

# Deep Vision Analysis for Customers' Perception and Service Refinement Under Artificial Intelligence

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**Received:** October 1st, 2025 | **Accepted:** December 12th, 2025

## ABSTRACT

To improve the tourist experience and service quality in the ice and snow tourism scene, this study discusses tourists' behavioral characteristics and emotional needs based on deep vision analysis using artificial intelligence (AI). Multimodal data fusion technology is introduced, combining facial expressions, body posture, and environmental factors to construct an emotional and behavioral analysis model suitable for ice and snow tourism scenes. The optimized model is compared with Swin Transformer, EfficientNetV2, Time-Space Transformer (TimeSForm), and other models. The results show the optimized model excels in predicting tourists' behavior and analyzing demand characteristics. This study provides a new technical approach for analyzing emotion and behavior in ice and snow tourism scenes and makes a valuable contribution to research in the field of ice and snow tourism.

## KEYWORDS

Ice and Snow Tourism, Emotion Analysis, Behavioral Characteristics, Deep Visual Analysis, Multimodal Data

## RESEARCH BACKGROUNDS AND MOTIVATIONS

As a significant part of the global tourism market, ice and snow tourism has rapidly developed in recent years, particularly with the promotion of winter sports and the increasing popularity of ice and snow culture. More tourists are choosing to experience this type of tourism. However, due to the unique environmental conditions and characteristics of ice and snow tourism, there are notable differences in tourists' travel experiences and perceptions of destination images. Therefore, improving tourist satisfaction and attractiveness, as well as optimizing ice and snow tourism services, have become core issues in current tourism (Cao, 2023; Huang, 2025; Jirásek, 2025). Additionally, with the rapid advancement of artificial intelligence (AI) and deep learning technology, the application of deep vision analysis in multimedia data processing and emotion recognition holds great promise. This enables the analysis of tourists' emotions and behaviors based on visual data, providing new ideas for refined services and personalized experiences (Koivujuuri, 2022).

Existing research on ice and snow tourism primarily focuses on destination development and resource management, with limited studies on tourists' perceptions and emotions. Specifically, the understanding of tourists' behavior and emotions through visual analysis remains in the exploratory

DOI: 10.4018/IJITSA.397927

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stage. This study aims to examine the emotional and behavioral characteristics of tourists in ice and snow tourism settings using AI deep vision analysis. It seeks to understand their perceptions of ice and snow tourism imagery to provide data support for tourism managers, helping them develop more targeted service optimization measures. By employing depth visual analysis technology, this study enhances the emotional and behavioral analysis of ice and snow tourists, promotes the refinement and intelligence of tourism management, and offers scientific support for optimizing the ice and snow tourism experience and industry development. The results are applicable not only to ice and snow tourism but also provide data analysis methods for other tourism destinations, encouraging the broader application of AI in the tourism sector and supporting the intelligent upgrading and high-quality development of the industry.

## **RESEARCH OBJECTIVES**

- Using AI and deep learning technology, a visual analysis model is developed to identify multi-dimensional information, such as tourists' expressions and body movements, to accurately capture their emotional experiences and behaviors in ice and snow tourism environments.
- Based on the emotion data from the deep visual analysis model, this study examines tourists' perceptions of ice and snow tourism imagery, including the distribution of positive and negative emotions and their influencing factors, to identify core needs and preferences.
- This study expands the research methods for ice and snow tourism imagery, provides innovative insights for related fields through visual data and emotion analysis, and promotes the integration of ice and snow tourism services with AI technology.

## **LITERATURE REVIEW**

In previous studies, Zou (2024) found that the image construction of ice and snow tourist destinations significantly attracted tourists, with the unique environment and cultural experiences enhancing satisfaction and loyalty. He also noted that the visual appeal of ice and snow tourism was a crucial factor influencing tourists' choices. Dannevig and Rusdal (2023) analyzed the relationship between the image of ice and snow tourism and tourists' emotions, discovering that emotional dependence on these destinations was primarily shaped by visual and emotional experiences. A positive tourism image could enhance tourists' sense of identity and willingness to revisit. Fu et al. (2024) found that AI applications in emotion recognition allowed the tourism industry to monitor tourists' emotional reactions in real time, improving personalized services. In particular, deep learning methods excelled with large-scale image data, identifying subtle emotional changes in tourists. Chi et al. (2022) highlighted that convolutional neural networks (CNNs) for image analysis effectively recognized tourists' facial expressions, providing reliable data for emotion analysis. They found a significant correlation between emotional characteristics extracted through visual analysis and overall tourist satisfaction. Calderón-Fajardo et al. (2024) studied the application of deep learning in tourist scenes, finding that CNNs could effectively extract behavioral characteristics from images. Their results indicated that visual analysis could identify tourists' activity patterns in various settings, aiding tourism managers in optimizing service design. Huang et al. (2024) proposed that using long short-term memory (LSTM) networks to analyze video sequences could more accurately capture the temporal characteristics of tourists' behaviors, improving the classification of behavior categories. They found that the optimized network performed better in dynamic scenes than traditional models, making it particularly suitable for long-term behavior monitoring.

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