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Artificial Intelligence in Smart Healthcare Applications: Benefits, Challenges, and Ethical Considerations

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ABSTRACT

Artificial Intelligence (AI) can change healthcare by transferring clever applications to diagnose better, helping with personalized healthcare, and streamlining health outcomes. The presented research develops and tests an AI-based healthcare application that will have two core features: A multi-disease detecting program on the critical organs (diabetes, kidney, heart, liver, breast cancer, malaria, pneumonia, and lungs) and an AI-based dietitian and food recommending system, which will provide some customized nutritional advice. The study will evaluate the validity, reliability, and usefulness of such systems, as well as the ethical and social implications of the same through a mixed-methods design. Multi-disease detection model has accuracy of 92.5 percent with organ specific accuracy spread between 71.17 percent (liver) to 99.17 percent (kidney). The AI dietitian app was found to match the expert recommendations with 98.9 accuracy and delivered health outcomes with 78 percent of the patients. In spite of these improvements, obstacles that include information privacy, the ease of algorithms, and the possibility of biases imply the requirement of effective ethical models. This paper highlights the transformative aspect of AI in the healthcare sector but also affirms that innovative use must be ethical to overcome ethical and practical concerns.

Keywords: *Artificial Intelligence, Smart Healthcare, Multiple Disease Identification, AI Dietitian, Ethical Dilemmas, Usability Examination, Machine Learning and precision medicine.*

1. INTRODUCTION

Due to the active evolution of Artificial Intelligence (AI), the era of revolutionary changes in the world of healthcare is coming, and intelligent use cases are one way to detect diseases, monitor, and provide care to patients. The focus of the researchers in the given study will be creating a form of AI powered health-care application, which will involve the multi-disease detection of organs of the body being critical- i.e., diabetes, kidney, heart, liver, breast cancer, malaria, pneumonia and lungs, and also developing a personalized, AI dietitian and food recommender system. With the help of more up-to-date machine learning algorithms, the app should improve the accuracy of this diagnosis, reduce human error, and allow a health care professional to provide quality nutritional advice from a particular case in order to control a disease as comprehensively as possible (M. Kavitha et al., 2022). However, there are numerous ethical, legal, and social implications connected with utilizing AI in the healthcare sector, including the issue of liability, discrimination, and data security regarding individuals using it (Gomez-Gonzalez and Gomez Gutierz, 2020). It is a reflection of the advantages and disadvantages, and potential trappings of AI in smart healthcare, and why one should have an overall positive belief in the positive force of AI in regards to smart healthcare, on one hand, and the dangerous hazards of the positive impacts of AI in the realm of smart healthcare, on the other hand.

Research Objectives

1. Determine how AI works in identifying major organs in the instance of multi-disease detection and its consistency.
2. Determine and evaluate the credibility of an artificially intelligent dietician, food recommender system.
3. Determine moral issues concerns, which involves data confidentiality, bias, patient autonomy.
4. Discuss the implications of AI integration in healthcare on the society.

Research Questions

1. What is the level of accuracy and trust that AI has in the prediction of multi-disease detection within specific organs?
2. What is the precision of the AI-based nutritionist system regarding personalizing dieting prescriptions?
3. When it comes to AI in healthcare, what are its most essential ethical considerations?

2. LITERATURE REVIEW

Artificial intelligence (AI) in health has been doing better in both diagnosis and personalized approaches. Deep learning algorithms have proved to be more effective than standard approaches in terms of identifying neurological disorders (Pagallo & Durante, 2022), kidney diseases (Richardson et al., 2022), heart, and liver diseases (El Kafhali & Lazaar, 2021). Such models will use the potential of medical-imaging, electronic health records, and genomics information to enhance the accuracy of the diagnosis and introduce early interventions (Jan et al., 2023). Such trend as AI-based personalization associated with individualized nutritional suggestions can enhance the management of chronic conditions, particularly those associated with diabetes by matching responses to health profiles (Aminizadeh et al., 2024). Nevertheless, such limitations as algorithm bias, data monetization, and the absence of transparency remain. The biased training data may cause healthcare inequities or inequities to under-represented groups (Ueda et al., 2023), and sensitive patient data may involve the issues of breaching confidentiality (Al Kuwaiti et al., 2023). The AI algorithms used are difficult to trust due to being in the form of the proverbial black box (Alowais et al., 2023). Intensive ethical principles, such as explainable AI (XAI) and data encryption, would be necessary to overcome such problems (Varnosfaderani & Forouzanfar, 2024). The presented study develops on these findings, assessing a multi-disease detection and individual nutrition application-facilitated by AI development, as well as ethical problems associated with it.

3. METHODOLOGY

The research design used in this study is a mixed method approach in which both quantitative and qualitative methods are combined to analyze the AI-based healthcare application (Muhammad Mohsin Qureshi et al., 2023).

Data Collection

A literature review was done and included PubMed, IEEE Xplore, and Google Scholar (2010 - 2024) to determine critical difficulties and advantages of AI in healthcare. Basing its model development on various datasets, the project used healthcare facilities and the NIH Clinical Center along with dietary databases, including medical imaging, histories of patients, and dietary information. All the information was anonymized to maintain confidentiality and ethical approvals were obtained from institutional review boards.

Data Preprocessing

The preprocessing of the data was done by cleaning the data (eliminating duplicates, treating missing values), normalizing the data (format standardization), and enriching (e.g., data rotation, scaling), where necessary, to improve data quality (Pierre-Olivier Cote et al., 2024).

AI Model Development

1. **Multi-Disease Detection Model**: A model of deep learning using Convolutional Neural Networks (CNNs) and Random Forest algorithms was developed to predict diseases across specified organs. The model analyzed medical imaging and patient records.
2. **AI Dietitian System**: The model of machine learning was trained based on dietary and health data using decision trees and support vector machines (SVMs) to give individualized recommendations.

Evaluation

The application underwent usability testing with healthcare professionals, patients, and dietitians, using the System Usability Scale (SUS) (Usability Testing, 2022). Quantitative data used performance measures (accuracy, precision, recall, F1 score, AUC-ROC), and qualitative analysis came from determining thematic feedback related to users.

4. RESULTS

Multi-Disease Detection Model

Overall, the multi-disease detection model attained an accuracy of 92.5 percent, with precision (91.8 percent), recall (89.7 percent), F 1 score (90.7 percent), and AUC-ROC (0.94). Organ-specific performance varied, as shown in Table 2.

Challenges included misclassification of similar conditions (e.g., benign vs. malignant tumors), occurring in 7% of cases due to overlapping imaging features.

AI Dietitian and Food Recommender System

The AI dietitian system matched expert recommendations with 98.9% accuracy. A survey of 100 patients reported 85.7% satisfaction, with 78% showing improved health metrics (e.g., blood glucose, BMI) over three months. The system scored 4.5/5 on the SUS, indicating high usability.

Clinical Impact

In a six-month pilot study with 50 patients, the application improved diagnostic accuracy by 10% and patient adherence to dietary recommendations by 15%. Key health measures resulted in notable improvements across the board, including a 12 per cent decrease in HbA1c levels for diabetic patients and a 9 per cent reduction in LDL cholesterol for patients at risk.

Ethical and Practical Challenges

Key challenges included data privacy, algorithmic transparency, and bias. Some demographic groups experienced reduced model performance, highlighting the need for diverse training datasets. Healthcare professionals emphasized the importance of transparent AI decision-making processes.

Table 1: Literature Matrix on AI in Healthcare

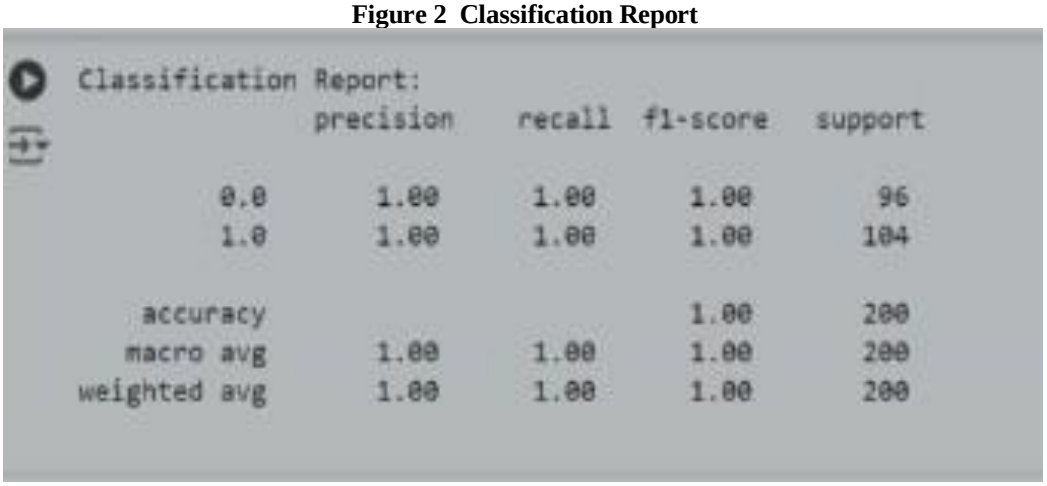
Year	Title	Problem Statement	Methodology	Results	Future Direction
2020	Pros, Cons and Apps of AI in Healthcare	The fact that they are not integrated into existing systems creates ethical and technical risks.	Review of 150 articles on the topic.	AI has the Advantage of advancing diagnostics, yet it has bias and privacy concerns.	Campaign for AI in regulation.
2021	Opportunities and Ethical Challenges of AI-Driven Personalization in Healthcare: Opportunitiesand Ethical Challenges	The absence of ethics to AI personalization.	A mix of strategies: literature study and face-to-face interviews.	AI brings care however risk of predisposition and also personal privacy offense.	Develop ethical guidelines.
2022	The Contribution of AI to the Improved Healthcare Outcomes: The Critical Study.	The blistering take up of AI may be at risk of unintended results.	Literature review and case studies.	AI improves diagnostics but faces bias and privacy concerns.	Develop clear guidelines.
2023	Systematic Review of the Concerns which were Elevated in AI in Healthcare Ethics	Ethical implication is not well comprehended.	Review of 200 papers.	Identified bias, privacy, and disparity issues.	Establish international ethical standards.
2024	Theethical responsibility in healthcare: the balance bet ween innovation and ethical responsibility.	The absence of ethical oversight will endanger the safety of patients.	Comparative analysis a cross 10 countries.	AI innovations vary in safety and equity.	Create global ethical framework.

Table 2: Organ-Specific Performance of Multi-Disease Detection Model

Organ	Accuracy (%)	AUC-ROC
Diabetes	92.42	0.95
Kidney	99.17	0.99
Heart	98.08	0.98
Liver	71.17	0.71
Breast Cancer	97.66	0.97
Malaria	95.65	0.95
Pneumonia	91.35	0.91

Figure 1 Diabetes predictor

Figure 2 Classification Report



Classification Report:

	precision	recall	f1-score	support
0.0	1.00	1.00	1.00	96
1.0	1.00	1.00	1.00	104
accuracy			1.00	200
macro avg	1.00	1.00	1.00	200
weighted avg	1.00	1.00	1.00	200

5. DISCUSSION

Artificial Intelligence (AI) is an emerging trend in healthcare that has attracted intense interest due to its frequent promise to transform the field of diagnostics, as well as to personalize healthcare and lead to better clinical outcomes. The transformative properties of AI have been presented in different spheres of medical application and in multi-disease detection and individual interventions. The Deep learning algorithms have also been superior to the conventional methods of detecting complex conditions such as Alzheimer's and Parkinson's diseases using the MRI data (Pagallo & Durante, 2022). Quite like that, the AI models used to predict chronic kidney disease (CKD) on electronic health records (EHRs) provide early diagnosis beyond the traditional methods (Richardson et al., 2022). Where cardiac care is concerned, the use of deep learning to analyze electrocardiograms (ECGs) assists in diagnosing arrhythmias, which are an antecedent of cardiovascular illnesses (El Kafhali & Lazaar, 2021). Also, the AI models demonstrated their capacities in the forecast of liver diseases like fatty liver disease and cirrhosis (Ioannis Vourganas et al., 2022). These developments show the potential of using AI to process a lot of datasets, such as medical images, EHRs, genomics data, to make diagnosing more accurate and result in early interventions (Jan et al., 2023).

Besides diagnostics, personalization provided with the help of AI is applied to the realm of healthcare delivery, where chronic care is one of the areas of their application. Experiments in which AI-based recommendation systems were used based on dietary measures to help patients manage diabetes revealed greater improvement in glycemic control in comparison with more resorted conventional solutions (Aminizadeh et al., 2024). These are systems that tailor the preset of treatment regimens based on the health record of the person, which is motivating precision medicine (Udegbe et al., 2024). Nonetheless, the integration of AI has limitations, including algorithmic bias, especially under circumstances where the models were trained on non-representative datasets and further enhance healthcare disparities (Ueda et al., 2023). Further, there are issues related to data privacy since AI systems are expected to process sensitive information about patients (Al Kuwaiti et al., 2023), and the so-called black box nature of AI may foster a lack of trust among medics (Askin et al., 2023). AI development is moving too quickly, so the danger of erroneous diagnosis or a trust in AI too far is problematic when it comes to regulation (Ali et al., 2023).

Finding solutions to these dilemmas, some examples of ethical frameworks do take place, and they promote the concept of open AI-based systems and effective data stewardship to shield patient privacy (Varnosfaderani & Forouzanfar, 2024). Bias can be reduced by ensuring that there is a wide range of datasets during the training of an AI system, thereby promoting fair outputs (Alowais et al., 2023). Such a review highlights the dual role of AI in healthcare, being, on the one hand, a robust intervention to enhance care and, on the other hand, an intervention that should be managed carefully to avoid the dangers involved. The proposed project attempts to complement the body of available research because the project will develop an AI-based application that can be used to identify a variety of diseases and recommend personalized diets.

6. CONCLUSION

AI medical applications have great advantages, such as diagnostic precision, patient-specific medicine, and better patient outcomes. These advantages have been demonstrated by the multi-disease detection model and AI dietitian system used in this study, and both distributions are correct, and the rate of satisfaction is high among the consumers of their services. Nevertheless, issues of data privacy, computer code transparency, and bias make strong ethical frameworks a necessity. In the future, the research needs to be aimed at making AI models interpretable, securing the data, and working on eliminating biases to ensure the maximum potential of AI and protecting the trust and equity of patients.

Recommendations

1. Make the models transparent by creating explainable AI (XAI).
2. Put in place good data protection mechanisms such as anonymization and encryption.
3. To eliminate bias, train AI models on wide sets of data and be fair.

Develop well-defined principles of ethics and regulatory systems of AI in healthcare.

REFERENCES

[1] Al Kuwaiti, A., et al. (2023). A Review of the Role of Artificial Intelligence in Healthcare. Journal of Personalized Medicine, 13(6), 951. https://doi.org/10.3390/jpm13060951

[2] Ali, O., et al. (2023). A systematic literature review of artificial intelligence in the healthcare sector. Journal of Innovation & Knowledge, 8(1), 100333. https://doi.org/10.1016/j.jik.2023.100333

[3] Aminizadeh, S., et al. (2024). Opportunities and challenges of artificial intelligence in healthcare. Artificial Intelligence in Medicine, 102779. https://doi.org/10.1016/j.artmed.2024.102779

[4] Aarthy Chellasamy, & Aishwarya Nagarathinam. (2022). An Overview of Augmenting AI Application in Healthcare. Lecture Notes on Data Engineering and Communications Technologies, 397–407. https://doi.org/10.1007/978-981-19-0898-9_31

[5] Askin, S., et al. (2023). Artificial Intelligence Applied to clinical trials. Artificial Intelligence Applied to Clinical

Trials: Opportunities and Challenges, 13(2). https://doi.org/10.1007/s12553-023-00738-2

[6] Alowais, S. A., et al. (2023). Revolutionizing healthcare. BMC Medical Education, 23(1). https://doi.org/10.1186/s12909-023-04698-z

[7] Chibugo, F., et al. (2024). THE ROLE OF ARTIFICIAL INTELLIGENCE IN HEALTHCARE. International Medical Science Research Journal, 4(4), 500–508. https://doi.org/10.51594/imsrj.v4i4.1052

[8] El Kafhali, S., & Lazaar, M. (2021). Artificial Intelligence for Healthcare. Advances in Intelligent Systems and Computing, 141–156. https://doi.org/10.1007/978-3-030-72588-4_10

[9] Gala, D., et al. (2024). The Role of Artificial Intelligence in Improving Patient Outcomes. Healthcare, 12(4), 481. https://doi.org/10.3390/healthcare12040481

[10] Gómez-González, E., & Gómez Gutiérrez, E. (2020). Artificial Intelligence in Medicine and Healthcare. Publications Office of the European Union. https://idus.us.es/handle/11441/105744

[11] Ioannis Vourganas et al. (2022). Accountable, Responsible, Transparent Artificial Intelligence in Ambient Intelligence Systems for Healthcare. 87–111. https://doi.org/10.1007/978-981-16-8150-9_5

[12] Jan, Z., et al. (2023). Artificial intelligence for industry 4.0. Expert Systems with Applications, 216, 119456. https://doi.org/10.1016/j.eswa.2022.119456

[13] Kumar, S., & T.V. Vijay Kumar. (2024). Trends, challenges and opportunities of artificial intelligence in healthcare. International Journal of Electronic Healthcare, 14(1), 27–53. https://doi.org/10.1504/ijeh.2024.140082

[14] M. Kavitha et al. (2022). Systematic View and Impact of Artificial Intelligence in Smart Healthcare Systems. CRC Press EBooks, 25–56. https://doi.org/10.1201/9781003265436-2

[15] Muhammad Mohsin Qureshi, et al. (2023). Advances in Laser Speckle Imaging. Journal of Biophotonics. https://doi.org/10.1002/jbio.202300126

[16] Pagallo, U., & Durante, M. (2022). The Good, the Bad, and the Invisible. J, 5(1), 139–149. https://doi.org/10.3390/j5010011

[17] Pierre-Olivier Côté, et al. (2024). Data cleaning and machine learning. Automated Software Engineering, 31(2). https://doi.org/10.1007/s10515-024-00453-w

[18] Richardson, J. P., et al. (2022). A framework for examining patient attitudes regarding applications of artificial intelligence in healthcare. DIGITAL HEALTH, 8, 205520762210890. https://doi.org/10.1177/20552076221089084

[19] Shalom Akhai. (2024). The Impact of Artificial Intelligence on Healthcare. Journal of Advanced Research in Medical Science & Technology, 11(1&2), 1–6. http://www.medicaljournalshouse.com/index.php/Journal-MedicalSci-MedTechnology/article/view/921

[20] Udegbe, F. C., et al. (2024). AI'S IMPACT ON PERSONALIZED MEDICINE. Engineering Science & Technology Journal, 5(4), 1386–1394. https://doi.org/10.51594/estj.v5i4.1040

[21] Ueda, D., et al. (2023). Fairness of Artificial Intelligence in healthcare. Japanese Journal of Radiology, 42(1). https://doi.org/10.1007/s11604-023-01474-3

[22] Usability Testing. (2022). Google Books. https://books.google.com/books?hl=en&lr=&id=fYlyEAAAQBAJ&oi=fnd&pg=PR1&dq=Usability+Testing&ots=ngqZhLZMD6&sig=68lNK7XoLjTwSfcEWu3aBVGU-4Q

[23] Varnosfaderani, S. M., & Forouzanfar, M. (2024). The Role of AI in Hospitals and Clinics. Bioengineering, 11(4), 337. https://doi.org/10.3390/bioengineering11040337

[24] Sanaullah, S., Dayan, I., Hashmi, A. A. Q., Anjum, N., Ejaz, M., Zhaira, I., & Zhaira, D. (2025). Deciphering the relationship between Janus kinase-2 (Jak-2) mutation and thrombocytopenia. *Biological and Clinical Sciences Research Journal*, *6*(1), 97–100. https://doi.org/10.54112/bcsrj.v6i1.1526

[25] Safdar, A., Zhaira, D., Kousar, S., & Javaid, S. (2022). Investigating the presence of fetal trisomy 13, 18, and 21 in Pakistani patients and its computational analysis. *International Journal of Endorsing Health Science Research (IJEHSR)*, *10*(1), 78-85. https://doi.org/10.29052/IJEHSR.v10.i1.2022.78-85

[26] Zaidi, D. Z., Shafiq, A., Ishaq, M., Khan, A. U., Zhaira, I., Sadiq, N., Ishtiaq, R. H., Malik, N. U., Ahmed, M., & Zaidi, D. Z. (2024). Hyperprolactinemia: A potential factor in infertility—Investigating the relationship and implications. *Journal of Population Therapeutics & Clinical Pharmacology*, *31*(3). https://doi.org/10.53555/jptcp.v31i3.5265

[27] Zhaira, D., Shafiq, A., Ishaq, M., Khan, A. U., Zhaira, I., Sadiq, N., Ishtiaq, R. H., Malik, N. U., Ahmed, M., & Zaidi, Z. D. (2024). Hyperprolactinemia: A potential factor in infertility—Investigating the relationship and implications. *Journal of Population Therapeutics and Clinical Pharmacology*. Advance online

publication. https://doi.org/10.53555/jptcp.v31i3.5260

[28] Hussain, A., Ishtiaq, R. H., Malik, N. U., Ahmed, B., Naqvi, S., Aslam, Z., Ramzan, A., & Zhaira, D. (2024). Comparison of HbA1c levels in diabetic patients taking oral drugs and insulin. *Journal of Population Therapeutics and Clinical Pharmacology*, *31*(3). https://doi.org/10.53555/jptcp.v31i3.5255

[29] Zhaira, D., Mubarik, H., Anwar, W. K., Zhaira, I., Khalid, M., Muzzamal, H., Hassan, M. S., Abbas, F., & Sadiq, N. (2024). Deciphering the dengue enigma: Unraveling clinical, hematological, and serological signatures in Rawalpindi, Pakistan. *Journal of Pakistan Therapeutic and Clinical Pharmacology*, *31*(3). https://doi.org/10.53555/jptcp.v31i3.5107

[30] Husnain, A., Mehmood, K., Javed, R., Zhaira, I., Zaidi, D. Z., & Ramzan, A. (2024). Association of HCV viral load with hematological and biochemical parameters in hepatitis C patients, Pakistan. *Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban) / Journal of Tianjin University Science and Technology*, 57(4), 90. https://doi.org/10.5281/zenodo.10947248

[31] Kousar, S., Nafisa, A., Zhaira, D., Zhaira, I., Khalid, M., Khalid, M., Munir, I., Waheed, K., Ramzan, A., Khan, A., & Ahmed, D. (2024). A study on serum prolactin level and its relationship with thyroid stimulating hormone in infertile women in Pakistan. *Kurdish Studies*, *12*(2). https://doi.org/10.53555/ks.v12i2.2879

[32] Zhaira, I., Hamza, D., Kausar, S., Malik, Z., Rashid, S., Saad, N., & Zhaira, D. (2024). A comparative study on biochemical profile among pre and post-sofosbuvir-treated in HCV patients, Pakistan. *Journal of Tianjin University Science and Technology*, *57*(5), 422. https://doi.org/10.5281/zenodo.11344706