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AI-DRIVEN DIAGNOSTIC SYSTEMS FOR EARLY IDENTIFICATION OF OCD, AUTISM, AND DEMENTIA

Maryam Siddique
maryamsiddique014@gmail.com
Department of Computer Science, Faculty of Computer Science & IT, Superior University Lahore, 54000, Pakistan
Arslan Ali
contactarslan4@gmail.com
Department of Computer Science, Faculty of Computer Science & IT, Superior University Lahore, 54000, Pakistan
Fatima Ali
fatima.m.ali233@gmail.com
Department of Computer Science, Faculty of Computer Science & IT, Superior University Lahore, 54000, Pakistan
Saleem Zubair Ahmad
saleem.zubair@superior.edu.pk
Department of Computer Science, Faculty of Computer Science & IT, Superior University Lahore, 54000, Pakistan
Syed Karar Haider Bukhari
karar.haider@superior.edu.pk
Department of Computer Science, Faculty of Computer Science & IT, Superior University Lahore, 54000, Pakistan

Abstract
Artificial Intelligence (AI) has become one of the potent methods in enhancing the early diagnosis of neurocognitive and behavioral disorders. This paper examines AI-based diagnostic systems in Obsessive-Compulsive Disorder (OCD), Autism Spectrum Disorder (ASD) and Dementia. The conditions are normally diagnosed late as they have similar symptoms and require subjective clinical evaluation. Machine learning, deep learning, natural language processing, and computer vision are AI methods that can be used to perform analysis of complex data, such as neuroimaging, speech, behavioral data, and electronic health records. The results show that AI improves diagnostic accuracy, minimizes delays and helps to detect the disease at the earliest stage. Multimodal AI solutions also enhance predictive performance and allow customized healthcare. Nevertheless, such challenges as small datasets, transparency, and ethical issues still exist. Various datasets, longitudinal research, and explainable AI models are also identified in the study as the necessary factors to enhance clinical adoption and reliability.

Keywords: Artificial Intelligence, Early Diagnosis, Obsessive-Compulsive Disorder, Autism Spectrum Disorder, Dementia, Machine Learning, Deep Learning, Explainable AI, Multimodal Systems, Precision Healthcare.

1. Introduction

1.1 Background

Over the past several years, the application of Artificial Intelligence (AI) in healthcare has completely transformed the manner in which diseases are diagnosed, monitored and managed. The use of AI in early detection of neurocognitive and behavioral disorders has been one of the areas that have received considerable attention. The diseases of Obsessive-Compulsive Disorder (OCD), Autism Spectrum Disorder (ASD) and Dementia represent an increasing global health issue, because these diseases impact millions of people, and are, in most cases, diagnosed at an advanced stage. Early identification is very important in improving patient outcomes, cutting healthcare expenses, and ensuring timely interventions. The ability of AI-

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based diagnostic systems to analyze big data, discover latent patterns, and offer forecasts has become a promising source in this field [1], [2].

1.2 The significance of early detection is explained

The timely detection of OCD, Autism and Dementia have far-reaching consequences to patients, caregivers and the healthcare systems. As an illustration, early diagnosis is an Autism Spectrum Disorder that is more effective in behavioral therapies and educational interventions before the age of five. Equally, early detection of OCD enables prompt cognitive-behavioral treatment and drug control to avoid the development of the disorder into chronic disability. As a progressive neurocognitive disorder, dementia responds well to early detection, since the sufferers may be offered lifestyle changes, medications, and support structures that can reduce the rate of cognitive deterioration. Sadly, conventional diagnostic techniques are based on clinical interviews, psychological tests, and subjective decisions and they may thus tend to slow down diagnosis. The AI-based systems are more likely to be objective, precise, and efficient in identifying early warning signs that may be missed otherwise [3], [4].

Table 1. Importance of Early Detection Across Disorders

Disorder	Benefits of Early Detection
OCD	Prevents chronic disability, improves response to CBT and medication
Autism	Enhances behavioral therapy outcomes, supports early education planning
Dementia	Allows lifestyle modifications, medical treatments, and family preparedness

1.3 Role of Artificial Intelligence in Healthcare

Artificial Intelligence in healthcare is built upon machine learning (ML), deep learning (DL), and natural language processing (NLP) algorithms. These methods allow AI systems to work with complex medical data, which includes all brain scans and genetic profiles, as well as all the data on behavior and patient history. Unlike conventional diagnostic practices, AI systems can recognize subtle, non-linear patterns and correlations that humans may miss. As an example, deep learning models have been shown to be highly accurate when compared to brain MRI scans to detect early signs of neurodegeneration associated with dementia [2], [5]. Likewise, Autism risk can be forecasted using machine learning models that are trained using behavioral data and, as a result, process speech patterns, eye movement, and social interaction data. In OCD, AI systems are able to identify recurrent behavioral signs and psychological patterns that indicate an early onset [6].

1.4 Challenges in Traditional Diagnosis

The overlapping symptoms are one of the greatest problems of the diagnosis of neurocognitive and behavioral disorders. Autistic patients, patients with OCD, or early Dementia tend to be characterized by repetitive behaviors, communication impairments, or memory impairments, making it harder to differentially diagnose them. Also, differences in the presentation of symptoms due to cultural, social, and personal differences may lead to misdiagnosis or underdiagnosis. The lack of trained psychiatrists and neurologists also contributes to the problem in most low- and middle-income countries. The traditional tools, although useful, are still limited in terms of scalability and accessibility. An example is that neuropsychological tests and structured interviews are very time-consuming and need expertise. It is here that the possibilities of AI-based diagnostic systems are enormous, as they can provide automated, scalable and cost-efficient solutions that can aid clinicians in making prompt and correct decisions [1], [4].

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1.5 AI in Early Detection of OCD

Obsessive-Compulsive Disorder can be described as being obsessive (intrusive thoughts) and compulsive (repetitive actions). ODS should be detected at the earliest age possible since most symptoms of the disorder tend to progress to a serious impairment of day-to-day activities. The applications of AI in diagnosing OCD are to analyze speech patterns of patients, track the data of wearable sensors to track repetitive behavior, and examine the risk factors through predictive models [6]. Electronic health records have been used to train machine learning algorithms to detect individuals with undiagnosed OCD to offer clinicians decision support tools. These strategies would allow intervention at earlier stages, which would possibly allow the disorder to not advance to more serious levels [5].

1.6 AI in Early Detection of Autism Spectrum Disorder

The heterogeneity of Autism Spectrum Disorder poses a challenge in diagnosis. The symptoms are diverse as they can include communication problems and limited interests and social impairments in a person. Artificial intelligence-based diagnostic tools have demonstrated impressive diagnostic capabilities in early Autism detection. As an example, computer vision algorithms have the capability to capture facial expressions, gaze patterns, and motor activities of children to predict unusual developmental patterns [3]. Also, speech and linguistic frameworks can be evaluated using natural language processing instruments to identify some minor deviations related to Autism. Not only does the use of AI improve the accuracy of diagnostic results, but it also saves time and money spent on conventional tests, making early screening more affordable to a wide range of people [6].

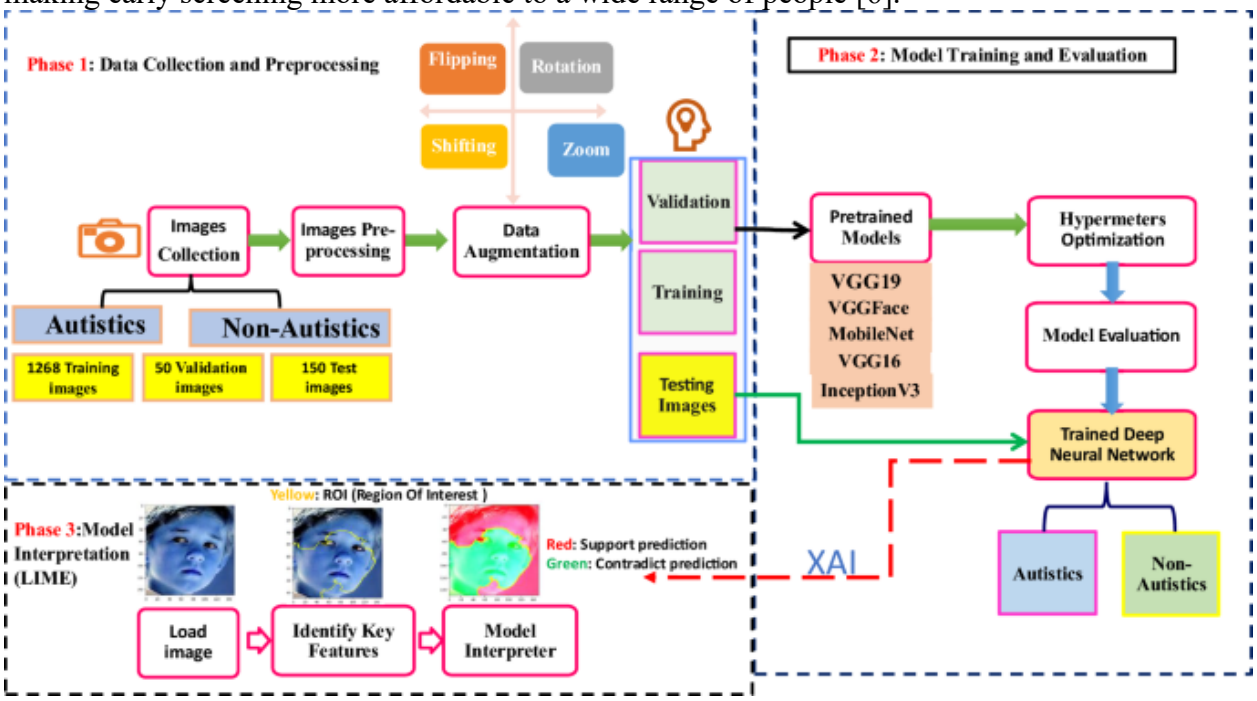

Figure 1. AI-based Autism detection pipeline [6]

1.7 AI in Early Detection of Dementia

Dementia is a condition that leads to a loss of reasoning, memory loss and impaired reasoning. Early diagnosis of dementia may dramatically change the management of the disease as patients may receive treatments that slow down its progression and families can be able to plan on how to take care of the patient. The first signs of dementia are detected by AI-based technologies with the help of neuroimaging, genetic, and cognitive tests. As an illustration, the deep learning models used on MRI and PET scans are able to identify the structural changes in

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the brain even before they are clinically noticeable [2], [7]. Moreover, speech and handwriting recognition AIs have indicated the potential of predicting cognitive impairment. These are technologies that enhance accuracy as well as providing non-invasive and cost-effective screening alternatives [8].

Table 2. Common AI Data Sources for Dementia Detection

Data Source	AI Application	Example Output
MRI/PET Scans	Deep Learning	Early brain structure changes
Speech Patterns	NLP models	Cognitive decline markers
Handwriting Data	Pattern analysis	Fine motor impairment detection

1.8 Benefits of AI-Driven Diagnostic Systems

Using AI in early detection has a number of advantages in the healthcare environment. To begin with, AI systems are more objective and reduce the dependence on subjective clinical observations. Second, they are scalable and allow diagnostic support to be available even in the areas where there are a limited number of healthcare professionals. Third, AI facilitates personalized medicine, with predictive models being customized to specific patient data, enhancing diagnostic accuracy. Finally, AI-based systems minimize delays in diagnosing, providing patients with appropriate treatment and assistance in time [1], [3], [7].

1.9 Ethical Considerations and Challenges

Although it promises, AI-based diagnostics systems do not come without issues. Issues related to data privacy, algorithmic bias, and transparency raise ethical concerns. As an example, AI models trained on small or biased data can be ineffective to work with various populations, resulting in false diagnoses. Additionally, over-reliance on automated systems could undermine the clinician-patient relationship. It is critical to ensure that AI tools are responsible, interpretable, and validated and can be integrated into clinical practice [4], [8].

2. Literature Review

2.1 Introduction to AI in Healthcare Diagnostics

In this section, we will introduce AI in healthcare diagnostics and its application in the healthcare field. The application of Artificial Intelligence (AI) in healthcare has altered the diagnostic methods with data-driven and predictive systems that are automated. Recent developments in machine learning, deep learning, and natural language processing have enabled the analysis of complex data, including neuroimaging, behavioral data, speech and electronic health records [9], [10]. In contrast to traditional approaches that require a great deal of clinician skill and subjective judgment, AI can provide the opportunity to identify nuanced and non-linear trends that humans can miss. Such disorders as Obsessive-Compulsive Disorder (OCD), Autism Spectrum Disorder (ASD), and Dementia have been given special attention due to their prevalence, complexity, and significance of early diagnosis [11].

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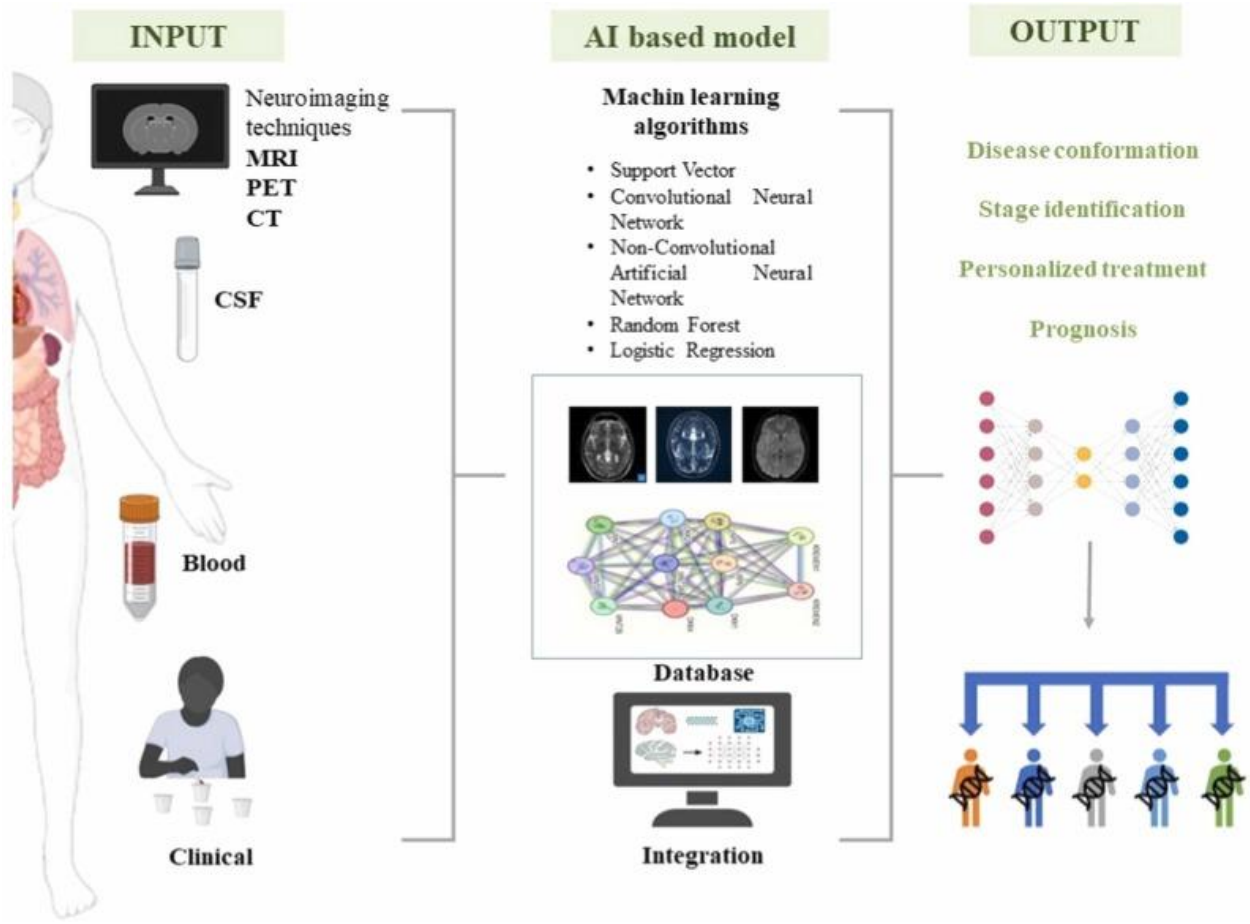

Figure 2. AI-driven diagnostic process for neurocognitive and behavioral disorders[11]

2.2 AI and Early Detection in Neurocognitive and Behavioral Disorders

2.2.1 The Need for AI-Based Approaches

Older diagnostic ways tend to slow down the process of diagnosis since they focus on protracted clinical interviews, psychological tests, and subjective tests. Such processes might fail to recognize early signs of diseases, particularly in diseases with overlapping symptoms. The tools that use AI can overcome these constraints by computing correlations among multimodal data in high volume, revealing latent correlations, and delivering consistent outcomes across different populations [9], [12].

2.2.2 AI as a Complementary Tool

AI is never intended to substitute the work of clinicians, but to assist them in making decisions. It enhances sensitivity and specificity, lowers the possibility of misdiagnosis and speeds up the process of diagnosis. Clinician expertise and AI-based insights can be used to improve patient outcomes and increase the accuracy of diagnosis [13].

2.3 AI in Early Detection of Obsessive-Compulsive Disorder (OCD)

2.3.1 Clinical Challenges in OCD Diagnosis

OCD is described as an intrusive thought and repetitive behavior, and it usually mimics the symptoms of other mental disorders. This overlapping renders the early diagnosis difficult and in most instances diagnosis is made when the disorder has already taken a chronic state [14].

2.3.2 AI Applications in OCD

The use of AI in OCD has been in speech and text processing, wearable sensor measurements, and predictive modeling. Obsessive thinking patterns in speech have been identified with the help of natural language processing, and repetitive behavior can be monitored with the help of

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wearable devices to obtain objective indicators of compulsion [15]. Electronic health records, when trained on predictive models, have also been shown to identify undiagnosed cases and hence clinical intervention can be done earlier [16].

2.3.3 Predictive Modeling and Risk Assessment

Machines can identify risk factors of OCD through the analysis of comorbidities, medical history, and behavioral patterns. These models are considered early warning systems that identify people at risk and aid in preventative care and timely therapy [14], [16].

2.3.4 Gaps in OCD Research

In comparison to Autism and Dementia, there is limited research on the use of AI to detect OCD. The paucity of standardized data and limited large-scale research is limiting. The increase of dataset diversity and the creation of standard behavioral markers are still vital to the further development [15].

2.4 AI in Early Detection of Autism Spectrum Disorder (ASD)

2.4.1 Complexity of Autism Diagnosis

Autism is a very heterogeneous condition and occurs in different ways, beginning with difficulties in communication and ending with repetitive behaviors. Conventional diagnostic testing, though powerful, is not economical in terms of resources and needs a lot of clinical skills. Early diagnosis is especially important as it improves therapeutic and educational outcomes [11], [17].

2.4.2 Computer Vision and Behavioral Analysis

Computer vision has proven to be a significant success in AI when it comes to detecting Autism. Gaze pattern, facial expressions, and motor behaviors can also be analyzed using AI models to distinguish between normal and abnormal developmental trajectories [9]. Deep learning models have demonstrated similar accuracy on home videos of children with expert clinical observation, which suggests the scalability of AI-based tools [17].

2.4.3 NLP and Speech Analysis

Another field of AI usage in Autism detection is speech-based analysis. The algorithms of machine learning can evaluate rhythm, prosody, and language patterns to identify small deviations [13]. These instruments offer a more efficient and cheaper method of screening children at risk and screening becomes more accessible [17].

2.4.4 Accessibility and Scalability

The benefits of AI-based tools in resource-constrained environments are also evident. AI-based mobile applications enable the caregiver to document the child behavior and get initial diagnostic feedback [18]. This democratizes access to early screening especially in areas where specialists are scarce [10].

2.4.5 Gaps in Autism Research

Gaps in Autism Research

The existing AI models tend to be based on small and homogeneous datasets, which constrain their capacity to generalize between populations. Also, there is an ethical issue of dependability of unsupervised tools, since false positives or false negatives can result in unnecessary stress. More studies are required in the future to deal with diversity of datasets and enhance the explainability of AI systems [9], [18].

2.5 AI in Early Detection of Dementia

2.5.1 Diagnostic Challenges in Dementia

Dementia is a progressive disorder that is linked to diminished cognitive functions, loss of memory, and loss of independence. Early diagnosis of dementia is not an easy task, because its symptoms are rather similar to normal aging. The conventional approaches normally identify dementia once a significant deterioration has taken place [12].

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2.5.2 Neuroimaging and Deep Learning

The analysis of neuroimaging data has demonstrated specific potential of AI. MRI and PET scans that are trained using deep learning can identify structural alterations in the brain well before they become noticeable [10], [17]. These models are better than other imaging analyses, providing earlier and more precise predictions [9].

2.5.3 Speech and Handwriting Analysis

Non-invasive data, including speech and handwriting, have also been trained using AI. Language complexity models on speech of a patient can be used to detect an early decline in cognition whereas handwriting recognition models can detect motor impairments that are linked with dementia [16]. These procedures are cheap, non-invasive, and accessible [12].

2.5.4 Multimodal AI Approaches

Multimodal AI systems, which integrate neuroimaging, genetic markers and behavioral data, are the most promising research in dementia. Combining various types of data, these systems enhance the accuracy of prediction and allow viewing the disease development as a whole, which opens the path to individual ways of treatment [9], [10].

Table 3. Common AI Data Sources for Dementia Detection

Data Source	AI Application	Example Output
MRI/PET Scans	Deep Learning	Early brain structure changes
Speech Patterns	NLP models	Cognitive decline markers
Handwriting Data	Pattern recognition	Fine motor impairment detection

2.5.5 Gaps in Dementia Research

Although, there are improvements, the wide-scale clinical use of AI tools in dementia is not widespread. Issues such as privacy, absence of standard imaging protocols, and problems in validating models in different populations are challenges. Collaborative research and regulatory frameworks are needed to address these barriers [11], [18].

2.6 Comparative Insights Across Disorders

Although, OCD, Autism, and Dementia are not similar, AI studies in these conditions reveal some common themes. Speech, gaze, and handwriting behavioral data are always an effective biomarker [14]. In dementia, neuroimaging has been the most credible source of diagnosis in cases where it has been analyzed using AI [10], [17]. In all disorders, AI is scaled, with low-cost diagnostic instruments in low-resource environments. Nevertheless, issues like algorithmic bias, interpretability, and compatibility with clinical workflows are similar across domains [12], [18].

Table 4. Comparative AI Applications Across Disorders

Disorder	Key AI Methods Used	Benefits of AI in Detection
OCD	NLP, Wearable Sensors, ML	Identifies repetitive behaviors & risks
Autism	Computer Vision, NLP	Detects gaze, facial expressions, and speech
Dementia	Deep Learning, NLP, Multimodal	Reveals brain changes, speech decline

2.7 Ethical and Practical Considerations in Literature

One of the themes in AI-based diagnostics is the problem of ethics. Models that are trained on smaller datasets are likely to be biased, and such bias may cause healthcare disparities [12], [13]. Also, due to the black-box nature of deep learning, there is a trust gap between clinicians and automated systems because predictions do not necessarily contain a clear reasoning. Another obstacle is that of data privacy, particularly when dealing with sensitive mental health

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information. To handle these issues, there must be clear, explainable AI systems and effective privacy models [11], [18].

2.8 Research Gaps and Future Directions

Nevertheless, AI studies in the early detection of disorders are limited in a number of ways. Majority of the studies are based on small or homogeneous population, which decreases the generalization. Clinical validation has not been done in practice, and it is urgently needed that explainable AI systems be developed that will gain clinician trust [9], [12]. There are also no longitudinal studies with most of the existing work being cross-sectional. Moreover, very little has been done in terms of differential diagnosis between disorders with similar symptoms like OCD and Autism. The development of large, diverse datasets, multimodal AI systems, and federated learning models that do not violate privacy and allow collaboration on a large scale should become the focus of future research. The effectiveness of AI tools in real-world conditions needs to be tested using clinical trials. Finally, AI needs to be incorporated as an auxiliary resource that will empower clinicians instead of substituting them [10], [18].

3. Methodology

3.1 Research Design

The paper will use the method of systematic review to examine how Artificial Intelligence (AI) can be used to detect Obsessive-Compulsive Disorder (OCD), Autism Spectrum Disorder (ASD), and Dementia at an earlier stage. This research design will help gather and synthesize existing knowledge on already published studies in an organized and objective fashion [1], [9]. Since it is a review-based research, no primary data is collected; the research is based on the analysis of secondary data by reputable academic sources [13]. Within this method, it becomes possible to learn about the latest developments, techniques and shortages of AI-based diagnostic systems as well as define gaps that need to be filled in with additional research.

3.2 Data Sources and Search Strategy

The literature used in the study under consideration was obtained in several reputable academic databases, such as Google Scholar, IEEE Xplore, ScienceDirect, SpringerLink, and PubMed [9], [13]. A systematic search strategy was implemented with the help of particular keywords and their combinations, including: Artificial Intelligence in healthcare, AI to detect OCD, Autism diagnosis machine learning, and Dementia detection machine learning deep learning [2], [6]. The search results were refined using the binary operators AND, OR, and NOT to make them more accurate. The choice of articles was mainly limited to 2020-2025 because it is necessary to make sure that the review is representative of recent changes and tendencies in AI technologies used in healthcare diagnostics [2], [10].

3.3 Inclusion and Exclusion Criteria

To determine the quality and relevancy of the selected studies, the inclusion and exclusion criteria were established. Inclusion criteria was based on peer-reviewed journal articles and conference papers discussing the use of AI techniques, such as machine learning, deep learning, and natural language processing, to diagnose OCD, Autism, or Dementia [5], [11]. The preference was on studies that focus on early detection, predictive modeling, and clinical uses. On the other hand, non-English articles, literature that was published earlier than 2020 (except in exceptional cases), and papers, which are not clear in methods or empirical evidence, were excluded. Blogs, reports and opinion-based articles were also excluded to ensure academic reliability [12].

3.4 Data Extraction and Analysis

Once the pertinent literature has been identified and chosen, significant information was systematically gathered out of individual papers. This entailed the kind of disorder under investigation, the AI methods applied, the characteristics of the datasets, and the most important findings and results [3], [7]. Also, study limitations and gaps identified by the original authors

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were taken into consideration. The data were then analyzed by a comparative method where the studies were categorized on the basis of the disorder and AI methodology used. The approach has made it possible to find the patterns, similarities, and differences among different studies and get the better idea of how AI is used in the early detection of the disease [6], [9].

3.5 Comparative Framework

In order to deepen the analytical nature of the research, a comparative framework was created to assess AI uses in OCD, Autism and Dementia. Factors that were taken into account in this framework include diagnostic accuracy, efficiency, the kind of data to be used, scalability, and practical use in real-life healthcare contexts [13], [19]. Using this systematic comparison, the study shows the advantages and disadvantages of various AI methods and reveals which methods would be the most effective in particular disorders. The areas that need more research and improvement are also identified with the help of this framework.

3.6 Ethical Considerations

This study does not imply any direct human involvement, but the ethical considerations were taken into account. Sources used in the research were properly referenced in order to achieve academic integrity and prevent plagiarism. Moreover, the research critically comments on ethical challenges presented in the literature, including the privacy of the data, bias in the algorithms, and the unclear nature of AI models [10], [22]. These issues are significant in the context of the responsible use of AI technologies in healthcare and the possibility to make sure that these systems are just, dependable, and credible.

3.7 Limitations of the Study

Despite following a systematic and structured approach, this study has certain limitations. As it uses secondary data, the results are based on the quality and extent of the available research [7], [12]. The rapid development of AI technologies also implies that not all of the recent developments can be covered in the chosen timeframe. Also, the variability of datasets, approaches, and measures of evaluation among studies can confound the comparison. Nonetheless, notwithstanding these shortcomings, the research offers a detailed description of AI usage in its initial disease detection and has its potential value to further investigations.

4. Discussion

4.1 Overview of AI in Early Disease Detection

The introduction will be the overview of AI in Early Disease Detection. The results of this review emphasize the potential of Artificial Intelligence (AI) to revolutionize the process of early diagnosis of neurocognitive and behavioral disorders, especially Obsessive-Compulsive Disorder (OCD), Autism Spectrum Disorder (ASD), and Dementia. The reviewed papers all show that AI technologies, such as machine learning, deep learning, natural language processing, and computer vision, have greatly contributed to the accuracy and efficiency of diagnostic processes. The methods allow the complicated and heterogeneous data, including neuroimaging, speech patterns, behavioral observations, and electronic health records, to be analyzed, which are often hard to decipher via conventional clinical approaches.

4.2 Effectiveness of AI Techniques Across Disorders

One of the major findings is that AI-powered mechanisms are very efficient in detecting early signs of these disorders at such an insidious stage. For example, in Autism detection, computer vision and speech analysis techniques have shown the ability to detect atypical developmental patterns at an early age. Likewise, in Dementia, deep learning models would be used on MRI and PET images to detect structural changes in the brain before the clinical evidence. Regarding OCD, despite the relative lack of research, AI-driven methods like text analysis and wearable sensor data have shown promise in identifying the patterns of repetitive behavior and early psychological indicators. Such results imply that AI can play an essential role in early diagnosis, which will allow taking timely action and optimally cover patients.

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4.3 Role of Multimodal AI Systems

The increasing application of multimodal AI systems is another significant trend observed in the literature. Integrating various data sources including imaging, behavioral data and speech result in better diagnostic accuracy than single-source data. Through this integration, it is possible to have a deeper insight into the conditions of patients and offer them more personalized healthcare solutions. Moreover, AI-based systems are scalable and accessible, which makes them especially useful in the areas with low access to the specialized healthcare provider.

4.4 Challenges and Limitations

Nevertheless, there are a number of challenges to be taken into consideration despite these developments. Among the key problems are reliance on small and usually homogenous datasets, which can limit the extrapolation of AI models to a wide range of populations. This makes the issue of bias and fairness a topic, since models trained on certain datasets might not yield the same results in other demographic contexts. Moreover, the fact that many AI models are black-boxes leads to a lack of transparency, and clinicians cannot rely on it entirely and interpret the results. The adoption of AI in healthcare is further complicated by ethical issues, such as data privacy and security and the possibility of sensitive health information being abused.

4.5 Research Gaps

Although the prospects of AI-based diagnostic systems are promising, there are several research gaps revealed in the reviewed literature. Firstly, the large-scale and diverse datasets are unavailable, which restricts the capability of AI models to be generalized to other populations and settings. This issue highlights the need for more inclusive and representative data collection practices. Secondly, the role of AI in OCD detection is comparatively underexplored, in contrast to Autism and Dementia, which means that this field is untouched and needs exploration. In addition, the majority of the available studies rely on cross-sectional data, and few studies are concerned with longitudinal analysis. This limits the capability of the AI systems to forecast disease development with time and decreases their efficiency in preventive care. The other significant gap is an inability to explain AI models since many modern systems are black boxes, and healthcare professionals struggle to comprehend the logic behind predictions. This restricts clinical adoption and trust. Moreover, AI models have a lack of real-life validation. Although numerous studies claim high accuracy under controlled conditions, their effectiveness in the real clinical settings is uncertain. This indicates the necessity of additional clinical trials and implementation studies. Lastly, issues of data privacy, algorithmic bias, and regulatory issues remain under-met, underscoring the need to establish clear and responsible AI guidelines.

5. Conclusion

This paper presents a review of the importance of Artificial Intelligence (AI) in the early diagnosis of neurocognitive and behavioral disorders, namely, Obsessive-Compulsive Disorder (OCD), Autism Spectrum Disorder (ASD), and Dementia. The results indicate that the work of AI-powered diagnostic systems has contributed to the enhancement of the healthcare sector considerably as it allows making decisions more quickly, more precise, and data-driven. Using machine learning, deep learning, natural language processing, and computer vision, AI systems are able to analyze complex and multimodal data sets which cannot be analyzed using the traditional diagnostic methods. Among the most significant findings in this review is the significance of early detection in enhancing the patient outcomes. The AI technologies have demonstrated high potential in the detection of subtle patterns and early-stage symptoms that otherwise cannot be detected in standard clinical testing. As an example, Autism: Speech and behavior analysis has shown promising outcomes in the diagnosis of Autism at an early stage,

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neuroimaging in Dementia, and pattern recognition in OCD. Such innovations do not only improve the accuracy of diagnoses but also enable early interventions, which eventually leads to better living standards of patients and lessens the burden of the overall healthcare in the long run. Moreover, the combination of multimodal data sources has become an important trend in AI-based diagnostics. Integrating data on imaging, behavioral observations, and patient records allows a more comprehensive picture of the state of an individual, and results in a more credible and individualized healthcare approach. Scalability and accessibility are other advantages of AI systems which are especially helpful in areas with scarce access to special medical care. Nevertheless, even with these potential developments, there are a number of challenges that need to be overcome in order to achieve successful rollout of AI in healthcare. Lack of transparency in the AI models, limited and biased datasets, and the fear of data privacy and security are still major obstacles. Also, the disconnect between the experimental and clinical practice indicates the necessity of additional validation, standardization, and regulatory models. Finally, AI has tremendous opportunities to revolutionize the early detection and diagnosis of OCD, Autism, and Dementia. Although existing studies show promising developments, further work is needed to create various datasets and explainable AI solutions and effective clinical validation strategies. Through solving these problems, AI can be an influential additional resource to health care professionals, which, in the long run, would lead to more effective, more accurate, and patient-oriented healthcare systems.

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