Research on the Application of Artificial Intelligence in Night Tourism

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Abstract. Artificial intelligence has driven innovation in the tourism industry, bringing convenience to tourism enterprises and tourists. Tourism companies have introduced chatbots and applied natural language processing technology to push the best itineraries for tourists based on their characteristics and preferences. Tourism enterprises use artificial intelligence, big data, etc. to analyze the needs of tourists, use deep learning algorithms to segment the market of tourists and achieve precision marketing. Tourists also benefit from artificial intelligence, for example, reducing the waiting time in line, using artificial intelligence assistants to solve problems before, during and after travel, and experiencing the stimulation brought by AR and VR. However, tourists' perceptions and attitudes towards AI, the use of AI products for night tourism, and preferences vary from each other to the future development of AI. Businesses should improve the application of AI in night tourism according to the needs and suggestions of tourists, and increase publicity.

Keywords: Artificial Intelligence · Night tourism · Artificial intelligence products

1 Introduction

AI will not only benefit tourism businesses, but also improve the lives of the public. As the main way for people to relax and relax, tourism enriches people's lives on the one hand and drives economic development. With the improvement of people's cultural level and rich tourism experience, sightseeing tourism can no longer meet the needs of most tourists. One of the purposes of people's travel is to dabble in new things and experience a life that is different from everyday life. Artificial intelligence technology is applied to the tourism industry, such as chatbots pushing travel paths for tourists, solving problems encountered in the tourism process, and making tourists' travel more intelligent; Tourism enterprises use big data analysis to segment the tourist market and accurately position; Tourist attractions and museums use high-tech means such as AR, VR, facial recognition, and intelligent tour guides to meet the individual needs of tourists. Artificial intelligence combined with the platform's search function helps consumers achieve personalized search, reducing the time for platform transactions. Tourism enterprises use artificial intelligence assistants combined with big data analysis to achieve the diversified needs of tourists, reducing corporate costs.

2   Application of Artificial Intelligence in Night Tourism

2.1   Artificial Intelligence

Artificial intelligence is a new technical science. It studies methods, theories, technologies, and application systems that simulate and expand human intelligence. Artificial intelligence is already widely used in various fields and has increased productivity [1]. The main branches of AI include machine learning, computer vision, natural language processing, artificial neural networks, robotics, and expert systems [1]. Like other industries, the travel industry is gradually using AI. In 2015, the first robot hotel opened in Japan, employing dinosaur receptionists, robot porters, cloakroom robots, and in-room personal assistants [3]. While there aren't many robots like this, other hotels are also using artificial intelligence in their operations, such as automated check-in systems, virtual personal assistants, and room delivery robots. Travel suppliers are also applying AI technology to predict and analyze customers' purchase likelihood and propensity to increase purchase rates. Tourist attractions are also using artificial intelligence, sending notifications and real-time translations to facilitate interaction between tourists and residents and explanations of attractions.

2.2   Night Tourism

Some scholars define night tourism in terms of time. For example, Cao Xinxiang believes that night tourism refers to the tourist activities of tourists and local residents from 19 to 24 pm [4]. Defining night tourism only from time points does not take into account the time differences between different regions and seasons, and lacks objectivity. Therefore, on this basis, some scholars combine people's normal life and rest time and the business hours of most social places, and define night tourism as a variety of tourism activities carried out by tourists in tourist destinations during the period from dark (sunset) to the early morning of the next day. This definition only starts from the perspective of time, blurs the specific point in time, and improves the objectivity of the definition.

Some scholars have pointed out that there are limitations to defining night tourism only in terms of time. Moreover, the main body of night tourism is tourists, so from the perspective of tourists, the iconic activities of tourists are used as the starting and ending points of night tourism activities. In people's consciousness, dinner means the beginning of night tourism activities, and bedtime means the end of night tourism activities. On this basis, Yue Chao et al. believe that night tourism is a tourist activity carried out by tourists from the beginning of dinner to bedtime [5].

Due to differences in region, customs, culture, history, etc., scholars study night tourism from different perspectives. For example, Yoo et al. studied the nocturnal economy awareness of Koreans from the perspective of tourism. Zmyslony, P et al. describe the evolution of the relationship between tourism and the nighttime economy from 1946 to 2005.

2.3   Types of Night Tourism Products

Scholars have studied and divided the types of night tourism products depending on different standards. Wen Tong divides it according to the type of activity, and divides

them into three categories: performance, participation and landscape, and performance-type products refer to various cultural performances in a specific stage space to provide tourists with entertainment products for viewing; Participatory products refer to tourists personally participating in the products and are the main body of the entire tourism activity; Landscape-based products are different from dynamic song and dance viewing, but mainly static landscapes [6]. On this basis, Cao Xinxiang divided night tourism products into four categories, namely performance-based products based on watching scenic performances, landscape-based products based on urban landscapes or tourist landscapes at night, participatory products based on night consumption of tourist places, and comprehensive products, it is worth mentioning that comprehensive products refer to the design of special tourist routes, which are completely different from the daytime [4]. However, with the exchange between China and the West, the continuous development of night tourism, a variety of tourism products emerge one after another, expanding the night tourism product system, therefore, Gu Zhixin in the comparison of domestic and foreign night tourism products, the night tourism products are divided into five categories: leisure block mode, scenic night tour mode, tourism performance mode, folk festival mode, lighting art mode [7].

2.4   Application of AI in Tourism

(1) **Tourist information services.**

In order to better meet the needs of tourists, tourism enterprises need to segment the tourism market. According to the results of the segmentation, different promotional programs and travel routes are developed for tourists in different markets. In the process of tourism market segmentation, artificial intelligence technologies such as classification, clustering, and decision trees are usually used for system simulation and reasoning decisions. In order to allow tourists to enjoy better services and tourism experience, the scenic spot has established a tourism consultation system, intelligent audio, video surveillance, AR experience system, etc. based on artificial intelligence technology [8].

(2) **Travel forecast.**

Tourism demand is an important content that cannot be ignored in the development of tourism. The most beginners and tourism enterprises use traditional qualitative research methods to predict tourism demand. But now they use artificial intelligence methods to predict tourism demand, such as rough set methods, gray theory, support vector regression, artificial neural networks [9].

Initially, American scholars proposed the theory of genetic algorithms, but it was not applied to tourism demand forecasting. Later, Ge Xiaobin combined the genetic algorithm with the transition probability matrix genetic algorithm to predict tourism demand [10]. In 1982, Polish scholar Z. Pawlak proposed rough sets, a mathematical tool used to describe phenomena with incompleteness and uncertainty. Goh & Law proposes that this theory can complement the traditional demand framework and use rough set theory and time-varying parameter models to analyze tourism demand forecasting [11]. Zhang Jiekuan et al. proposed a gray neural network model to predict tourism demand [12]. Support vector regression theory is an analysis method that can achieve high fitting

accuracy and strong generalization of new energy, which can improve the prediction speed [13].

For example, tourism companies use neural network algorithms to predict the flow of people:

$$N = \frac{x - f + 2p}{s} + 1$$

2.5 Application of AI in Night Tourism Products

According to the previous review of tourism products, this study refers to Cao Xinxiang's classification method for night tourism product types. Night tourism products are divided into four categories: performance products, landscape products, participation products, and comprehensive products. Among the four types of night tourism products, the most used AI products are performance products and participation products.

(1) **Performance products.**

The most representative of night tourism performance products is cultural performance, which adopts 3D projection, multimedia technology, light and shadow technology and other high-tech.

(2) **Participatory products.**

The night tour project uses environmental rendering techniques such as lighting, music, and scenery and artificial intelligence products such as AR and VR to provide tourists with a better travel experience. In various theme parks and museums, there are also high-tech shocking experience scenes and artificial intelligence products for interactive amusement. Such as ticket reservation, scanning code to enter the park, facial recognition, fingerprint recognition, real-time monitoring of crowd flow, etc.

3   Experiment

3.1 Questionnaire Design Process

This study uses questionnaires to collect data and distribute questionnaires online, which is fast, convenient, low-cost, and not limited by geographical area. In this study, a total of 400 questionnaires were distributed and 356 valid questionnaires were returned, with an effective rate of 89.25%. Questionnaires that are incomplete and short to fill out are considered invalid and eliminated.

3.2 Questionnaire Design Content

The research content of this paper is whether night tourism tourists use artificial intelligence products, cognition and attitude, satisfaction level, and future development suggestions. Therefore, the questionnaire is divided into two parts, the first part is personal basic information, and the second part includes the respondent's understanding of the use of AI in night tourism, satisfaction with night tourism AI products, and suggestions on the future development of AI in night tourism.
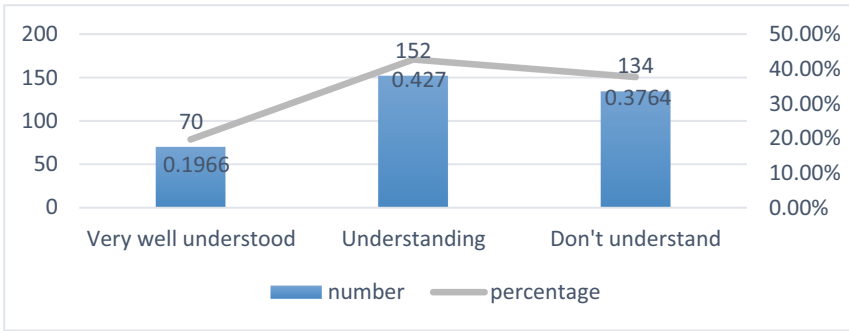
Fig. 1. Tourists' perception of AI products for night tourism

3.3 Reliability Test

The Spearman-Brown formula was used to calculate the reliability of the experiment.

$$rkk = \frac{krxx}{1 + (k - 1)rxx}$$

4 Discussion

4.1 Descriptive Statistical Analysis of Tourists' Cognitive and Emotional Attitudes Towards Night Tourism AI Products

As shown in the figure, tourists' cognition of night tourism artificial intelligence products is not as good as expected. The data shows that 37.64% of respondents do not know about night tourism AI products, and the vast majority of respondents do, but only 19.66% of respondents know night tourism AI products very well. We can see that although artificial intelligence has been popularized in China, the combination of night tourism products and artificial intelligence is still in its infancy and is not familiar to all the public. This also shows that there is still a lot of room for development and publicity of night tourism AI products. While paying attention to the combination of tourism products and AI, tourism enterprises should also pay attention to their promotion (Fig. 1).

Although one-third of respondents are not aware of night travel AI products, their attitude towards its future development is still impressive. 87% of respondents support the widespread use of future night tourism AI products, 11.5% do not care, and 1.4% do not approve of the use of future night tourism AI products, which may be because artificial intelligence has not brought her a better travel experience (Fig. 2).

4.2 Descriptive Statistical Analysis of Tourists' Use of Night Tourism AI Products.

As we can see from the figure, when respondents participate in night tourism, they use more AI to focus on performances in scenic spots and landscape-based products that
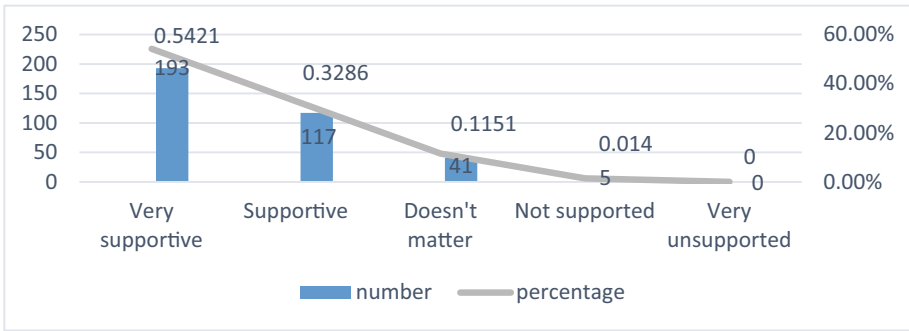
Fig. 2. Tourists' attitude towards the future development of night tourism AI products

focus on urban landscapes or tourist landscapes at night. In reality, these two products also use AI more, such as performance products will use 3D, light and shadow technology and other high-tech, landscape products will use VR or AR is an immersive experience for tourists. The other two nighttime travel products use less AI, so travel companies can increase their efforts to develop these two products and introduce AI (Fig. 3).

Among the many AI-powered services, which one do tourists use most? As shown in the figure, audio guides are the most popular, followed by online booking, which is in line with our usual cognition. With the development of technology and the Internet, tourists choose to buy tickets online, such as air tickets, high-speed rail tickets, scenic spot tickets, etc. when traveling. In order to reduce the queuing time of tourists, major scenic spots also use artificial intelligence to swipe ID cards or brush faces to enter the park, which greatly reduces the congestion of tourists at the entrance of scenic spots. VR and AR are the least chosen by respondents, which also shows from the side that artificial intelligence has not been fully applied to night tourism, which puts forward the future development direction for tourism enterprises, and the scope of use and intelligence of artificial intelligence should be increased (Fig. 4).
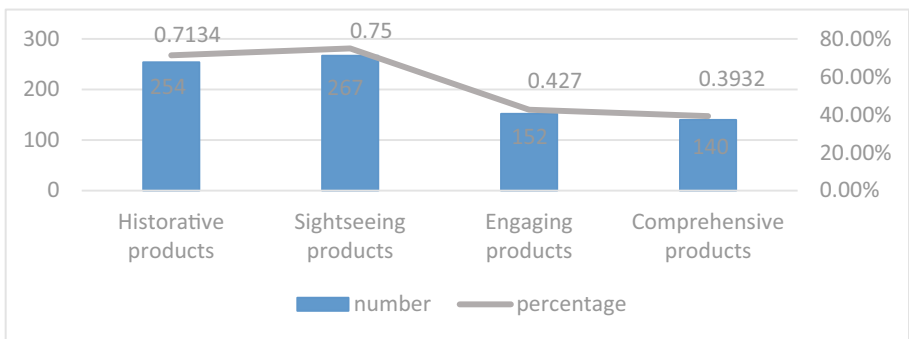

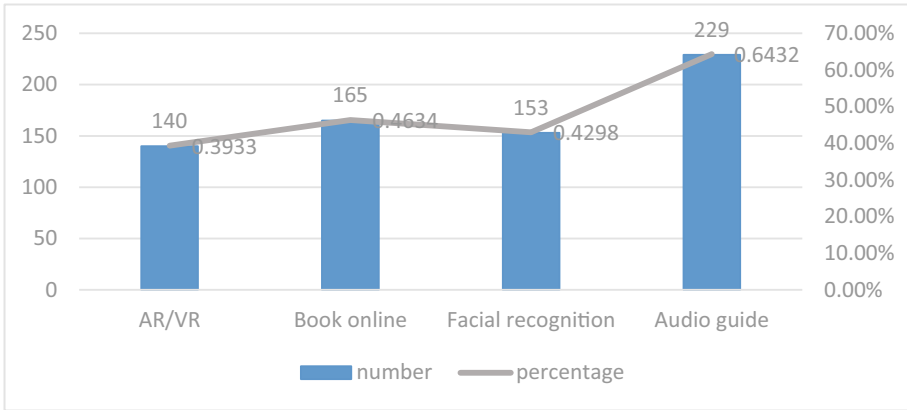**Fig. 3.** Analysis of the types of products that tourists participate in night tourism

Fig. 4. Travelers' use of night tourism AI product analysis

5   Conclusion

AI promotes the progress of society and drives the development of tourism. AI has saved a lot of manpower and material resources in the tourism industry, and tourism companies can segment the market of tourists based on data analysis. The scenic spot monitors the flow of people in real time, saving tourists a lot of unnecessary time waste. Other AI technologies are also improving the visitor experience in all ways. But tourists do not have a deep understanding of artificial intelligence. Perhaps everyone has heard the term artificial intelligence, but they have not experienced the convenience brought by artificial intelligence in the tourism industry. Some tourists even feel that AI is not intelligent in the tourism industry and want it to be more humane. This still shows from the side that tourists do not understand artificial intelligence. Tourism enterprises should increase the integration of tourism and artificial intelligence, so that tourism products are constantly updated, more humanized and intelligent, so that they can benefit more tourists and let them feel the convenience brought by artificial intelligence. And artificial intelligence should be popularized, so that artificial intelligence can enter every household, and all residents can have a new understanding of artificial intelligence.

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