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Artificial Intelligence-Driven Face Recognition in Healthcare Informatics: A Systematic Review of Technologies, Clinical Applications, Privacy Challenges, and Future Research Directions

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Abstract—

Artificial Intelligence (AI)-driven face recognition has emerged as a transformative technology in healthcare informatics, offering secure, contactless, and efficient solutions for patient identification, authentication, clinical monitoring, and healthcare service delivery. Recent advances in deep learning and computer vision have significantly improved the accuracy and robustness of facial recognition systems, enabling their integration into smart hospitals, telemedicine platforms, and intelligent healthcare management systems. At the same time, developments in cognitive face perception research have provided deeper insights into facial identity recognition, facial motion analysis, gender perception, and memory mechanisms, which are fundamental to designing reliable recognition systems. This systematic review synthesizes current research on AI-driven face recognition in healthcare informatics by examining technological developments, clinical applications, cognitive foundations, and emerging healthcare challenges. The reviewed literature also highlights the growing role of AI in disease diagnosis, breast cancer screening, patient-centered healthcare, and healthcare quality improvement, demonstrating the broader impact of intelligent technologies within modern healthcare environments. Furthermore, this review discusses important concerns related to privacy protection, ethical deployment, data security, fairness, and real-world implementation challenges that continue to influence the adoption of facial recognition technologies in clinical practice. Based on the analyzed studies, this paper presents a structured taxonomy of existing approaches, identifies key research gaps, and proposes future research directions for developing trustworthy, explainable, and privacy-aware AI-driven face recognition systems capable of supporting next-generation

healthcare informatics and intelligent clinical decision-making.

Keywords— Artificial Intelligence; Face Recognition; Healthcare Informatics; Deep Learning; Computer Vision; Privacy-Preserving Healthcare.

I. INTRODUCTION

Artificial Intelligence (AI) has revolutionized modern healthcare by enabling intelligent decision-making, automated disease diagnosis, and efficient healthcare management. Among various AI-enabled technologies, face recognition has emerged as a promising biometric solution for secure patient identification, contactless authentication, remote healthcare services, and smart hospital management. Recent advances in deep learning and computer vision have substantially improved the accuracy, robustness, and real-time performance of facial recognition systems, making them increasingly suitable for healthcare informatics applications [1]. Simultaneously, research on facial perception has enhanced the understanding of facial identity, motion, memory, and gender recognition, providing important cognitive foundations for developing reliable AI-based recognition models [2]–[4]. Furthermore, AI has demonstrated remarkable success in breast cancer screening, early diagnosis, healthcare quality improvement, and patient-centered clinical decision support, highlighting its growing importance in intelligent healthcare ecosystems [1], [5]–[8]. Despite these technological advancements, challenges related to data privacy, ethical deployment, algorithmic fairness, explainability, and integration with healthcare information systems continue to hinder widespread clinical adoption. Therefore, this systematic review critically examines recent developments in AI-driven face recognition within healthcare informatics by analyzing existing technologies, healthcare applications, privacy concerns, and future research opportunities. The review also presents a structured synthesis of the available literature to identify current research gaps and support the development of secure, explainable, and trustworthy AI-driven healthcare systems.

II. LITERATURE REVIEW

Artificial Intelligence has significantly transformed both facial recognition technology and healthcare informatics during the last decade. Recent studies have focused not only on improving recognition accuracy but also on understanding the cognitive mechanisms underlying human facial perception. Tordjman et al. demonstrated that facial shape influences the perception of natural facial motion while maintaining stable identity representation, providing valuable insights for designing robust facial recognition algorithms [2]. Similarly, Rekow et al. reported that graded facial gender characteristics significantly influence automatic neural processing during facial recognition, suggesting that natural facial attributes contribute to more reliable recognition performance [3]. Pounder et al. further showed that face perception and face memory represent distinct cognitive processes, indicating that multiple perceptual mechanisms should be considered when developing AI-based recognition systems [4].

The application of AI in healthcare has expanded rapidly, particularly in disease diagnosis and preventive medicine. Bothou et al. conducted a systematic review demonstrating that AI-assisted diagnostic systems improve the accuracy, sensitivity, and efficiency of early breast cancer detection while reducing diagnostic workload [1]. Likewise, AlAwadh et al. reported that integrating electronic health records with quality-improvement strategies significantly enhanced breast cancer screening coverage within primary healthcare settings [5]. These findings demonstrate the potential of intelligent healthcare systems to improve clinical outcomes through data-driven decision support.

Beyond technological development, patient-centered healthcare remains equally important. Tumushabe et al. identified healthcare infrastructure limitations, medication shortages,

financial constraints, and treatment-related side effects as major barriers affecting breast cancer medication utilization [6]. Similarly, Pichetsopon et al. found that fear of cancer recurrence and unmet healthcare needs negatively influence the quality of life among breast cancer survivors, emphasizing the need for comprehensive survivorship care [7]. Amin et al. further observed that although healthcare professionals possess adequate knowledge regarding breast cancer screening, their actual screening practices remain relatively limited, highlighting a significant knowledge-practice gap [8]. Collectively, these studies indicate that while AI-driven healthcare technologies continue to advance, successful implementation depends on balancing technological innovation with clinical effectiveness, patient engagement, healthcare accessibility, privacy protection, and ethical responsibility.

Table I. Summary of Reviewed Literature

Study	Research Focus	Strengths	Limitations
Bothou et al. (2026)	AI in breast cancer detection	Comprehensive systematic review; discusses DL and ML	Limited real-world clinical validation
Tordjman et al. (2026)	Face motion perception	Strong cognitive and behavioral analysis	Not healthcare-specific
Rekow et al. (2026)	Face gender perception	Uses EEG with natural face images	Limited AI implementation
Pounder et al. (2026)	Face perception and memory	Valuable cognitive insights	No clinical healthcare application
AlAwadh et al. (2026)	Breast cancer screening	Practical healthcare implementation	Conducted within one healthcare network
Tumushabe et al. (2026)	Medication utilization	Patient-centered qualitative analysis	Regional study with limited generalizability

Recent research has further demonstrated the expanding role of Artificial Intelligence beyond conventional healthcare applications. Gupta et al. proposed SmartVote India, a secure digital election platform that integrates AI-driven authentication and intelligent security mechanisms to improve transparency, reliability, and digital trust, illustrating the broader applicability of AI-enabled identity verification systems beyond traditional domains [9]. In the educational sector, Sadhukhan et al. presented a systematic framework highlighting how Artificial Intelligence supports personalized learning, governance, ethical decision-making, and collaborative knowledge creation, emphasizing the importance of explainable and trustworthy AI for real-world deployment [10]. Furthermore, Laha et al. introduced an intelligent clinical decision-support framework for Polycystic Ovary Syndrome (PCOS) prediction using the CatBoost algorithm integrated with AI-based clinical report generation. Their study demonstrated the potential of machine learning to enhance diagnostic accuracy while automating clinical documentation, reinforcing the growing significance of AI-assisted decision support within healthcare informatics [11]. Collectively, these studies indicate that the successful implementation of AI extends across multiple domains, where secure authentication, intelligent analytics, explainable decision-making, and automated reporting are becoming essential components of next-generation digital ecosystems.

III. REVIEW METHODOLOGY

This review was conducted using a systematic approach to summarize recent advancements in Artificial Intelligence (AI)-driven face recognition within healthcare informatics. Relevant literature was selected from the collection of research articles provided by the authors, with particular emphasis on studies investigating facial perception, face recognition, AI-assisted healthcare, breast cancer diagnosis, healthcare quality improvement, and patient-centered healthcare. Papers unrelated to the scope of healthcare informatics, such as studies focusing on materials science or educational methodologies, were excluded to maintain the thematic consistency of the review.

The selected literature was carefully examined to identify common research themes, technological

developments, healthcare applications, implementation challenges, and future research opportunities. The analysis focused on three major perspectives: (i) cognitive foundations of facial recognition, including face perception, facial motion, memory, and gender recognition; (ii) AI-enabled healthcare applications involving disease diagnosis, patient identification, and healthcare quality improvement; and (iii) ethical, privacy, and security challenges associated with deploying facial recognition technologies in healthcare environments. Based on this synthesis, the reviewed studies were categorized according to their objectives, methodologies, strengths, limitations, and practical contributions. This structured review methodology provides a comprehensive understanding of the current state of AI-driven face recognition while identifying existing research gaps and opportunities for future development in intelligent healthcare informatics [1]–[8].

IV. AI-DRIVEN FACE RECOGNITION TECHNOLOGIES

Artificial Intelligence has significantly transformed facial recognition technology by improving its ability to accurately identify and verify individuals under varying environmental conditions. Modern face recognition systems combine computer vision, machine learning, and deep learning techniques to extract distinctive facial features and perform reliable identity matching. These systems generally operate through multiple stages, including face detection, image preprocessing, feature extraction, feature matching, and identity verification. Continuous improvements in AI algorithms have enabled faster processing speeds, greater recognition accuracy, and improved robustness against variations in lighting, facial expressions, pose, and occlusion.

Recent studies on facial perception have provided valuable insights into the cognitive mechanisms underlying facial recognition. Tordjman et al. demonstrated that facial shape directly influences the perception of natural facial motion while preserving identity recognition, suggesting that structural and dynamic facial information jointly contribute to accurate facial analysis [2]. Their findings indicate that integrating both static and dynamic facial characteristics may improve the performance of AI-based recognition systems operating in real-world healthcare environments.

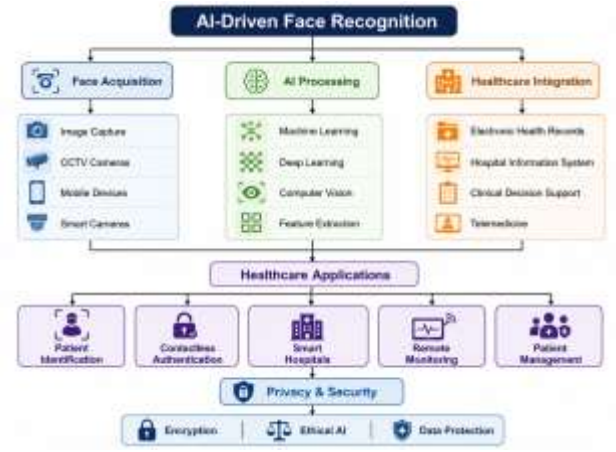

Figure 1. Taxonomy of AI-Driven Face Recognition Technologies in Healthcare Informatics

Similarly, Rekow et al. investigated the influence of facial gender characteristics on neural face recognition and reported that natural variations in gender-related facial features significantly affect automatic facial categorization [3]. The study highlights the importance of using diverse and representative datasets during AI model development to improve recognition performance across different demographic groups while reducing algorithmic bias.

Another important contribution comes from Pounder et al., who examined the relationship between face perception, face memory, and face matching [4]. Their findings revealed that face perception and face memory are independent cognitive processes, suggesting that facial recognition systems should incorporate multiple complementary facial descriptors rather than relying solely on memorized facial representations. This observation is particularly valuable for healthcare environments where patient appearances may change because of aging, illness, surgery, or long-term treatment.

Table II. Comparative Analysis of AI and Face Recognition Studies

Study	Research Area	AI Technique	Limitation
Bothou et al.	Breast Cancer	Deep Learning	Limited clinical validation
Tordjman et al.	Face Perception	Computational Face Analysis	No healthcare application
Rekow et al.	Face Recognition	EEG-based Analysis	Limited dataset
Pounder et al.	Face Memory	Cognitive Analysis	No AI deployment

In parallel, AI technologies have demonstrated remarkable success in medical image analysis and disease diagnosis. The systematic review conducted by Bothou et al. showed that deep learning algorithms substantially improve diagnostic accuracy in breast cancer screening while reducing false-positive interpretations and radiologists' workload [1]. Although their work primarily focuses on diagnostic imaging rather than facial recognition, it clearly demonstrates the broader capability of AI to support intelligent healthcare systems through automated image interpretation.

Collectively, these studies indicate that modern AI-driven face recognition extends beyond simple biometric identification. It increasingly incorporates cognitive science, deep learning, computer vision, and intelligent image analysis to develop more reliable, adaptive, and clinically applicable healthcare solutions. The convergence of these technologies provides a strong foundation for next-generation healthcare informatics, where secure patient identification, intelligent monitoring, and automated clinical decision support can operate within an integrated AI ecosystem.

V. HEALTHCARE APPLICATIONS OF AI-DRIVEN FACE RECOGNITION

The integration of Artificial Intelligence into healthcare informatics has created new opportunities for improving patient care, healthcare management, and clinical decision-making. Although many healthcare applications currently focus on medical image analysis and disease diagnosis, facial recognition technologies are increasingly being explored as complementary tools for secure patient identification, contactless authentication, remote healthcare services, and intelligent hospital management.

One of the most promising healthcare applications involves patient identification. Accurate patient identification is essential for minimizing medical errors, preventing duplicate records, and ensuring safe delivery of healthcare services. AI-based facial recognition systems provide a contactless authentication mechanism that can simplify hospital registration and improve patient verification, particularly in emergency departments and telemedicine platforms. As healthcare continues to adopt digital transformation strategies, reliable biometric identification has become increasingly important for protecting patient information while improving healthcare efficiency.

AI has also demonstrated significant success in disease diagnosis and preventive healthcare. Bothou et al. reviewed recent developments in AI-assisted breast cancer detection and reported that machine learning and deep learning algorithms consistently improve diagnostic performance by increasing sensitivity, specificity, and overall diagnostic accuracy [1]. These intelligent systems support radiologists by reducing workload and assisting with earlier disease detection, thereby contributing to improved patient outcomes.

Table III. AI Applications in Healthcare Informatics

Healthcare Domain	AI Application	Key Findings	Practical Impact
Breast Cancer	Early Diagnosis	Higher diagnostic accuracy	Improved clinical decisions
Primary Healthcare	Screening Management	Increased screening coverage	Better preventive care
Cancer Care	Medication Utilization	Identified treatment barriers	Patient-centered healthcare

Healthcare Domain	AI Application	Key Findings	Practical Impact
Survivorship Care	Quality of Life Assessment	Identified unmet healthcare needs	Improved follow-up care
Healthcare Awareness	Screening Practice	Knowledge-practice gap	Institutional improvement

Quality improvement initiatives further demonstrate the value of intelligent healthcare systems. AlAwadh et al. showed that integrating electronic health records with structured quality-improvement workflows substantially increased breast cancer screening coverage while improving follow-up efficiency within primary healthcare services [5]. Their findings emphasize the importance of combining AI technologies with healthcare information systems to optimize preventive healthcare delivery.

Patient-centered care remains another essential component of healthcare informatics. Tumushabe et al. identified several practical barriers affecting medication utilization among breast cancer patients, including medication shortages, financial limitations, transportation difficulties, and inadequate healthcare infrastructure [6]. These findings indicate that technological innovation alone cannot guarantee successful healthcare delivery unless supported by accessible healthcare services and effective resource management.

Similarly, Pichetsopon et al. demonstrated that fear of cancer recurrence and unmet healthcare needs negatively influence the quality of life of breast cancer survivors [7]. Their study highlights the importance of integrating psychological support with technological healthcare solutions to improve long-term patient well-being.

Furthermore, Amin et al. identified a significant gap between healthcare professionals' knowledge and their actual breast cancer screening practices [8]. Despite high awareness levels, screening participation remained relatively low, emphasizing the need for institutional policies, continuous education, and digital healthcare support systems.

Overall, the reviewed studies demonstrate that AI-driven healthcare informatics extends well beyond disease diagnosis. When combined with facial recognition technologies, healthcare information systems, and patient-centered approaches, AI has the potential to improve healthcare accessibility, enhance patient safety, support clinical decision-making, and contribute to the development of secure and intelligent healthcare environments [1], [5]–[8].

VI. CHALLENGES IN AI-DRIVEN FACE RECOGNITION FOR HEALTHCARE INFORMATICS

Despite remarkable advancements in Artificial Intelligence (AI), the widespread implementation of face recognition technologies in healthcare informatics continues to face several technical, ethical, and organizational challenges. One of the primary concerns is protecting patient privacy and maintaining the confidentiality of biometric information. Unlike passwords or identification cards, facial biometric data are permanent personal identifiers. Unauthorized access, data leakage, or misuse of facial information may expose patients to identity theft, discrimination, or privacy violations. Therefore, healthcare organizations must implement secure data management practices and comply with ethical and legal regulations governing sensitive patient information.

Another significant challenge is the reliability and fairness of AI models. Recognition accuracy can be affected by variations in facial appearance caused by aging, medical treatments, surgical procedures, facial expressions, lighting conditions, or occlusions. Cognitive studies further indicate that facial perception depends on multiple factors, including facial motion, gender characteristics, and memory, suggesting that AI systems must be sufficiently robust to handle natural human variability [2]–[4]. Failure to address these variations may result in biased predictions or inaccurate patient identification.

Healthcare implementation also requires integration with existing electronic health records and clinical workflows. Studies focusing

on breast cancer screening and healthcare quality improvement demonstrate that successful AI adoption depends not only on technological performance but also on healthcare infrastructure, workflow optimization, and user acceptance [1], [5]. Furthermore, patient-centered studies reveal that financial limitations, limited healthcare resources, psychological concerns, and healthcare accessibility continue to influence the effectiveness of intelligent healthcare systems [6], [7]. Addressing these challenges requires multidisciplinary collaboration among AI researchers, clinicians, healthcare administrators, and policymakers to ensure that face recognition technologies are secure, transparent, reliable, and clinically beneficial.

VII. FUTURE RESEARCH DIRECTIONS

The rapid evolution of Artificial Intelligence presents numerous opportunities for advancing face recognition technologies within healthcare informatics. Future research should focus on developing more accurate, adaptive, and clinically reliable recognition systems capable of operating under diverse healthcare conditions. Integrating facial recognition with electronic health records, intelligent hospital information systems, and telemedicine platforms could significantly improve patient identification, remote consultation, and healthcare management while reducing administrative errors.

Another promising research direction involves improving the explainability and transparency of AI models. Healthcare professionals require trustworthy systems whose decisions can be interpreted and validated before being integrated into routine clinical practice. Future studies should therefore emphasize explainable AI techniques that provide meaningful explanations for facial recognition decisions while maintaining high predictive performance.

Researchers should also prioritize the development of privacy-preserving AI frameworks that protect sensitive biometric information without compromising recognition accuracy. In addition, more diverse and representative datasets are required to minimize demographic bias and improve algorithm fairness across different populations. Finally, interdisciplinary collaboration among computer scientists, clinicians, psychologists, and healthcare policymakers will be essential for translating AI-driven face recognition from experimental research into safe, ethical, and patient-centered healthcare applications. Such collaborative efforts will support the development of intelligent healthcare systems that improve clinical efficiency while preserving patient trust and data security [1], [5]–[8].

VIII. CONCLUSION

Artificial Intelligence has become an essential component of modern healthcare informatics by supporting intelligent decision-making, automated diagnosis, and improved healthcare management. This systematic review examined recent developments in AI-driven face recognition by analyzing its technological foundations, cognitive aspects, healthcare applications, and implementation challenges. The reviewed studies demonstrate that advances in facial perception, computer vision, and deep learning have significantly improved the capability of AI systems to perform reliable facial analysis while supporting broader healthcare applications such as disease diagnosis, screening, and quality improvement [1]–[8].

The literature further indicates that successful adoption of AI-driven face recognition requires more than technological innovation alone. Issues related to privacy protection, ethical deployment, healthcare accessibility, algorithm fairness, and clinical integration remain important considerations for future implementation. Addressing these challenges will require collaborative efforts between researchers, healthcare professionals, and policymakers to ensure that intelligent healthcare systems remain secure, transparent, and patient-centered.

Overall, AI-driven face recognition represents a promising direction for next-generation healthcare informatics. With continued improvements in explainable AI, secure data management, and intelligent healthcare

infrastructure, facial recognition technologies have the potential to enhance patient identification, improve healthcare efficiency, strengthen clinical decision support, and contribute to the development of smarter and more accessible healthcare systems in the future.

IX. REFERENCES

[1] A. Bothou, A. Bolou, K. Dinas, G. Kyrkou, D. Hardy, P. Pappou, P. Varela, G. Margioula-Siarkou, M. Balafouta, and A. Diamanti, "Artificial Intelligence in Early Breast Cancer Detection: A Systematic Review of Innovations in Preventive Women's Healthcare," Healthcare, vol. 14, p. 1674, 2026, doi: 10.3390/healthcare14121674.

[2] R. Tordjman, E. R. Martin, and F. A. Soto, "Motion-from-Structure in Face Perception: Expectations of Natural Face Motion Depend on Face Shape," Proceedings of the Royal Society B: Biological Sciences, vol. 293, 2026, doi: 10.1098/rspb.2026.0515.

[3] D. Rekow and B. Röder, "Face Gender Perception Influences Automatic Neural Face-Sex Categorization," Research Square Preprint, 2026, doi: 10.21203/rs.3.rs-10041874/v1.

[4] Z. Pounder, M. Stantić, R. Reeder, C. Catmur, and G. Bird, "Individuals with Aphantasia Show Independent Impairments in Face Perception and Face Memory, but Not Face Matching," Cortex (Accepted Manuscript), 2026.

[5] S. A. AlAwadh, R. Z. AlShammari, H. A. AlJohi, R. M. Aseeri, F. T. AlOhali, A. M. Alghamdi, N. AlAhmari, and S. Alharthi, "Improving Breast Cancer Screening Coverage in Primary Healthcare: A Quality-Improvement Study (2023–2025)," Cureus, vol. 18, no. 5, e108674, 2026, doi: 10.7759/cureus.108674.

[6] B. Tumushabe, H. M. Babikako, R. S. Owino, and S. P. S. Kibira, "Exploring Utilization of Breast Cancer Medications at Mbarara Regional Cancer Centre: Voices of Patients and Healthcare Providers," Research Article, 2026.

[7] P. Pichetsopon, P. Pokpalagon, and N. Butsing, "Relationships Between Fear of Cancer Recurrence, Unmet Healthcare Needs, and Quality of Life Among Thai Breast Cancer Survivors Post-Treatment," Healthcare, vol. 14, p. 226, 2026, doi: 10.3390/healthcare14020226.

[8] L. Amin, N. Ahmed, A. S. Laboni, F. Afroz, and F. A. Ferdausi, "Awareness Does Not Ensure Action: Breast Cancer Screening Practices among Healthcare Professionals in Bangladesh," Journal of AMCGH, vol. 2, no. 1, pp. 27–31, 2026.

[9] B. D. Gupta, N. Das, S. Das, and S. Roy, "SmartVote India: A Secure Digital Election Platform," International Journal of Science, Strategic Management and Technology, vol. 2, no. 6, 2026, doi: 10.55041/ijsmt.v2i6.038.

[10] S. Sadhukhan, R. Saha, S. Das, S. Das, and S. Dey, "The Impact of Artificial Intelligence in Modern Education: A Systematic Framework for Pedagogy, Governance, and Ethical Co-Creation," International Journal of Science, Strategic Management and Technology, vol. 2, no. 6, 2026, doi: 10.55041/ijsmt.v2i6.147.

[11] N. Laha, P. Mazumder, and L. Ghorui, "Intelligent PCOS Prediction Framework Using CatBoost and AI-Based Clinical Report Generation," International Journal of Science, Strategic Management and Technology, vol. 2, no. 5, 2026, doi: 10.55041/ijsmt.v2i5.343.