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Data Mining for Economic Efficiency of Ecological Environment Based on Machine Learning Algorithms

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ABSTRACT

This can help people better understand and grasp the laws of economic changes in the ecological environment and tap the tremendous value contained in the information, thereby promoting the research process of ecological environmental economics. This paper tentatively introduced ML algorithms and conducted in-depth research on innovative models for evaluating the economic efficiency of the ecological environment. Combining artificial neural networks and highly integrated sensor systems, a model for evaluating the economic efficiency of innovative ecological environments was proposed. Through comparative analysis of application experiments in two cities in a certain region, it can be concluded that the innovative ecological environmental economic efficiency evaluation model proposed in this article had an average improvement of about 20.3% in four evaluation indicators compared to the traditional ecological environmental economic efficiency evaluation model.

KEYWORDS

Machine Learning, Environmental Protection, Economic Efficiency, Data Mining

INTRODUCTION

With the rapid development of the social economy, environmental problems have become increasingly prominent and a key factor restricting further economic development. Environmental pollution and ecological destruction affect residents' quality of life and pose a serious threat to sustainable development. Globally, the degradation of ecosystems, excessive consumption of resources, and reduction in biodiversity have made people pay more and more attention to the balance between environmental protection and economic development. The economic efficiency of the ecological environment refers to achieving the optimal balance between maximizing economic benefits and minimizing ecological impacts through the rational use and protection of natural resources and the environment while promoting economic growth.

Traditional methods have many limitations in the evaluation of ecological environmental economic efficiency. Traditional evaluation models rely on the knowledge and subjective judgment of experts, which leads to a lack of objectivity and accuracy in the evaluation results. Due to the complexity and diversity of ecological environmental data, traditional methods have difficulty processing large-scale datasets and cannot achieve real-time monitoring and accurate prediction of the ecological environmental status. In the face of a complex ecological environment, traditional methods often require a lot of human and material resources, which is an uneconomical and unrealistic choice for

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long-term economic construction and environmental protection. Therefore, exploring a more scientific, efficient, and low-cost evaluation method to meet the current challenges of ecological environmental protection and economic development has important theoretical significance and practical value.

Some experts and scholars have summarized the socioeconomic impact of the increasingly severe ecological environment situation. They analyzed the internal relationship between the ecological environment and economic construction and proposed some optimization plans for the ecological environment pollution problem. To explore effective methods to improve the economic efficiency of the ecological environment and promote the development of a low-carbon economy, Liu et al. (2019) analyzed and obtained the potential determinants of the ecological environment and economy in different regions at different times. Combining the relaxation measurement model and green economy development standards, Ke et al. (2022) explored and analyzed the impact of different economic development levels on the state of the urban ecological environment and found that the impact of the urban ecological environment gradually increased as the economic levels increased. Mariyono (2020) conducted a study on the relationship between the improvement of the local ecological environment and the economic sustainability of business management. Taking production optimization theory as the core theory, a model was proposed to measure the impact of ecological environment improvement on the development performance of agricultural integrated enterprises.

By studying the trend of ecological environment changes in local cities in recent years, Du et al. (2022) explained the impact mechanism of the green economy on urban ecological environment issues from the perspective of innovation in green technology, which proposed new ideas for optimizing ecological environment stability, harmony, and green development of economic construction. Combining a set of general least squares methods and fixed effect models, they studied the development trend of economic construction under the comprehensive review of the ecological footprint and verified that the advancement of economic construction increased the ecological footprint and worsened the ecological environment (Majeed & Mazhar, 2019). Bateman and Mace (2020) conducted a study on the core role of the ecological environment in maintaining socioeconomic and social development. Combining the ecological and environmental protection policies issued by the local government and relevant departments, they researched the development laws of local economic construction and proposed an analysis and decision-making framework that links ecological and economic perspectives.

Ahmed et al. (2022) studied the role of ecological environmental protection regulations in the sustainable development of economic construction and proposed a theoretical framework for data analysis of ecological environmental protection policies in renewable energy and ecological economy. Machin (2019) investigated and analyzed the implementation of ecological and environmental protection policies in local cities over the past 30 years and concluded that political decision-making is the main driving force for the rational construction of a green economy. Usman and Hammar (2021) studied the dynamic relationships between socioeconomic development, renewable energy development, and ecological footprint in the ecological environment and revealed their two-way causal relationships.

The above studies have contributed to the development of research on the economic efficiency of the ecological environment. In addition, some experts and scholars have considered and summarized effective measures to improve the development of the ecological environment and economy and conducted practical exploration experiments. Khan et al. (2021) proposed a business model that can effectively change the circular economy against the backdrop of increasing ecological and environmental issues, which significantly improved the stability of the local ecological environment and the sustainable development of the circular economy. Samargandi (2021) explored the abundance of resources in the local ecological environment. Her research showed that in the process of economic growth caused by rich ecological resources, the ecological footprint was higher than the biological carrying capacity. To study the degree of change in local ecological environmental efficiency, Mirmozaffari et al. (2021) conducted data analysis on the content of carbon monoxide in the local atmosphere to assess the degree of change in local ecological environmental efficiency, which