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Research on the Application of Data Mining Algorithm in BaShu Cultural Tourism Decision Making

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Abstract: *Based on the existing problems in the current research on BaShu cultural tourism decision-making, we propose a research approach for the application of data mining algorithms in BaShu cultural tourism decision-making. Firstly, a deep learning based model of BaShu cultural tourism and related tourist attraction attributes is constructed. Based on this, a tourist group behavior model based on spatial temporal mining is constructed, and a BaShu cultural tourism spatial layout and tourist accurate matching model are proposed. Finally, a BaShu cultural tourism route decision-making model is designed. The method we constructed can provide a basis for recommending BaShu cultural tourism attractions, planning BaShu cultural tourism routes, and making BaShu cultural tourism decisions.*

Keywords: *data mining, BaShu culture, tourism decision-making, application research*

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I. INTRODUCTION

The construction of the Chengdu Chongqing dual city economic circle is the core of the development strategy of Sichuan and Chongqing provinces and cities. Building a world-renowned tourist destination and promoting the construction of the Ba Shu cultural tourism corridor are important components of the development and construction of the Chengdu Chongqing economic circle. As a new highland of smart tourism construction, the integration of culture and tourism plays a key role in accelerating the integration of Bashu culture into the tourism economy. Taking Bashu culture as the core and promoting the integration of culture and tourism to achieve long-term development is an important goal of cultural tourism construction in Sichuan and Chongqing. It is also a powerful driving force and important way to create Bashu tourism business cards and promote Bashu culture to the world. At present, there is a lack of research on the excavation of scenic spots and related tourism functions with typical Bashu cultural attributes in Sichuan Province. There is no theoretical method that can accurately quantify the connotation and attributes of Bashu culture in related cultural and tourism attractions, which makes Bashu culture research stay at the level of qualitative analysis and generalized description. There is a lack of research on quantitative analysis models of Bashu culture, and there is no research specifically on data mining methods for Bashu cultural attributes. Tourists are the core of the tourism industry, and the ultimate goal of cultural tourism integration research is to meet the motivation and interests of tourists. The research on the integration of culture and tourism should always revolve around the core needs of tourists. However, existing studies lack in-depth exploration of potential tourists and their behavioral motivations in the "Ba Shu" cultural and tourism industry, resulting in insufficient target orientation and functional orientation of cultural and tourism research to serve the needs of tourists. It is difficult to develop cultural and tourism integration products that cater to the personalized needs of tourists. At present, there is a lack of research on route decision-making methods specifically aimed at mining and serving potential tourists in the "Ba Shu" cultural and tourism industry. There is a lack of research on spatial data mining models based on Ba Shu cultural and tourism labels, as well as research on accurate attraction recommendations and route decision-making methods. This has led to weak targeting in the design and development of Ba Shu cultural and tourism routes, and insufficient ability to match tourists' motivations and interests.

To address this issue, we introduce data mining algorithms into the research of Bashu cultural tourism decision-making. Firstly, we construct a deep learning based attribute model of Bashu cultural tourism and related cultural tourism attractions. Based on this, we construct a tourist group behavior model based on spatial time series mining, and propose a Bashu cultural tourism spatial layout and tourist accurate matching model. Finally, we design a Bashu cultural tourism route decision-making model.

II. CONSTRUCTION OF APPLICATION MODELS BASED ON DATA MINING

2.1 Deep Learning based Text Mining Model for BaShu Cultural Tourism

Build a deep learning text classification model to classify the comment big data text of BaShu cultural and tourism attractions, extract the comment big data text features of cultural and tourism attractions, and obtain word frequency statistics for feature labels. Firstly, determine the N number of categories of the evaluation text for cultural and tourism attractions, and use it as the first attribute element for constructing the DIANA clustering algorithm. Each text category is denoted as $T_{(i)}$, $0 < i \le N, i \in \mathbf{Z}^+$,and a feature label $L_{(i,\,j)}$ is set for each text category. By analyzing the word frequency $F_w \sim F_{(i,\,j)}$ of each text category $T_{(i)}$ feature tag $L_{(i,\,j)}$ in the big data of cultural and tourism scenic spot reviews, the text category of cultural and tourism scenic spots is ultimately determined. Equations (1) to (3) are the word frequency $F_w \sim F_{(i,\,j)}$ calculation models for text mining of BaShu cultural and tourism attractions, where p_{word} represents the number of times feature labels $L_{(i,\,j)}$ appear in comments, p_{total} represents the total number of words in the text, N_{paper} represents the total number of comment texts, $N_{p(word)}$ represents the number of texts with feature labels $L_{(i,\,j)}$, and the word frequency $F_w \sim F_{(i,\,j)}$ is the product of TF and IDF.

$$TF = \frac{p_{word}}{p_{total}} \tag{1}$$

$$IDF = \log_{10} \frac{N_{paper}}{N_{p(word)}} \tag{2}$$

$$F_w = TF \times IDF \tag{3}$$

2.2 Attribute mining model for BaShu cultural and tourism attractions based on DIANA clustering method

Based on the text mining model, the objective function $f(To_{(u)}, To_{(v)})$ of the DIANA clustering method constructed is shown in equation (4), where p_i is the No. i feature attribute of BaShu cultural and tourism attraction $To_{(u)}$ and q_i is the No. i feature attribute of BaShu cultural and tourism attraction $To_{(v)}$. In the feature attributes, the first attribute is the text category attribute of the scenic spot, k is the level of the objective function. The construction process of the DIANA clustering model is shown in Figure 1.

$$f(To_{(u)}, To_{(v)}) = \left[\sum_{i=1}^{\max i} (p_i - q_i)^k \right]^{\frac{1}{k}} \tag{4}$$

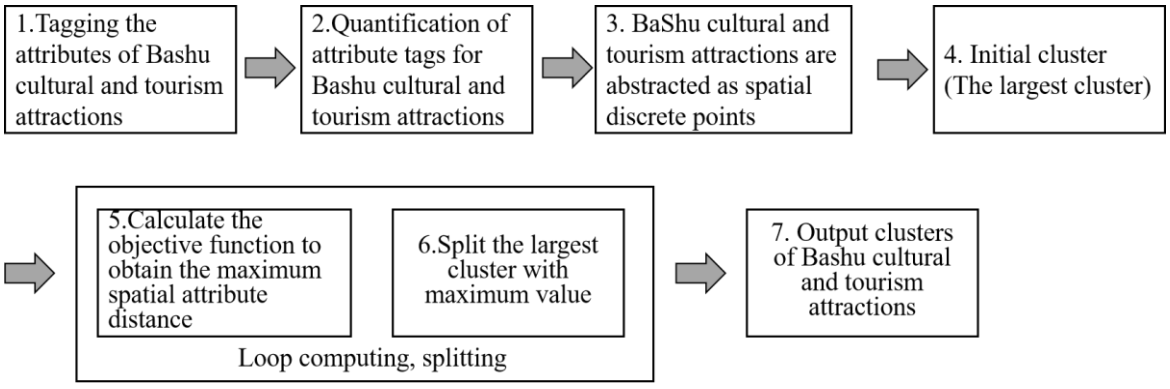

Figure 1. The construction process of the DIANA clustering model

2.3 Tourist Group Behavior Model Based on Spatial Temporal Mining

Based on the web travel records and review data of historical tourists on Sichuan Province's BaShu cultural and tourism attractions, a potential tourist group and behavior mining model for "leaning towards BaShu" cultural and tourism based on spatial temporal mining is constructed. Including tourist classification tags, interest data tags, demand attribute tags, tourism consumption ability tags, etc. By deeply exploring the

potential interests of tourists in the "BaShu" cultural and tourism industry, constructing a spatial model of tourist interest fields, obtaining models of tourist consumption psychology and behavioral tendencies, and providing strong support for the design and development of BaShu cultural and tourism route products. Based on the progress of time deduction t, determine the travel time units within a certain time range: $t_1, t_2, ..., t_n$. Extract feature attributes of tourist groups participating in the evaluation of BaShu cultural and tourism attractions within the geographical space of Sichuan Province in each travel time unit, obtain evaluation tendencies through text statistical methods, determine the weights of tourist feature attributes using word frequency sorting method, construct a set of tourist feature attributes, and then construct data intersection with the set of attraction feature attributes to ultimately extract feature attributes for tourist rating. Tourists with a preference for BaShu culture and tourism can obtain subjective interest weights for each feature attribute by rating it, in order to explore the quantitative value of their interest tendency. The tourist feature attribute label L_i extracted from the data set are shown in equation (5), which λ_i quantifies the No.i feature attribute of the tourist , L_i relates to the feature attributes p_i of the BaShu cultural and tourism attractions. Equation (6) is the constructed model for calculating the rating weight of the feature attribute, where $\delta(\lambda i)$ is the rating weight of the No.i feature attribute of the tourist and $S_{c(\lambda i)}$ is the rating of the No.i feature attribute of the tourist.

$$L_i = [\lambda_1, \lambda_2, \ldots, \lambda_i, \ldots, \lambda_n] \tag{5}$$

$$\delta(\lambda i) = \frac{S_{c(\lambda i)}}{\sum_{i=1}^{n} S_{c(\lambda i)}} \tag{6}$$

2.4 Layout of BaShu Cultural Tourism Space and Precise Matching Model for Tourists

By constructing the attribute model of BaShu cultural and tourism attractions and the tourist interest field model, combined with the characteristics of Sichuan cultural tourism, a spatial layout of BaShu cultural tourism and a precise matching model for tourists are constructed to achieve accurate matching between tourist interest attributes and BaShu cultural and tourism attractions. This provides the potential tourist group of "leaning towards BaShu" with the best motivation and interest satisfaction of BaShu cultural and tourism attractions, improves tourists' satisfaction with Sichuan tourism, enhances the image of Sichuan as a world tourism destination, and expands the domestic and international influence of Sichuan tourism. Based on the spatial layout of BaShu cultural tourism and the precise matching model for tourists, the recommended scenic spots are most in line with the potential needs of "leaning towards BaShu" cultural tourism. Based on such scenic spots, the design of BaShu cultural tourism route products can achieve precise marketing of BaShu cultural tourism products. Equation (7) is a tourist matching model based on tourist interest labels and the characteristic attributes of BaShu cultural and tourism attractions. In the equation, $\delta(\lambda i)$ is the weight of the No.i characteristic attribute of the tourist, p_i is the characteristic attribute of BaShu cultural and tourism attraction $To_{(u)}$, t_i is the No.i tourist, and k is the degree of the matching function. Sort the BaShu cultural and tourism attractions based on their matching degree to obtain a recommended sequence of attractions for the No.i tourist.

$$M(t_i, To_{(u)}) = \left[\sum_{i=1}^{\max i} \left(\delta(\lambda i) - p_i \right)^k \right]^{\frac{1}{k}} \tag{7}$$

2.5 Decision Model for BaShu Cultural Tourism Routes

The design of scenic spots in the BaShu cultural and tourism route is based on the BaShu cultural and tourism scenic spot attribute model. By accurately matching the demand data labels of the potential group of "leaning towards BaShu" cultural and tourism, and focusing on the consumption psychology and behavioral motivations of these tourists, accurate recommendations of BaShu cultural and tourism scenic spots are obtained. Based on the geographic spatial information, tourism transportation information, and spatial distribution information of scenic spots in Sichuan Province, provide route decision-making plans that meet the travel needs of tourists, match personalized services such as voice guided tours and scenic spot guides with BaShu culture explanations as the background, and deeply integrate BaShu culture into the entire tourism route and sightseeing

process. Figure 2 shows the framework and basic principles of the decision-making model for BaShu cultural tourism routes.

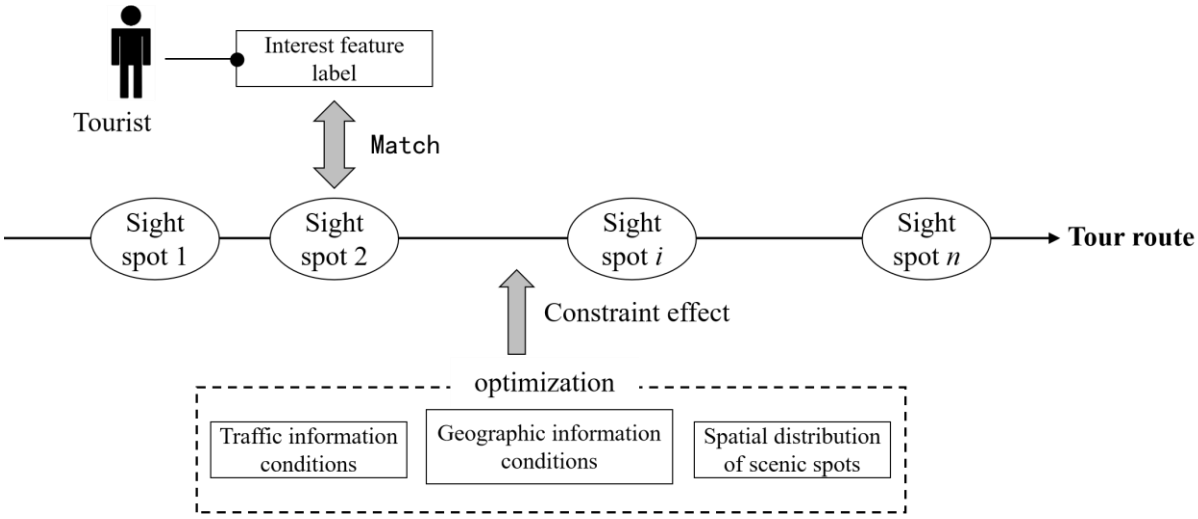

Figure 2. The constructed framework and basic principles of the decision-making model for BaShu cultural tourism routes

Ⅲ. CONCLUSION

By analyzing the current research status of BaShu cultural tourism, we introduced data mining algorithms and studied their application in BaShu cultural tourism decision-making. Using text mining algorithms to mine the characteristic attributes of scenic spots, and obtaining tourists' interest attributes and behavioral characteristics through spatial temporal sequence mining. By building a matching relationship between the attributes of tourist attractions and their behavioral characteristics, we recommend the most suitable attractions for tourists. Based on the geographical spatial conditions, traffic information conditions, and spatial distribution of tourist attractions in the tourism scene, a decision-making model for BaShu cultural tourism routes with scenic spots as nodes was designed, providing decision-making basis for tourists' travel.

Conflict of interest

There is no conflict to disclose.

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