





Editorial

Innovative Artificial Intelligence-Based Internet of Things for Smart Cities and Smart Homes

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The Internet of Things (IoT) consists of interconnected things with built-in and function-oriented sensors, essentially constituting a network of physical devices. These devices have the ability to gather measurement or observation data and then communicate or exchange data with each other by communication networks. IoT systems can be applied in various fields to improve human life, especially applications for smarter cities or smarter homes.

However, basic IoT systems have been unable to meet the requirements of a modern smart city or smart home that features various and complex functionality with hybrid communication networks. Modern applications of IoT systems must be assisted by powerful artificial intelligence (AI) technology to process and analyze big data and deal with the problems of finding an optimal solution, making the best decision, detecting events, and identifying objects. Artificial intelligence simulates natural intelligence as exhibited by humans or animals and can make the system capable of performing tasks without the assistance of humans and even perform tasks better than humans can. Modern AI technology usually utilizes evolutionary computation, nature-inspired algorithms, machine learning, or deep learning to solve the problems of optimization, decision making, event detection, and object identification. The integration of IoT systems and AI technology is very suitable for interconnected things to enhance intelligence, thus the artificial intelligence of things (AIoT),

which enables the establishment of innovative IoT systems and applications for the modern smart city and smart home.

This special issue aims to publish original and innovative research works that focus on challenging issues in the field of innovative AI-based IoT in smart cities and smart homes. After the review process for evaluating all submitted manuscripts, there are sixteen research papers accepted for publication in this special issue.

The paper titled “Industrial Internet of Things Intrusion Detection Method Using Machine Learning and Optimization Techniques” by T. Gaber et al. proposes a novel approach of intrusion detection for Industrial Internet of Things (IIoT). Two artificial intelligent algorithms, PSO and BA, are used for feature selection of network traffic. After applying the feature selection schemes, classification of malicious behaviors is performed with machine learning-based models for the IIoT-based network traffic. The experimental results show that the proposed approach obtained good performance.

The paper titled “Utilizing Artificial Intelligence and Lotus Effect in an Emerging Intelligent Drone for Persevering Solar Panel Efficiency” by F. A. Almalki et al. proposes a drone system with AI framework to help clean solar panels mounted on the top of buildings and enhance their efficiency. The evaluation shows the improvement of solar power efficiency by the proposed system.

The paper titled “Performance Optimization of 3-DOF Application Scene Based on 360-Degree Panoramic Technology with Depth Information” by Q. Wang et al. proposes an optimization scheme to improve the spatial realism of an indoor 3-DOF application scenario. The experimental results show that the scheme is great in terms of visual effect and performance.

The paper titled “Artificial Intelligence of Things-Based Optimal Finite-Time Terminal Attractor and Its Application to Maximum Power Point Tracking of Photovoltaic Arrays in Smart Cities” by E.-C. Chang et al. utilizes AIoT technique to obtain the maximum power output from photovoltaic (PV) arrays. The method can save energy and reduce carbon emissions for the development of smart cities. The simulation results show that the proposed PV array system actually yields promising performance.

In the paper titled “A Study on the Optimization Simulation of Big Data Video Image Keyframes in Motion Models” by J. Guo et al., the signal of athletic sports video image frames is processed and studied according to the technology of big data. It proposes a fuzzy kernel extraction scheme based on the low-rank theory and is robust in fuzzy video forgery detection. The experimental results show that the efficiency of fuzzy video detection is improved compared to traditional video forgery detection methods.

The paper titled “Image Real-Time Detection Using LSE-Yolo Neural Network in Artificial Intelligence-Based Internet of Things for Smart Cities and Smart Homes” by Z.-X. Zheng and F. Zhang proposes a visual image real-time detection LSE-Yolo neural network which helps bring a healthy and comfortable life in smart cities and homes.

The paper titled “MidSiot: A Multistage Intrusion Detection System for Internet of Things” by D.-T. Nguyen et al. focuses on the security issue for IoTs. It presents a collaborative intrusion detection system (IDS) deployed at both Internet gateways and IoT local gateways. The evaluation results indicate the proposed scheme could detect seven common cyberattacks targeting IoT devices with an average accuracy of 99.68% and outperforms state-of-the-art IDSs.

The paper titled “Real-Time 3D Pedestrian Tracking with Monocular Camera” by P. Xiao et al. deals with the pedestrian tracking issue which is a popular research area in computer vision. It proposes a target tracking method with a short-time prediction function to solve continuous tracking and occlusion judgment. The evaluation results show the method can achieve high accuracy and high tracking speed.

The paper titled “Gene Selection and Classification of scRNA-seq Data Combining Information Gain Ratio and Genetic Algorithm with Dynamic Crossover” by J. Feng et al. focuses on the single-cell RNA sequencing technology and presents a novel algorithm to address the gene selection and classification for scRNA-seq data. It utilizes information gain ratio to eliminate irrelevant genes roughly and utilizes genetic algorithm with dynamic crossover to choose high quality genes. The experimental results show it is superior to the other several competing algorithms in terms of classification accuracy.

The paper titled “Enhanced Intelligent Smart Home Control and Security System Based on Deep Learning Model” by O. Taiwo et al. focuses on the control and security system of smart homes. It presents a deep learning-based intelligent

home automation system for controlling home appliances, monitoring environmental factors, and detecting movement in the home and its surroundings. An experimental prototype for surveillance was implemented using an ESP32 camera in this study.

The paper titled “Analysis and Research on Digital Reading Platform of Multimedia Library by Big Data Computing in Internet Era” by W. Zhang et al. focuses on the analysis of digital reading platforms of multimedia library in China. Fourteen prefecture-level public libraries and fifty-eight libraries of higher education institutions in each region were accessed. It summarizes the problems found in the research and proposes solutions for the regional digital reading platform.

The paper titled “Frequent-Pattern-Based Broadcast Scheduling for Conflict Avoidance in Multichannel Data Dissemination Systems” by C.-C. Lai et al. considers the channel switching time and identifies the data conflict issue in an on-demand multichannel dissemination system. It models the considered problem as a data broadcast with conflict avoidance problem and proposes a frequent-pattern-based broadcast scheduling scheme to avoid data conflicts when assigning data items to time slots in the channels. The simulation results show that the proposed scheme can shorten the average access time compared with the existing heuristic methods.

The paper titled “Stock Trading System Based on Machine Learning and Kelly Criterion in Internet of Things” by L. Chen et al. proposes an AI-based stock trading system. A long short-term memory neural network is used to study stock price fluctuations, as well as genetic algorithms are used to obtain appropriate trading signals in the system. The Kelly criterion is used to determine the best investment score to control the risk of the transaction. The experiments show that the use of Kelly criterion for fund management reduces the risk of trading, and the return is higher.

The paper titled “Research on a Power Grid Cascading Failure Prevention and Control Method considering WSN” by H. Deng et al. proposes a WSN-based preventive control model to prevent cascading failures in the power grid. The nondominated sorting genetic algorithm II and particle swarm optimization are utilized to solve the issue. The method is verified in the IEEE39 node system.

The paper titled “The Hybrid Traffic Offloading Mode for Disaster-Resilient Communication Networks Based on User Mobility” by A.-H. Tsai and C.-H. Tsai provides a hybrid traffic offloading mechanism combining device-to-device (D2D) and local IP access (LIPA) modes for the disaster-resilient network. The method can prevent the local communication traffic from flowing into the core network and improve the system spectrum efficiency when the core network is under congestion.

The paper titled “Rotated Black Hole: A New Heuristic Optimization for Reducing Localization Error of WSN in 3D Terrain” by Q.-W. Chai and J. W. Zheng proposes the rotated black hole (RBH) algorithm which can improve the global search ability of the original black hole (BH) algorithm. The proposed RBH is also applied in reducing the error of position estimation of WSN unknown nodes in 3D terrain. The simulation results show that the proposed algorithm has better

search performance than other famous algorithms and has a good effect the localization problem of WSN in 3D terrain.

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Conflicts of Interest

The guest editors declare that they have no conflicts of interest regarding the publication of this special issue.