Intelligence Applications in Hypoglycemia Prevention and Management

AI technologies are increasingly employed to reduce the risk of hypoglycemia. In particular, artificial pancreas systems integrated with continuous glucose monitoring (CGM) sensors and insulin pumps automatically regulate glucose levels by adjusting insulin delivery according to the user's lifestyle and real-time glucose data, thereby reducing the risk of hypoglycemia and providing stable glycemic control (Aiello et al., 2023). Furthermore, AI-enabled applications provide personalized recommendations and predictive analyses, enabling proactive diabetes management. This approach allows individuals to make informed daily decisions and better manage hypoglycemia risk (Hidalgo et al., 2023) are expected to make diabetes management safer, more effective, and increasingly individualized (Fox et al., 2020; Aiello et al., 2023).

AI is utilized in hypoglycemia risk scoring through the analysis of medical history, glucose measurements, insulin dosages, and lifestyle factors. Machine learning and deep learning algorithms are particularly effective in identifying risk patterns due to their ability to model complex data relationships. In the study by Sun et al. (2018), long short-term memory (LSTM) and bidirectional LSTM-based deep neural networks predicted future glucose values with high accuracy (Sun et al., 2018). Similarly, Zhu et al. (2024) demonstrated that recurrent neural networks and deep learning techniques using wearable device data improved prediction accuracy beyond 87%. Alvarado et al. (2023) also achieved promising results in predicting hypoglycemia events by applying transformation functions and deep learning to glucose time-series analysis. In Turkey, a smartphone application developed by Kılıç (2021) successfully applied AI-based models to predict blood glucose levels over time, achieving high accuracy.

With the integration of artificial intelligence into clinical practice, machine learning and deep learning algorithms have been incorporated into CGM systems to predict future glucose trends and provide early warnings to prevent hypoglycemia (Damar, 2024). In particular, closed-loop insulin pumps (artificial pancreas systems) significantly reduce hypoglycemia risk by automatically adjusting insulin doses in response to glucose fluctuations. CGM device and insulin pumps can also be integrated with mobile applications, enabling real-time tracking and insulin delivery for blood glucose control. In addition, numerous AI-based mobile health applications have been developed for diabetes management that function independently of devices. Through their algorithms, these applications predict blood glucose levels, inform individuals in real time, and help prevent hypoglycemia by offering personalized recommendations on diet, physical activity, and medication use (Hochberg et al., 2016; Maheshwari et al., 2025). Beyond patient use, AI-based mobile applications are also valuable in clinical settings. They facilitate patient follow-up, support healthcare professionals in making informed decisions, and play a critical role in monitoring treatment adherence and optimizing care processes (Maheshwari et al., 2025).

Artificial Intelligence in Diabetic Ketoacidosis Management

Similar to hypoglycemia, AI algorithms have the potential to predict the onset of DKA by analyzing patient data. By processing parameters such as blood glucose, ketone levels, and blood gases, AI-enabled systems can estimate DKA risk and serve as automated hospital screening tools, thereby facilitating earlier intervention (Guan et al., 2023). AI-based clinical decision support systems (CDSS) further assist healthcare professionals in optimizing treatment by providing personalized recommendations for intravenous fluid therapy, insulin dosage, and electrolyte management. A recent study has shown that AI-based CDSS can reduce in-hospital episodes of hypo- and hyperglycemia, accelerate treatment, and shorten hospital stays in patients with DKA (Akalın et al, 2022).

Artificial Intelligence in Hyperosmolar Hyperglycaemic State Management: Similar to DKA, AI-based clinical decision support systems can generate early warnings by analyzing patients' laboratory results, vital signs, and other clinical data. By identifying early signs of HHS, these systems facilitate timely clinical interventions. In treatment, accurate administration of intravenous fluids and insulin therapy is critical, and AI-based applications can provide decision support in this process. By analyzing individual data of patients, AI-based systems help personalize treatment, optimize management strategies, and ultimately reduce mortality (Guan et al., 2023).

Chronic Complications of Diabetes and Artificial Intelligence Applications

Microvascular Complications of Diabetes Mellitus: Microvascular complications of diabetes include diabetic retinopathy (DR), neuropathy, and nephropathy (TEMD, 2024). DR is one of the most common microvascular complications, is a leading cause of preventable blindness worldwide. It results from long-term hyperglycemia-induced damage to retinal microvessels and is characterized by hemorrhage, edema, ischemia, and neovascularization. Strict control of blood glucose and blood pressure can reduce the risk of both onset and progression (Yau et al., 2012). Diabetic nephropathy is a chronic kidney disease and a major long-term complication of both type 1 and type 2 diabetes. It is characterized by progressive deterioration of glomerular structure and renal function. Clinically, the process begins with microalbuminuria (30–300 mg/day) and may progress to macroalbuminuria, decreased glomerular filtration rate (GFR), hypertension, and ultimately end-stage renal disease (ESRF) (ADA, 2022).

Diabetic neuropathy is another common complication, resulting from chronic hyperglycemia-induced peripheral nerve damage. It manifests with symptoms such as pain, numbness, and tingling in the extremities (Pop-Busui et al., 2017)

AI Applications in Diabetic Retinopathy: AI-based deep learning systems are among the most effective tools for the early detection of DR. Advanced image processing techniques enable the identification of DR and diabetic macular edema at an early stage (Özçelik and Altan, 2021). In a landmark study, Gulshan et al. (2016) reported a sensitivity of 87.4% and a specificity of 89.5% for DR detection in fundus photographs using a deep learning algorithm (Gulshan et al., 2016). Similarly, Aykat and Senan (2023) demonstrated that deep learning models applied to fundus images for cataract and DR detection achieved high accuracy, highlighting their potential as decision-support tools in medical image analysis (Kowalski and Słowiński, 2021). In particular, convolutional neural networks (CNNs) are widely used to identify the presence and stage of DR by analyzing retinal images (Taha et al., 2017). Furthermore, IDx-DR was the first Food and Drug Administration approved AI system for DR detection; by analyzing color fundus photographs, it identifies DR-related biomarkers and guides whether referral to an ophthalmologist is necessary (Abràmoff et al., 2018).

Diabetic Nephropathy: Diabetic nephropathy is a major microvascular complication of diabetes and one of the leading causes of end-stage renal disease worldwide. Early diagnosis and intervention are critical in slowing the progression of the disease. AI, and especially machine learning techniques, have provided significant advances in the diagnosis and management of diabetic nephropathy (ADA, 2022). Machine learning algorithms can predict the risk and course of nephropathy by analyzing patient data. In a study, Yin et al. (2023) used a machine learning approach to analyze the effect of serum metabolites on diabetic nephropathy and predict its prevalence. Their findings showed that the eXtreme Gradient Boosting (XGB) algorithm performed best and achieved high accuracy in screening (Yin et al., 2023). Similarly, Muharram et al. (2023) developed supervised learning models for early detection of albuminuria risk in type 2 diabetes patients. The authors reported that, multi-layer perceptron (MLP) algorithm outperformed other algorithms with 74% accuracy and 75% F1 score (Muharram et al., 2023).

Diabetic Neuropathy: Early diagnosis and treatment of diabetic neuropathy are of great importance to improve the quality of life of patients. AI, and especially deep learning techniques, have been reported to provide significant advances in the diagnosis and management of neuropathy. By analyzing clinical data, AI-based systems enable accurate detection in the early stages of neuropathy and optimize treatment processes (Boulton et al., 2017). In a study, Haque et al. (2023) developed a machine learning-based tool to predict the severity of diabetic sensorimotor polyneuropathy (DSPN) using Michigan neuropathy screening instruments. In this study, using a large patient dataset, features with high correlation in the diagnosis of DSPN were identified. The developed nomogram shows that the model provides high accuracy with AUC (Area Under the Curve) values of 0.9421 and 0.946 in the internal and external datasets, respectively. These high accuracy rates increase the usability of the model in clinical applications and show that it has great potential in the early diagnosis of DSPN (Haque et al., 2023).

Artificial intelligence (AI) applications in the diagnosis of neuromuscular diseases play an important role in the classification of diseases through the analysis of electromyography (EMG) signals. In particular, algorithms such as artificial neural networks and support vector machines can distinguish diseases such as neuropathy and myopathy by processing EMG data (Kucuk and Eminoğlu, 2019). Machine learning applications are being developed for the early detection of neurodegenerative diseases.

Macrovascular Complications: Macrovascular complications of diabetes include conditions in which chronic hyperglycemia leads to metabolic disorders such as endothelial dysfunction, inflammation, oxidative stress, and dyslipidemia, affecting large-diameter arteries, and resulting in atherosclerotic cardiovascular disease. These complications are mainly categorized into three clinical presentations: coronary artery disease, cerebrovascular disease, and peripheral artery disease. The risk of these events is elevated in individuals with diabetes, independent of glycemic control, and represents a major contributor to morbidity and mortality. In type 2 diabetes, macrovascular complications may progress concurrently with microvascular changes or may even be present even prior to the initial diagnosis (Cosentino et al., 2020).

Coronary artery disease (CAD) is a common and serious cardiovascular disease in which the coronary arteries supplying the heart muscle become narrowed or blocked by atherosclerosis, leading to myocardial ischemia. Cerebrovascular diseases (CVD) include clinical conditions that result from blockage or rupture of blood vessels supplying the brain and can lead to severe neurological damage. Peripheral arterial disease (PAD) is a vascular disease caused by the narrowing or blockage of the arteries in the extremities, usually due to atherosclerosis, which can lead to serious consequences such as difficulty walking, pain, and, in advanced cases, tissue loss. (ADA, 2024)

Coronary Artery Disease: Traditional ECG interpretations are based on experience and can be subjective. AI-based models can detect conditions such as heart failure with low ejection fraction with high accuracy by analyzing ECG data. For example, a convolutional neural network (CNN) model using 12-lead ECGs as input was able to detect patients with left ventricular ejection fraction below 35% with 86.3% sensitivity and 85.7% specificity (Attia et al., 2020).

Imaging techniques such as coronary CT angiography (CCTA) are widely used in the assessment of coronary artery disease. AI algorithms can automatically detect the presence and localization of atherosclerotic plaques by analyzing these images. In particular, deep learning- based 3D CNN models can detect atherosclerosis in coronary arteries with high accuracy by processing CCTA images (Atlan, 2022).

Fractional Flow Reserve (FFR) is an invasive method used to assess the hemodynamic significance of stenoses in coronary arteries. AI technologies can estimate FFR values by analyzing non-invasive imaging data, thus reducing the need for invasive procedures (Atlan, 2022).

AI-based systems can automatically determine the morphology and severity of lesions by analyzing coronary angiography images. This contributes to more objective and faster decisions in treatment planning. For example, Du et al. developed two separate deep learning models for the identification of coronary artery segments and recognition of lesion morphology using a dataset of more than 20,000 angiograms (Du et al., 2019).

Coronary Artery Disease and Remote Monitoring: By analyzing remote monitoring data, AI algorithms can detect potential problems at an early stage and provide timely intervention opportunities to healthcare professionals. For example, by analyzing heart rhythm and blood pressure data, conditions such as arrhythmias or hypertension can be proactively managed (Karabacak M., 2022).

Cerebrovascular Disease: Early diagnosis and treatment of cerebrovascular diseases are critical to improve patients' quality of life and reduce mortality rates (Özdemir & Bilgin, 2021). The use of AI technologies in the diagnosis and treatment of CVD has rapidly increased in recent years (Kutan, 2023). For example, an AI-based decision support system developed in a study accelerated the diagnosis process and increased its accuracy by analyzing the clinical data of patients (Kutan, 2023). Effective management of risk factors is of great importance in the prevention of CVD. AI can make personalized risk assessments by analyzing the genetic and environmental data of individuals. In this way, high-risk individuals can be identified at an early stage and preventive measures can be taken (Şahin, 2015). Furthermore, in the rehabilitation of stroke patients, AI-based systems play a supportive role in helping patients regain motor skills. These systems enable the creation of individualized rehabilitation programs by continuously monitoring the performance of patients (Akalın, 2022).

Peripheral Artery Disease (PAD): Artificial intelligence algorithms analyze these images and identify vascular narrowing and occlusions more precisely. For example, deep learning algorithms are used to improve imaging accuracy in the diagnosis of PAD (Arslan, 2021). Computed tomography (CT) and magnetic resonance imaging (MRI) are widely used methods in the diagnosis of PAD. In conventional ultrasonography, the variability of results depending on the operator experience may lead to errors in the diagnostic process. However, AI-based autonomous ultrasound systems provide more consistent and reliable results by scanning arteries independently of the operator. For instance, AI-enabled ultrasound systems developed by Siemens Healthineers have been shown to reduce operator-induced error rates and improve imaging accuracy in the diagnosis of PAD (Healthineers, 2020).

Conclusion

AI-based systems serve as auxiliary tools in preventing and managing acute and chronic complications, supporting self-management, and accelerating clinical diagnosis and treatment processes. The most common area of clinical use is DR, one of the chronic complications of diabetes. AI-based systems play an effective role in the early diagnosis and automatic classification of DR. In the future, with the development of AI-based diagnostic systems, early diagnosis of DR and patient management processes are expected to become more effective. Real-time evaluation of multiple parameters, such as blood gas, electrolyte, and renal function tests, which should be examined in all complications other than DR, enables physicians to make more informed and effective decisions. Furthermore, bibliometric analyses show that AI-based CDSSs are increasingly used in diabetes management and that the widespread use of these technologies in clinical applications will provide better health outcomes for patients in the future. Nurses play a primary role in supporting self-care and self-management for individuals with diabetes. After diagnosis, individuals with diabetes perform many tasks themselves, such as monitoring blood sugar, foot care, and managing complications. In this regard, nurses' use and recommendation of technologies that are independent of time and place facilitates self-care and self-management for individuals with diabetes, reduces nurses' workload, and helps prevent complications. Overall, integrating AI-based systems into diabetes care is not only expected to enhance diagnostic accuracy and patient outcomes but also to transform nursing practice by reinforcing patient self-management and reducing the burden of care.

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References

Abràmoff, M.D., Lavin, P.T., Birch, M., Shah, N., & Folk, J.C. (2018). Pivotal trial of an autonomous AI-based diagnostic system for the detection of diabetic retinopathy in primary care. *NPJ Digital Medicine, 1*(1), 39.

Aiello, E.M., Jaloli, M., & Cescon, M. (2023). Model predictive control (MPC) of an artificial pancreas with data-driven learning of multi-step-ahead blood glucose predictors. *arXiv preprint arXiv:*2307.12015.

Akalın, B. (2022). Sağlık bilimlerinde yapay zeka tabanlı klinik karar destek sistemleri. *Gevher Nesibe Journal of Medical & Health Sciences*, *7*(18), 64–73.

Akalın, B., & Demirbaş, M.B. (2022). Rehabilitasyon hizmetlerinde yapay zekâ uygulamaları. *Acta Infologica*, *6*(2), 141–161. doi:10.26650/acin.1068576

Alvarado, M., García, L., & Rodríguez, P. (2023). Transformation functions in the analysis of glucose time series and prediction of hypoglycemia events with deep learning techniques. *Journal of Diabetes Technologies and Therapies, 25*(3), 150-159.

American Diabetes Association. (2022). Microvascular complications and foot care: standards of medical care in diabetes. *Diabetes Care, 45*(1), 185-194. doi: 10.2337/dc22-SPPC.

American Diabetes Association. (2024). Cardiovascular disease and risk management: standards of care in diabetes. *Diabetes Care*, *47*(1), 166-191. doi:10.2337/dc24-S011ADA

Arslan, M., Şahin, S., & Yılmaz, T. (2021). Derin öğrenme tabanlı pulmoner arter hipertansiyonu tanısında bilgisayarlı tomografi görüntü analizi. *arsMedical Imaging and Analysis, 68,* 101934. doi:10.1016/j.media.2020.101934

Atlan, M., Yılmaz, S., & Kılıç, Ö. (2022). Deep learning-based detection of functionally significant stenosis in coronary CT angiography. *Journal of Cardiovascular Computed Tomography*, *16*(4), 315–323. doi: 10.1016/j.jcct.2022.06.005

Attia, Z. I., Kapa, S., Lopez-Jimenez, F., McKie, P. M., Ladewig, D. J., Satam, G., ... Friedman, P. A. (2019). Screening for cardiac contractile dysfunction using an artificial intelligence–enabled electrocardiogram. *Nature Medicine*, *25*(1), 70–74. doi: 10.1038/s41591-018-0240-2

Aykat, Ş., & Senan, S. (2023). Derin öğrenme kullanılarak fundus görüntülerinden katarakt ve diyabetik retinopati tespiti. *Mühendislik Bilimleri ve Araştırmaları Dergisi, 5*(2), 312-324.

Boulton, A.J.M., Vinik, A.I., Arezzo, J., Bril, V., Feldman, E.L., & Malik, R.A. (2017). Diabetic Neuropathy: A position statement by the american diabetes association. *Diabetes Care*, *39*(5), 724-737

Cosentino, F., Grant, P. J., Aboyans, V., Bailey, C. J., Ceriello, A., Delgado, V., ... Halcox, J. (2020). 2020 ESC Guidelines on diabetes, pre-diabetes and cardiovascular diseases developed in collaboration with the EASD. *European Heart Journal, 41*(2), 255–323. doi:10.1093/eurheartj/ehz486

Damar, M. (2024). Sağlık sektöründe karar destek araçları: İş zekâsı, makine öğrenmesi, derin öğrenme ve yapay zeka uygulamaları, *İzmir Sosyal Bilimler Dergisi*, *6*(2), 90-115. doi:10.47899/ijss.1591168

Demirci Şahin, A., Üstü, Y., & Işık, D. (2015). Serebrovasküler hastalıklarda önlenebilen risk faktörlerinin yönetimi. *Ankara Medical Journal, 15*(2). doi:10.17098/amj.48090

Du, T., Xie, L., Zhang, H., Liu, X., Wang, X., Chen, D., ... Xu, B. (2021). Training and validation of a deep learning architecture for the automatic analysis of coronary angiography: Automatic recognition of coronary angiography. *EuroIntervention, 17*(1), 32. doi: 10.4244/EIJ-D-20-00570

Fox, I., Lee, J., Pop-Busui, R., & Wiens, J. (2020). Deep reinforcement learning for closed-loop blood glucose control. *arXiv preprint arXiv:*2009.09051.

Guan, Z., Li, H., Liu, R., Cai, C., Liu, Y., Li, J., ... Sheng, B. (2023). Artificial intelligence in diabetes management: Advancements, opportunities, and challenges. *Cell reports. Medicine*, *4*(10), 101213. doi:10.1016/j.xcrm.2023.101213

Gulshan, V., Peng, L., Coram, M., Stumpe, M. C., Wu, D., Narayanaswamy, A., ... Webster, D. R. (2016). Development and validation of a deep learning algorithm for detection of diabetic retinopathy in retinal fundus photographs. *JAMA, 316*(22), 2402-2410.

Gupta, R., & Gupta, A. (2021). Artificial intelligence for diabetes management and decision support. *Journal of Medical Internet Research*, *23*(5), e10775.

Haque, F., Reaz, M.B.I., Chowdhury, M.E.H., Shapiai, M.I.B., Malik, R.A., Alhatou, M., ... Bhuiyan, M. A. S. (2023). A machine learning-based severity prediction tool for the michigan neuropathy screening instrument. *Diagnostics*, *13*(2), 264. doi:10.3390/diagnostics13020264

Hidalgo, J. I., Colmenar, J. M., Risco-Martín, J. L., Cuesta-Infante, A., Maqueda, E., Botella, M., & Rubio, J. A. (2023). Modeling glycemia in humans by means of Grammatical Evolution. *arXiv preprint arXiv:*2305.04827.

Hochberg, I., Feraru, G., Kozdoba, M., Mannor, S., Tennenholtz, M., & Yom-Tov, E. (2016). A reinforcement learning system to encourage physical activity in diabetes patients. *arXiv preprint arXiv:*1605.04070.

Hoşgör, H. & Güngördü, H. (2022). Sağlıkta yapay zekanın kullanım alanları üzerine nitel bir araştırma. *Avrupa Bilim ve Teknoloji Dergisi*, 35, 395-407.

Karabacak, M. (2022). Kardiyolojide dijital dönüşüm; telemonitorizasyon sistemleri ve yapay zeka uygulamaları. C. Sarı (Ed.), *Kardiyovasküler hastalıklarda tanısal testler ve görüntüleme yöntemleri* içinde (s. 357–362). Ankara: Akademisyen Yayınları. doi: 10.37609/akya.1126

Kılıç, V. (2021). Yapay zeka tabanlı akıllı telefon uygulaması ile kan şekeri tahmini. *Avrupa Bilim ve Teknoloji Dergisi*, *26*, 289-294.

Kowalski, A., & Słowiński, R. (2021). Use of artificial intelligence for management and identification of complications in diabetes mellitus. *Clinical Diabetology*, *10*(1), 1-6.

Kucuk, U., & Eminoğlu, M.S. (2019). Nöromüsküler hastalıkların yapay zeka yöntemleri ile sınıflandırılması. *Gazi Mühendislik Bilimleri Dergisi, 5*(3), 149-162.

Kutan, F. (2023). *Serebrovasküler hastalıkların teşhisi için yapay zeka tabanlı karar destek sistemi* [Yayınlanmamış Yüksek lisans tezi]. Gazi Üniversitesi, Ankara.

Maheshwari S, Kalia A, Tewari J, Tewari A, Srivastava A, Dantu R ... Maheshwari (2025). A. Artificial intelligence for diabetes management – A review. *Journal of Diabetes, Metabolic Disorders & Control, 12*(1), 24-32.

Muharram, A.P., Tahapary, D.L., Lestari, Y. D., Sarayar, R., & Dirjayanto, V.J. (2023). Supervised learning models for early detection of albuminuria risk in type-2 diabetes mellitus patients. *arXiv preprint arXiv:*2309.16742.

Özçelik, Y.B., & Altan, A. (2021). Diyabetik retinopati teşhisi için fundus görüntülerinin derin öğrenme tabanlı sınıflandırılması. *Avrupa Bilim ve Teknoloji Dergisi*, *29*, 156-167.

Pop-Busui, R., Boulton, A. J., Feldman, E. L., Bril, V., Freeman, R., Malik, R. A., ... Ziegler, D. (2017). Diabetic neuropathy: a position statement by the American Diabetes Association. *Diabetes Care, 40*(1), 136–154. doi: 10.2337/dc16-2042

Siemens Healthineers. (2020). Yapay zekâ destekli çözümlerimiz ile dijital sağlığın geleceğini şekillendiriyoruz. *Siemens Healthineers.* https://www.siemens-healthineers.com/tr/digital-health-solutions/artificial-intelligence-in-healthcare

Sun, J., Wang, Y., & Li, H. (2018). Blood sugar level estimation with LSTM and bidirectional LSTM based deep nerve networks. *Journal of Biomedical Engineering, 15*(2), 98-105.

Taha, H. N., Gamal, A., & Nasreldin, S. H. (2017). Transscleral micropulse diode laser for treatment of diabetic retinopathy. *arXiv preprint arXiv:1710.02628*.

Türkiye Endokrinoloji ve Metabolizma Derneği (2022). TEMD diabetes mellitus ve komplikasyonlarının tanı, tedavi ve izlem kılavuzu. Retrieved date: August, 06, 2025. Retrived from: diabetes-mellitus_2024.pdf (temd.org.tr).

Umpierrez, G.E., Davis, G.M., ElSayed, N.A., Fadini, G.P., Galindo, R.J., Hirsch, I. B., ... Dhatariya, K.K. (2024). Hyperglycaemic crises in adults with diabetes: A consensus report. *Diabetologia*, *67*(8), 1455–1479. doi: 10.1007/s00125-024-06183-8

Yau, J.W.Y., Rogers, S.L., Kawasaki, R., Lamoureux, E.L., Kowalski, J.W., Bek, T., ... &Wong, T.Y. (2012). Global prevalence and major risk factors of diabetic retinopathy. *Diabetes Care, 35*(3), 556–564. doi: 10.2337/dc11-1909

Yin, J.M., Li, Y., Xue, J.T., Zong, G.W., Fang, Z.Z., & Zou, L. (2023). Explainable machine learning-based prediction model for diabetic nephropathy. *arXiv preprint arXiv:*2309.16730.

Zhu, Q., Chen, X., & Liu, Z. (2024). Blood sugar level estimation using repetitive graphs and deep learning techniques modified with wearable device data. *Journal of Health Informatics, 22*(1), 45-53.