METEOROLOGICAL AND GEOSPATIAL ANALYSIS-BASED INTEGRATED MACHINE LEARNING FOR ACCURATE AIR QUALITY FORECASTING

Journal of Environmental Protection and Ecology • Article • 2024

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Abstract

In light of the growing environmental problems caused by low air quality, this investigation offers a thorough approach to precise air quality forecasting. The goal of the research effort is to disentangle the intricate network of variables affecting air quality by fusing state-of-the-art machine learning algorithms with meteorological and geographic data. The investigation acknowledges both man-made and natural air pollution sources, among other diverse sources. The burning of fossil fuels, industry, farming, waste disposal, deforestation, automobile traffic, and indoor sources are all included in the following list. To create accurate forecasting models, a comprehensive data collection process is employed, which includes historical and current datasets from weather sources and monitoring stations. To comprehend spatial connections and trends, spatial analysis is incorporated using Geographic information system (GIS) capabilities. Continuous hyperparameter tuning is carried out while model validation, using measures like Mean absolute error (MAE) and Root mean squared error (RMSE), assures accuracy. In order to provide dynamic forecasting, the created system is integrated into a real-time framework and continuously assimilates updated meteorological and geographical data. Access to stakeholders is facilitated by an intuitive interface, which highlights the environmental consequences of changes in air quality. Working

together with environmental groups, research institutes, and meteorological agencies promotes data exchange and ongoing model improvement. With an emphasis on the effects on the environment, this integrated method offers a comprehensive solution for precise and fast air quality forecasts. This research helps to proactive decision-making in pollution control and sustainable environmental practices by addressing the important requirement for effective environmental management techniques.

Author keywords

air quality forecasting; environmental impacts; geospatial integration; machine learning models; meteorological analysis; sustainable environmental practices

Indexed keywords

GEOBASE Subject Index

accuracy assessment; air quality; data set; environmental impact; environmental management; forecasting method; machine learning; meteorology; spatial analysis; sustainability

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Artificial intelligence and blockchain technologies for smart city

Intelligent Green Technologies for Sustainable Smart Cities • Book Chapter • 2022 •
DOI: 10.1002/9781119816096.ch15

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Abstract

In this digital age of rapid communication, the advances of emerging technologies can be used for making smart city as intelligent society. Specially, the speedy acceptance of artificial intelligence (AI) and blockchain technologies have guided a paradigm that is shifting to a new dimension called as digital ecosystem for smart city. A large number of AI and applications of blockchain guarantee resolutions for challenges in the fields varying from financial services, and threat management to cryptocurrency, and from social and public services to Internet of Things (IoT). Moreover, the conjunction of blockchain and AI technologies is transforming the network of smart city architecture for developing sustainable ecosystems. When we try to achieve the goal of developing smart cities, the innovations in technologies created both challenges and opportunities. This chapter presents a broad literature examination to the safety problems and the challenges, which influence the blockchain utilization in developing sustainable and smart societies. Our work represents a comprehensive dialogue of various vital issues for coming together for AI and blockchain knowledge, which help us to develop smart societies. Therefore, we talk about the solutions of security issues of blockchain and summarize the

important concepts that need be utilized to develop many AI and blockchain-centered smart transportation techniques. Moreover, we review the problems that stay public and our forthcoming research directions, this contains new proposals for security and future regulations for developing a smart society with sustainable ecosystem. © 2022 Scrivener Publishing LLC.

Author keywords

Artificial intelligence; Blockchain technologies; Green computing; Internet of thing; Smart city; Smart transport system

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Article a novel algorithm for capacitated vehicle routing problem for smart cities

Symmetry • Article • *Open Access* • 2021 • DOI: 10.3390/sym13101923

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Abstract

Smart logistics is an indispensable building block in smart cities development that requires solving the challenge of efficiently serving the demands of geographically distributed customers by a fleet of vehicles. It consists of a very well-known NP-hard complex optimization problem, which is known as the capacitated vehicle routing problem (CVRP). The CVRP has widespread real-life applications such as delivery in smart logistics, the pharmaceutical distribution of vacancies, disaster relief efforts, and others. In this work, a novel giant tour best cost crossover (GTBCX) operator is proposed which works stochastically to search for the optimal solutions of the CVRP. An NSGA-II-based routing algorithm employing GTBCX is also proposed to solve the CVRP to minimize the total distance traveled as well as to minimize the longest route length. The simulated study is performed on 88 benchmark CVRP instances to validate the success of our proposed GTBCX operator against the nearest neighbor crossover (NNX) and edge assembly crossover (EAX) operators. The rigorous simulation study shows that the GTBCX is a powerful operator and helps to find results that are superior in terms of the overall distance traveled, length of the longest route, quality, and number of Pareto solutions. This work employs a multi-objective optimization algorithm to solve the capacitated vehicle routing problem (CVRP),

where the CVRP is represented in the form of a two-dimensional graph. To compute the values' objective functions, the distance between two nodes in the graph is considered symmetric. This indicates that the genetic algorithm complex optimization algorithm is employed to solve CVRP, which is a symmetry distance-based graph.

Author keywords

Capacitated vehicle routing problem; Non-dominated sorting; Pareto optimality; Smart logistics

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