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Computer-Aided Gastrointestinal Disease Analysis Based on Artificial Intelligence Method

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ABSTRACT

The diagnosis and treatment of gastrointestinal diseases are challenging because of the long incubation period. Although it has made progress at present, the overall prospect is still not optimistic. In this paper, a computer-aided gastrointestinal disease analysis scheme based on artificial intelligence method is proposed. The improved dictionary learning method is combined with BP neural network method in artificial intelligence method to analyze gastrointestinal diseases, extract key feature quantities, find common factors affecting treatment and choose the best treatment scheme. Finally, the simulation test and analysis are carried out. The simulation results show that this method has a certain accuracy, which is 6.25% higher than the traditional method. With the powerful data analysis ability of artificial intelligence technology, clinicians can combine complex molecular biological information to make more accurate judgments on patients' current condition and possible future progress, which is conducive to making individualized clinical decisions.

KEYWORDS

Artificial Intelligence, Computer-Aided, Gastrointestinal Diseases

INTRODUCTION

In the field of medicine, accurately diagnosing gastrointestinal diseases has always been one of the challenges doctors face (Pannala et al., 2020). Doctors usually need to rely on observations of anatomical or physiological abnormalities to describe symptoms and signs to make a diagnosis (Nazarian et al., 2021). However, when encountering functional abnormalities or diseases, diagnosis becomes more difficult because of the lack of observable pathophysiological defects (Lui et al., 2020). More than half of gastrointestinal diseases are functional, which further increases the complexity of diagnosis (Okagawa et al., 2022). In recent years, gastrointestinal diseases have been the focus of research in the digestive sector, but their high incidence rate, unclear etiology, limited treatment methods, and high costs have brought huge burdens to patients' normal lives and to society. AI technology has become a promising solution to meeting this challenge. AI, as a complex grassroots system, can simulate human cognitive processes and quickly transmit knowledge concepts through multimedia information. Therefore, this article adopts an improved backpropagation neural network (BPNN) method to reduce computational costs and improve the quality and efficiency of gastrointestinal disease analysis. The

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application of AI theory and technology to computer-aided systems will form a diagnostic feature reconstruction model for gastrointestinal disease analysis and optimization design, which will provide a feasible treatment plan for treatment. The system can extract key feature quantities on the basis of patients' actual situations, such as the degree of disease development, and adopt corresponding treatment methods and strategies to better match their treatment needs at different stages and correct the problems in existing treatment methods. The information provided in this article will help improve the diagnostic accuracy and efficient treatment of gastrointestinal diseases, promotes technological progress in the medical field, and enhances the understanding and treatment level of gastrointestinal diseases. This will help doctors identify and accurately diagnose a patient's condition more quickly, reduce their medical expenses, save medical resources, and provide better guidance for treatment. Its innovation lies specifically in the following two ways:

- This article adopts the backpropagation (BP) neuro web method in AI method in order to reduce the execution cost of the method.
- This article constructs the key characteristic quantities of the optimal design scheme of gastrointestinal diseases and uses the dictionary learning method to realize the optimal design and recognition of the treatment scheme of gastrointestinal diseases.

LITERATURE REVIEW

In the treatment of gastrointestinal diseases, traditional Chinese medicine has more advantages than the simple drug treatments used in Western medicine, eliminating the problem of only alleviating symptoms but not fundamentally relieving the disease; For example, the etiology and pathogenesis of some functional gastrointestinal diseases have not been accurately described in modern medicine. Some drugs that promote gastric motility, inhibit gastric acid, and fight Helicobacter pylori are commonly used in clinical treatment, but some of these drugs may cause cardiovascular disease or other adverse reactions (Brodersen et al., 2024).

Machine learning has been increasingly used in the field of gastrointestinal diseases to aid in diagnosis, prediction, and surveillance. A study conducted by Visaggi et al. (2022) focused on using supervised machine learning algorithms to differentiate between inflammatory bowel disease (IBD) and alimentary lymphoma in cats, demonstrating the potential of machine learning in distinguishing between different diseases on the basis of noninvasive diagnostic tests. Similarly, Mohapatra et al. (2021) aimed to create a machine learning prediction model for IBD that is based on routine blood, urine, and fecal tests; the model showed a high level of accuracy in supporting the diagnosis of IBD. In the context of syndromic surveillance, Milluzzo et al. (2021) evaluated machine learning methods using veterinary necropsy reports, highlighting the importance of machine learning in monitoring disease patterns and outbreaks. Furthermore, Visaggi et al. (2022) focused on assessing gastrointestinal predictors for the risk of COVID-19–related hospitalization using machine learning algorithms, emphasizing the role of gastrointestinal parameters in predicting patient outcomes. Khan et al. (2020) discussed the application of machine learning in analyzing gut microbiota related to intestinal diseases, showcasing the potential of machine learning in understanding the role of micro-organisms in disease onset. In addition, Yao et al. (2022) conducted a systematic review of the applications of AI and machine learning in IBD, highlighting the potential of computational methods, such as machine learning, in providing individualized care for IBD patients. Moreover, Pannala et al. (2020) proposed a concatenated neural network model for diagnosing gastrointestinal diseases using machine learning classification techniques, demonstrating the use of advanced neural networks in disease diagnosis. Last, Nazarian et al. (2021) used machine learning analysis of national health insurance data to assess the associations of preterm birth with dental and gastrointestinal diseases, showcasing the versatility of machine learning in exploring various disease relationships.