The Impact of Artificial Intelligence on Environmental Protection

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Abstract. In the face of escalating global environmental issues, the role of artificial intelligence (AI) in environmental protection has become increasingly significant. One of the key areas of focus is water quality monitoring in sewage treatment. AI has been instrumental in predicting and identifying potential contaminants, thus ensuring the safety and cleanliness of water resources. This not only aids in maintaining public health but also contributes to the preservation of aquatic ecosystems. Another crucial aspect is the prediction of air pollution. AI algorithms have been developed to forecast air quality, enabling timely measures to mitigate the adverse effects of air pollution. This is particularly beneficial in urban areas where air pollution levels are typically high. The paper also explores AI's role in soil protection, specifically in detecting soil quality. AI can help identify nutrient deficiencies, monitor moisture levels, and detect the presence of harmful substances, thereby promoting sustainable agriculture and preserving soil health. Furthermore, the paper extends its scope to specific applications of AI in other areas of environmental protection. These include wildlife conservation, waste management, and climate change mitigation, among others. Finally, the paper looks forward to the future impact and development of AI in the field of environmental protection. It discusses the potential challenges and opportunities, and how AI can be leveraged to create a more sustainable and environmentally-friendly future. The paper underscores the importance of continued research, and development in AI to fully harness its potential in environmental protection.

Keywords: Artificial intelligence; environment; protection.

1. Introduction

With the development of the times, the popularization of computers, the Internet, sensors, and surveillance video, artificial intelligence has become the focus of people's attention, the research and investment in artificial intelligence at home and abroad is also more and more, about 140 artificial intelligence startups have been acquired by information giants such as Google, Microsoft, Apple. and artificial intelligence plays a great role in various fields such as the medical field, the field of education, the field of construction, and the field of data measurement. Wastewater is generated mainly from human activities, industrial manufacturing processes, and agricultural operations, which include cleaning, cooking, physiological excretion, industrial wastewater discharges, and irrigation of agricultural land, among others, water pollution in addition to the impact of human life, for the living organisms in the water, the water around the ecosystem also has a more serious impact [1].

There are many types of gaseous pollutants, such as nitrogen oxides (NOx), which are produced when fossil fuels are burned, and sulfur oxides (SOx), which can be removed by either SCR (traditional selective catalytic reduction) or selective non-catalytic reduction (SNCR), which is more costly, but the effects of which are now widely recognized. SOx compounds can cause serious damage to human health, inducing health problems including bronchoconstriction, respiratory distress, etc. There are various technologies for SOx treatment, and many of them are nowadays well capable of treating Sox gas emissions, such as ceramic filters, ammonia scrubbers, and particulate bed filters integrated with co-removal air pollutant systems.

In this paper, the systematic literature research method was used to study the application and impact of artificial intelligence technology on environmental protection work and its future role in achieving sustainable development.

2. Application of Artificial Intelligence in Environmental Protection Work

2.1. The Application Technology of Artificial Intelligence in Sewage Treatment

River water management has always been one of the important parts and challenges in environmental protection, due to the increasing number of industrial zones worldwide in the past decades, human activities have entered the environment in large numbers, thus affecting water bodies. Pollution of river water has become one of the centers of concern around the world, and the management of sewage is closely related to the water used by residents in their daily lives, the water used in agriculture, and the monitoring of water quality is the key to the management of sewage.

Artificial neural network modeling (ANN) comes from the source of the human brain nervous system simulation, it can help researchers from highly complex relationships or highly complex data to find the relationship, in the processing of information, fast and accurate arithmetic is far ahead of humans. There are a variety of modeling methods using ANN algorithms to predict Water Quality Index (WQI) such as Backpropagation Neural Network (BPNN), which has achieved significant results and simplified the calculation of WQI.

2.2. Application of Artificial Intelligence in Air Cleaning

The rapid development of human civilization, but there are many problems, such as fuel energy is the main source of human energy, its extraction and use of the process of the natural environment has a great impact, which is significant for the impact of the air, fossil fuels will produce a lot of harmful gases to pollute the environment, such as oxides of nitrogen, oxides of sulfur, the environment and the human body is very harmful, so it is necessary to effectively clean the air.

2.2.1 Artificial Intelligence Prediction of Air Pollution Technology

There are various artificial intelligence models for predicting air pollution, such as ANN, support vector machines (SVM), logistic fuzzy deep neural networks, etc. Deep Neural Networks (DNN) is a more complex version of an artificial simulation neural network, which is considered to be the most accurate model for predicting air pollution [2].

The Air Pollution Index (API) classification characterizes the degree of air pollution and air quality conditions and is suitable for representing the short-term air quality conditions and trends in cities. The items included in the API in China are tentatively: sulfur dioxide, nitrogen oxides, and total suspended particulate matter (TSP). When the concentration of a pollutant Ci, ≤ Ci ≤ Ci, j + 1, its pollution sub-index

$$Ii = [(Ci\text{-}Ci, j) (Ii, j +1\text{-}Ii, j)]/ (Ci, j +1\text{-}Ci, j) + Ii, j \quad (1)$$

Where: the pollution sub-index of the ith pollutant of Ii; the concentration value of the ith pollutant of Ci; the value of the pollution sub-index of the jth turning point of the ith pollutant of Ii, j; the concentration value of the ith pollutant (corresponding to Ii, j+1) at the jth turning point of Ci, j; and Ci, j+l is the concentration value of the ith pollutant (corresponding to Ii, j+1) at the jth turning point of the jth turning point;

After the pollution sub-indexes of various pollution parameters are calculated, the largest one is taken as the air pollution index API of the region or city.

$$API=\max (Il, I2.....Ii.....In) \quad (2)$$

DNN is based on the extension of the MLP perceptual machine, which can be understood as a neural network with many hidden layers, it can help working researchers to evaluate a variety of different types of data by training the connection weights between neurons to achieve a complex mapping from the input to the output, with a very strong adaptive and generalization ability. Several modeling approaches use DNN algorithms to predict APIs, which have achieved significant results without relying on existing values, simplifying the computation of APIs.

2.3. Application of Artificial Intelligence in Troposphere Protection

The ozone layer is known as the umbrella for the reproduction of life on earth, but the high concentration of tropospheric ozone in the atmosphere indicates its adverse effects on human health, plants, and the environment Therefore, there is a need to analyze the atmospheric pollutants and their concentration variations, which is a key factor in urban air quality management.

Ozone concentration is the amount of ozone per unit volume. The unit of mass ratio mg/L, g/m3 is used, the unit of volume ratio 1%, 5%, etc., and the unit of ppm is often used in the health sector. The Ministry of Health of the country's ozone safety concentration of 0. ppm, industrial hygiene standard of 0.15pPm, and labor protection department regulations in the safe concentration of work are allowed to work for no more than 10 hours.

Various mechanical or statistical modeling techniques have been applied to predict ambient ozone concentrations in the past decades. Deep learning-based networks and Long Short-Term Memory (LSTM) networks have achieved good performance mechanisms in recent studies [3,4]. Models numerically and explicitly simulate the life cycle of air pollutants, including formation, emission, transportation, and disappearance [5]. Whereas artificial intelligence techniques have helped researchers to develop an ANN model for predicting ozone concentrations using only a few meteorological parameters, the structure of the neuronal network has little effect on the predictive ability of the ANN model.

2.4. Artificial Intelligence Techniques in Soil Conservation

Soil is a porous medium with vitality, which is vital to maintain the balance of the ecosystem and the utilization of water resources, and as a natural buffer in the environment, it helps to mitigate the impact of natural disasters, but as the depth of coal mining becomes deeper and deeper, the damage to the soil becomes more and more serious, and the ensuing water intrusion into the ground is becoming more and more obvious day by day [6].

Soil moisture (SM) is an important factor in the interaction between the surface and the atmosphere, the weight water content is the ratio of the weight of water in the soil to the weight of the corresponding solid-phase material, and the volumetric water content is the ratio of the volume occupied by water in the soil to the total soil volume. Volumetric water content and weight water content can be converted between the two.

In predicting soil water content weight, hybrid modeling treatment is a classical combination of neural network (Back Propagation Neural Network) and Adaptive Boosting Algorithm (AdaBoost), which can achieve up to 100% prediction accuracy in model prediction, with the recent technological revolutions and industrial changes, Back Propagation Neural Network and Adaptive Boosting Algorithm (AdaBoost) methods and steps can be used in the prediction of different soil water contents.) methods and steps can be used to create practical prediction models in different mining areas, thus effectively reducing the phenomenon of water intrusion into the soil and achieving the purpose of soil protection.

3. The Impact of Artificial Intelligence on Environmental Protection Work

3.1. The Specific Application of Artificial Intelligence in Sewage Treatment

To accurately monitor water pollution and take timely measures for early warning, artificial intelligence technology is gradually applied to the field of water pollution monitoring, bringing innovation and change, for example, for the Up-flow Anaerobic Sludge Bed/Blanket (UASB) reactor to deal with low concentrations of domestic sewage when there are many influencing factors [7]. It is difficult to determine the relationship between the various influencing factors, as well as it is difficult to carry out appropriate control and prediction of the treatment effect of the problem, in the artificial neural network theory, the basic structure of the prediction model of UASB treatment of low concentration of domestic wastewater based on BP artificial neural network is established, and the

pilot experiment is simulated, and the results show that the predicted value and the experimental value coincide well, and play a simulation and prediction effect, and at the same time optimize the operation state. The establishment of this model for UASB treatment of domestic sewage process systems to achieve intelligent control provides a simple and practical way, with good research and engineering practical value; in the river and lake ecology, artificial intelligence is applied to automated monitoring and early warning technology, such as water quality intelligent detection of unmanned boats, can be intelligent and automatic scanning of the pollution field of the water body of the river and lake, the source of the pollution source of the independent traceability, the realization of automatic collection of water samples, real-time analysis of water quality and other functions. Real-time analysis of water quality and other functions. It applies to the daily river patrol of the river and lake chief system, emergency management of sudden water pollution, and supervision and management of river outfalls.

3.2. Specific Application of Artificial Intelligence in Air Cleaning

In terms of air protection, through the optimization and upgrading of intelligent algorithms, the monitoring station can more accurately monitor all kinds of pollutants in the environment. Secondly, between multiple monitoring stations, the joint analysis system constructed by artificial intelligence technology can quickly locate the pollution source and wind direction, thus reducing the error and omission rate of monitoring stations and improving the overall effect of the monitoring network.

3.3. Specific Application of Artificial Intelligence in Soil Protection

The use of artificial intelligence decision-making technology, combined with soil moisture, meteorological data, and other multifaceted information, can not only effectively reduce the phenomenon of water intrusion into the soil, but also provide intelligent analysis and prediction of farmland irrigation.

4. Conclusion

Nowadays, artificial intelligence has become an important tool in the field of pollution prediction. It can help us predict the impact of pollutant emissions more accurately, as well as provide early warning to the environment. Although artificial intelligence cannot replace the traditional means of environmental protection, it can provide us with more comprehensive and accurate information to help us better protect the environment. Compared with traditional methods of environmental pollution prediction, the application of artificial intelligence algorithms can better overcome the weaknesses of traditional statistical data and models, through large-scale data analysis and learning, to improve the accuracy and predictability of environmental pollution prediction to "prevent the problem before it occurs" and achieve better environmental protection results. Nowadays, Spain's unique model can predict air pollution with high accuracy which gives, on this basis, experts can determine the need to improve the existing air quality monitoring system in the city of the area, thus helping to optimize the strategy to reduce air pollution. In the future, it is believed that with the continuous progress of artificial intelligence technology, the effectiveness of environmental protection will become more and more significant.

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