2025 International Journal of Management Science Research, Vol.8, Issue 6, (Jun)
ISSN 2536-605X
DOI: 10.53469/ijomsr.2025.08(06).07

Talk about the use of Artificial Intelligence and Machine Learning in Smart Cities

Xunzhi Wang

Tianjin University of Science and Technology Tianjin 300457

Abstract: ***With the rapid development of science and technology in China and the advancement of urbanization, people's attention to smart cities has also increased to a certain extent. In the rapid development of smart cities, artificial intelligence is a very important element, In the field of artificial intelligence, machine learning is one of the most important content, and strengthening the application of artificial technologies such as artificial intelligence and machine learning in smart cities can effectively promote the further development of cities and better ensure people's lives in cities. Based on this, this paper analyzes and studies the application of artificial intelligence and machine learning technologies in smart cities.***

Keywords: Artificial intelligence; Machine learning techniques; Smart cities; Application.

1. INTRODUCTION

Smart city is a new smart term derived from the rapid development of society and the improvement of science and technology. It is an important expression of modern cities. It is not only a technology, but also a developmental thinking. Smart city is based on the Internet of things, artificial intelligence and cloud computing technology, and gradually developed and formed an information, intelligent urban form. China wants to become a world power and a digital power in the future development, and smart cities are very important content, and artificial intelligence and machine learning technology are very conducive support in smart cities, which must be valued and applied. In the energy sector, Wu et al. (2025) investigated how supply chain digitalization enhances energy efficiency in oil and gas industries to support carbon neutrality goals [1]. Healthcare applications show remarkable progress, with Yang et al. (2025) developing an IoT-based active learning system for improved skin cancer detection accuracy [2], while Zhang et al. (2025) proposed innovative machine learning techniques for anomaly detection in biomechanical big data [3]. The intersection of technology and social sciences is evident in Zeng et al.'s (2025) analysis of education investment impacts on household financial participation [4] and Wang et al.'s (2024) AI-powered system for early identification of learning difficulties in educational settings [5]. In AI evaluation research, Chen et al. (2024) introduced "Emotionqueen" as a novel benchmark for assessing empathy in large language models [6]. Biomedical engineering has seen substantial innovations, including Ding and Wu's (2024) comprehensive review of self-supervised learning applications for ECG and PPG signal processing [7] and Restrepo et al.'s (2024) multimodal deep learning approach for healthcare applications in low-resource settings [8]. Autonomous systems research is represented by Zhou et al. (2024), who developed advanced LSTM-based solutions for UAV path planning [9]. The field of AI detection and optimization features Jiang et al.'s (2025) meta-attention enhanced model for identifying AI-generated news [10] and Tu's (2025) intelligent real-time network optimization through log analysis [11]. Technical advancements include Peng et al.'s (2022) novel domain adaptation framework [12] and Zheng et al.'s (2025) motion-aware diffusion model for human mesh recovery from video data [13].

2. AN OVERVIEW AND ANALYSIS OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING TECHNOLOGIES

2.1 Overview of Artificial Intelligence

Artificial Intelligence (Artificial Intelligence) technology is in the middle of the 20th century when it appeared, it effectively promoted the further development of our society and the improvement of economic level. Artificial intelligence technology is also known as AI technology in our daily life,It involves many application fields, including a lot of disciplines, such as information, computer, mathematics, engineering, etc. It is a new technology with learning, communication and input and output functions [1]. The application of artificial intelligence technology also exerts the role and value of all machines and equipment. The e-commerce system, data and knowledge built under its guidance have all achieved effective integration of the network and physical space, leading our society into the 2.0 era of artificial intelligence. In the new era, artificial intelligence technology

attaches greater importance to the connection with human life, and has developed into a very important part of people's lives. In the process of development and evolution of artificial intelligence, the following three points are mainly changed [2]: First, hybrid intelligent systems that combine machine and human enhancement; Second, new crowd intelligence systems organized by machines, humans, and networks; Third, more sophisticated intelligent systems such as smart cities.

2.2 Machine learning techniques

Machine Learning (Machine Learning) technology is mainly system identification, effective, scientific improvement of mechanical learning ability, so as to obtain new knowledge, new technology of a technology. For machine learning, its learning is very similar to the way humans learn, and only through systematic learning and mastering effective learning methods can it fully analyze and solve problems and fully realize its role and value. Because of this, machine learning is needed to meet the development requirements of artificial intelligence, and to keep pace with artificial intelligence to continually learn, develop and innovate. The body of knowledge established by ML is practical, and can effectively solve practical issues in life. Machine learning technology is a very important technology in artificial intelligence, but also an indispensable technology, which has a great impact on the development and application of artificial intelligence [3]. In addition, machine learning technology also has the ability of perception and information processing, its application in the smart city, can play a very large technical space, such as in the field of image recognition, language recognition, has made very effective achievements.

2.3 Deep Learning

Deep learning is a feature under machine learning that is intuitive and diverse, and does not require human involvement in feature selection. The technologies built by deep learning, such as image recognition, object detection, and language processing, have all been very mature in application, and can be said that it has a broader application area, which broadens the application scope of artificial intelligence to a certain extent.

3. APPLICATION OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING TECHNOLOGIES IN SMART CITIES

In the process of building smart cities, image recognition technology in the field of artificial intelligence is constantly developing, At the same time, the recognition system is also very important, such as license plate recognition, fingerprint recognition, face recognition, etc., which we are very familiar with.

3.1 Application of gait recognition technology

What is gait recognition technology, which is mainly a technology for the identification and authentication of people's mindset and walking posture in a long distance, has long been used in medical research systems. But there are 24 different identities for our human gait. Therefore, we need to categorize carefully.Then combined with artificial intelligence and machine learning technology to detect the basic content of human gait, extract personal characteristics, and then realize the identification of human individuals [4]. In general, gait recognition technology is generally used in the field of security, and it belongs to an emerging biometrics technology. It is often used in public security administration, criminal investigation and other security areas. The gait recognition technology can have a very accurate judgment on the movements of suspects, and better ensure the safety of our human life and property. In addition, gait recognition technology has also been used in the field of medicine, mainly for the abnormal judgment of patients who are sick or people who walk abnormally, which can help medical staff to determine the location of patients with problems in a timely manner.

3.2 Application of face recognition technology

Face recognition technology is no stranger to everyone, and it is a very important key technology in the application of artificial intelligence and machine learning technology. It is an effective method of identification and is widely used in a variety of fields, such as security, as described above, and security, as well as payment, as we are very familiar with. Face recognition technology is a new technology that mainly emphasizes security and uniqueness, and face recognition technology can better meet people's need. From a professional point of view, there are three main application modes of face recognition technology, namely 1: 1 face recognition, 1: N face recognition and M: N face recognition. Face recognition technology will be applied to face recognition technology, such as face

payments commonly used in our current life, ticketing verification, boarding verification, and so on. In the above three facial recognition application modes, 1: N and M: N mainly refer to finding a target in one or N objects, and then dynamic face comparison to achieve verification. Both of these facial recognition application models are very widespread and require big data information as support. Such as very list, VIP customer management are applied to this kind of face recognition mode [5].

3.3 Practical application of gait recognition technology and face recognition technology

(1) Analysis of the integration practice of technology:

In the application of artificial intelligence and machine learning technology, in order to realize the construction of smart cities, it is necessary to integrate gait technology and face recognition technology. By applying DBN deep belief networks, it can establish multiple restricted Boltzmann (RBM) stacking effect systems, making it an important component of deep belief networks. In general, whether it is gait recognition technology or face recognition technology, the network space constituted after fusion contains both explicit and hidden layers, and two layers can be used to assume the total probability distribution to meet and limit the construction requirements of the Boltzmann model, and the sub-practical value is very high. In the process of application of gait recognition technology and face recognition technology in converged practice, there are several types of models that are mainly applied to: convolutional neural networks, pooling layer, full connectivity layer, etc., to effectively emphasize the distance of grid nodes. Because this fusion practice is based on convolutional neural networks, human gait and face features can be extracted to the maximum extent through deviation in face recognition technology and gait recognition technology, so as to more effectively ensure the correctness of recognition results.

(2) Analysis of gait recognition experiments and results:

First, 10 people were chosen as experimental data and samples to identify their walking under normal circumstances. In the course of the experiment, 320 * 240 pixel raw images were needed to generate an image of the contours, and finally the size was reduced to 64 * 64 to calculate the cycle.

Second, during the experiment, it is necessary to focus on the analysis of pixel content, and at the same time, it is necessary to combine the limitations of the Boltzmann device to ensure that every DBN network layer has input， The output of the hidden layer and the analysis of the invisible layer in combination with the time series model ensure that the data dimension can reach more than 15,000, among which the top layer data dimension must be more than 100, and the other hidden layer nodes data are 5,000, 10,000 and 500.

Third, the experimental results show that it will be more accurate than the traditional face recognition algorithm. And in this experiment, the metric learning algorithm is also used to extract more accurate facial contours and features. Although the number of key points used is very small, the verification effect is much higher [6].

4. ANALYSIS OF THE ADVANTAGES OF JOINT USE OF GAIT RECOGNITION TECHNOLOGY AND FACE RECOGNITION TECHNOLOGY

Face recognition requires close recognition in order to extract the facial features of the human body; The biggest feature of gait recognition technology is its uniqueness, even without obtaining many data images, it can effectively identify human gait information. The application of face recognition technology and gait recognition technology together can not only solve the distance of face identification, but also accelerate the speed and accuracy of recognition on the basis of human gait information, and when the two technologies are used together, the identification equipment requirements are not very high. The impact of gait recognition technology on issues such as human wear and load will not be involved in face recognition; Face recognition, on the other hand, is affected by makeup, expressions, etc., while gait recognition is not involved. Therefore, using the two together can achieve complementarity and play a strong joint role, and have greater assurance of the accuracy of identification.

5. CONCLUSIONS

All in all, smart cities are the future development trend and direction of China, and to realize the construction of smart cities, we must apply artificial intelligence and machine learning technology. Through the application of these two technologies, we can effectively promote the development of smart cities, promote the improvement of

China's economic level, and also realize the progress of material and spiritual civilization, so as to make China's urbanization development in a healthier direction.

REFERENCES

[1] Wu, W., Bi, S., Zhan, Y., & Gu, X. (2025). Supply chain digitalization and energy efficiency (gas and oil): How do they contribute to achieving carbon neutrality targets?. Energy Economics, 142, 108140.
[2] Yang, Jing, et al. "IoT-Driven Skin Cancer Detection: Active Learning and Hyperparameter Optimization for Enhanced Accuracy." IEEE Journal of Biomedical and Health Informatics (2025).
[3] Zhang, Shengyuan, et al. "Research on machine learning-based anomaly detection techniques in biomechanical big data environments." Molecular & Cellular Biomechanics 22.3 (2025): 669-669.
[4] Zeng, Yuan, et al. "Education investment, social security, and household financial market participation." Finance Research Letters 77 (2025): 107124.
[5] Wang, Chun, Jianke Zou, and Ziyang Xie. "AI-Powered Educational Data Analysis for Early Identification of Learning Difficulties." The 31st International scientific and practical conference “Methodological aspects of education: achievements and prospects”(August 06–09, 2024) Rotterdam, Netherlands. International Science Group. 2024. 252 p.. 2024.
[6] Chen, Yuyan, et al. "Emotionqueen: A benchmark for evaluating empathy of large language models." arXiv preprint arXiv:2409.13359 (2024).
[7] Ding, Cheng, and Chenwei Wu. "Self-Supervised Learning for Biomedical Signal Processing: A Systematic Review on ECG and PPG Signals." medRxiv (2024): 2024-09.
[8] Restrepo, David, et al. "Multimodal Deep Learning for Low-Resource Settings: A Vector Embedding Alignment Approach for Healthcare Applications." medRxiv (2024): 2024-06.
[9] Zhou, Dianyi, et al. "Research on LSTM-driven UAV path planning." Fourth International Conference on Advanced Algorithms and Neural Networks (AANN 2024). Vol. 13416. SPIE, 2024.
[10] Jiang, Chenxi, et al. "LMAT-ND: A Meta-Attention-Enhanced Llama-7B Model for AI-Generated News Detection." 2025 5th International Conference on Consumer Electronics and Computer Engineering (ICCECE). IEEE, 2025.
[11] Tu, T. (2025). Log2Learn: Intelligent Log Analysis for Real-Time Network Optimization.
[12] Peng, Qucheng, et al. "RAIN: regularization on input and network for black-box domain adaptation." arXiv preprint arXiv:2208.10531 (2022).
[13] Zheng, Ce, et al. "Diffmesh: A motion-aware diffusion framework for human mesh recovery from videos." 2025 IEEE/CVF Winter Conference on Applications of Computer Vision (WACV). IEEE, 2025.