



Research on the Application of Intelligent Tourism Data Analysis Based on Python

Yuncaï Luan*, Xiangcai Zhu

School of Information Science and Technology, Taishan University, Tai'an, Shandong, China.

How to cite this paper: Yuncai Luan, Xiangcai Zhu. (2023) Research on the Application of Intelligent Tourism Data Analysis Based on Python. *Advances in Computer and Communication*, 4(6), 373-377. DOI: 10.26855/acc.2023.12.005

Received: November 25, 2023

Accepted: December 22, 2023

Published: January 18, 2024

***Corresponding author:** Yuncai Luan, School of Information Science and Technology, Taishan University, Tai'an, Shandong, China.

Abstract

With the rapid development of technology, smart tourism has become a disruptive innovation in the tourism industry. This article explores the key role and application scenarios of Python-based data analysis applications in the field of smart tourism. Firstly, we focused on the tourism destination recommendation system and provided a detailed introduction to the principles and applications of personalized recommendation algorithms. These algorithms utilize Python's data analysis libraries, such as Pandas and NumPy, to process a large amount of user data to provide personalized destination recommendations for tourists. Secondly, the field of real-time transportation and route planning was studied, with a focus on real-time traffic data analysis and intelligent route optimization. Python's data processing and machine learning tools are used to analyze traffic conditions, provide the best routes, and help tourists avoid traffic congestion. Finally, we focused on attraction management and experience improvement. Tourist behavior analysis uses Python's data science technologies, such as data mining, to gain insights into tourists' needs and behavior patterns. This enables attraction managers to better optimize service processes, provide personalized guides, and improve the tourist experience.

Keywords

Python, Wisdom, Tourism data

1. Introduction

With the rapid development of information technology, smart tourism is becoming a revolutionary innovation in the global tourism industry. Smart tourism not only provides tourists with more convenient and personalized travel experiences but also brings new opportunities and challenges to the management and sustainable development of the tourism industry. The Python ecosystem provides powerful data processing, visualization, and machine learning tools, making data analysis more efficient and accurate. From recommending tourist destinations to real-time traffic analysis to improving attraction management and experience, Python has a wide and diverse range of applications, providing data-driven solutions for various aspects of smart tourism [1].

2. The Advantages of Python in Data Analysis

Python has significant advantages in data analysis (as shown in Figure 1), making it the preferred tool for smart tourism data analysis. Its appeal lies in its versatility, rich libraries, and community support.

Firstly, Python has an easy-to-learn and use grammar, allowing even beginners to quickly get started. This enables the data analysis team to work quickly without spending a lot of time learning complex languages. Secondly, the Python ecosystem includes many powerful libraries, such as Pandas, NumPy, Matplotlib, and Seaborn, which provide a wide range of data processing, visualization, and analysis tools, enabling data scientists to easily clean, explore,

and visualize data. Once again, Python also supports machine learning and deep learning. With libraries such as Scikit-Learn and TensorFlow, data analysis teams can develop complex predictive models for improving tourism destination recommendations, traffic analysis, and user experience. Finally, Python has a huge community support, which means it can easily access solutions, tutorials, and third-party libraries, helping to quickly solve problems and drive project progress. In short, Python, as a multifunctional programming language, has unique advantages in smart tourism data analysis, providing powerful tools for data analysis teams to unlock the potential of the smart tourism field [2].

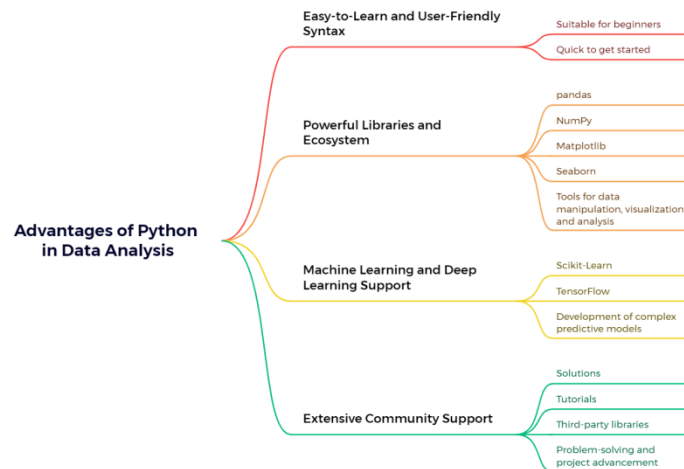


Figure 1. Advantages of Python in Data Analysis.

3. Tourist Destination Recommendation System

3.1 Personalized Recommendation Algorithm

The personalized recommendation algorithm utilizes Python's powerful data analysis and machine learning tools to provide personalized travel destination recommendations for each tourist by analyzing the user's historical behavior and interests.

Firstly, personalized recommendation algorithms require the collection and analysis of a large amount of user data. This includes information such as the user's geographical location, travel history, search queries, budget range, interests, and hobbies. Python's data analysis libraries such as Pandas and NumPy can be used for data cleaning, organization, and preprocessing to ensure data quality and consistency. Secondly, the algorithm utilizes this user data to create personalized user models. Through machine learning technologies such as collaborative filtering, content filtering, and deep learning, the system can understand users' preferences and behavior patterns. Collaborative filtering algorithms can identify other users with similar interests and recommend their preferred destinations. The content filtering algorithm recommends relevant destinations to users based on their previous choices and preferences. Deep learning algorithms can mine more complex correlations to provide more accurate personalized recommendations. Finally, personalized recommendation algorithms present these personalized suggestions to users, typically through mobile applications or websites. Users can choose the most suitable tourist destination, itinerary, and activities based on their interests and needs. This personalized recommendation not only improves user satisfaction with travel but also helps the tourism industry provide more attractive services and experiences, enhancing overall competitiveness [3].

3.2 User feedback and improvement

User feedback and improvement are crucial processes that not only allow tourists to share their perspectives and experiences but also provide valuable information for system operators to continuously improve and optimize recommendation systems to better meet user needs.

Firstly, user feedback is collected through various channels, including user ratings, comments, suggestions, and complaints. This feedback information provides tourists with the opportunity to express their travel experience and expectations. These ratings and comments not only include evaluations of tourism destinations, restaurants, attractions, and other elements but may also include feedback on system recommendations. The collection and analysis of feedback data can help the system understand user satisfaction and identify existing problems. Secondly, user feedback is not only an input of information but also a driving force for system improvement. By analyzing user feedback, system operators can quickly identify and solve problems, and improve system performance and user experience. For example, if multiple users report service quality issues at a certain destination, the system operator can take action, communicate with relevant businesses, and take measures to improve the service. This feedback loop helps the system continuously optimize, meet user needs, and improve user satisfaction. Finally, user feedback can also be used for system decision support and strategic planning. By analyzing feedback data, system operators can identify user needs and preference trends to develop more accurate market strategies and provide recommendations that better meet user expectations. This helps system operators better understand user groups, improve recommendation algorithms, and provide more personalized services [4].

4. Real-time transportation and route planning

4.1 Real-time traffic data analysis

Real-time traffic data analysis aims to provide accurate traffic information and efficient route planning for tourists, as shown in Figure 2. Red represents traffic congestion, yellow represents accidents, and blue represents vehicles parked on the shoulder. This process enables tourists to better plan their travels, avoid traffic congestion, and save time and costs by collecting, processing, and analyzing real-time traffic data.

Firstly, real-time traffic data analysis relies on multiple data sources, such as traffic cameras, sensors, GPS data, traffic signals, and mobile applications. These data sources provide information about road flow, traffic congestion, vehicle speed, and travel time. Python's data analysis libraries such as Pandas and NumPy can be used to clean, organize, and analyze these data to ensure accuracy and availability. Secondly, real-time traffic data analysis uses various algorithms and technologies to process data to generate real-time traffic information and recommendations. This may include traffic status layers, route recommendations, estimated arrival time, and traffic congestion alerts. Through machine learning and data mining techniques, the system can predict the likelihood of traffic congestion, identify the best travel route, and even provide real-time traffic alerts to help tourists avoid traffic problems. Finally, the results of real-time traffic data analysis are usually provided to tourists through mobile applications or online platforms. Users can view real-time traffic conditions, choose the best route, and even receive notifications of traffic events in the application. This real-time information helps tourists better plan their itinerary, improving the convenience and efficiency of travel [5].

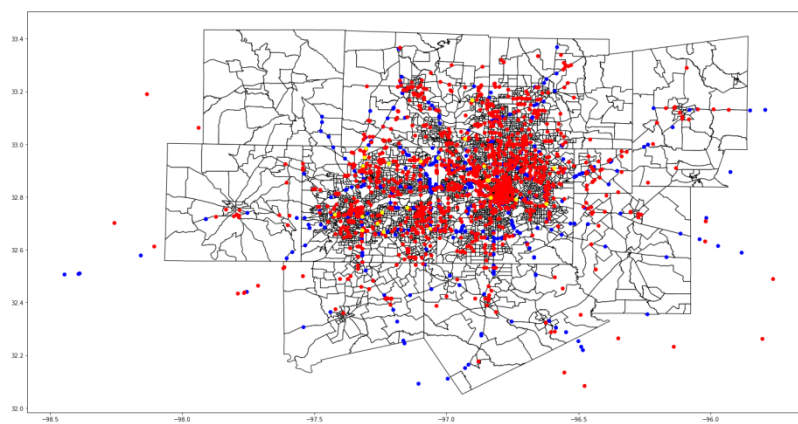


Figure 2. Real-time traffic data analysis diagram for Python.

4.2 Intelligent Route Optimization

Intelligent route optimization aims to help tourists choose the best travel path by fully utilizing Python's data

analysis and machine learning tools, thereby improving travel efficiency and convenience.

Firstly, intelligent route optimization considers multiple key factors, such as traffic conditions, distance, time, cost, personal preferences, and special needs. The system analyzes real-time traffic data, and utilizes Python's data analysis libraries such as Pandas and NumPy, as well as machine learning algorithms, to determine the optimal route selection. This may include choosing the shortest path, avoiding traffic congestion, optimizing public transportation options, and considering users' time windows and stopping points. Secondly, intelligent route optimization algorithms rely on various technologies, such as graph theory, dynamic programming, greedy algorithms, or heuristic algorithms, to solve complex path-planning problems. These algorithms not only need to consider the distance of the route, but also need to comprehensively consider other factors, such as real-time traffic conditions, user time constraints, and preferences. This comprehensive analysis helps to generate the optimal travel plan. Finally, intelligent route optimization provides personalized travel advice to tourists through mobile applications or online platforms. Users can choose the best travel route based on their own needs and preferences, thereby improving travel efficiency and satisfaction. This personalized route planning not only makes tourists' itineraries smoother but also helps save time and costs.

5. Attraction Management and Experience Improvement

5.1 Analysis of Tourist Behavior

Tourist behavior analysis aims to better understand the needs, interests, and habits of tourists by collecting, analyzing, and interpreting their behavior data within the attraction, in order to improve attraction management and provide a higher-quality travel experience.

Firstly, tourist behavior analysis requires collecting various types of data, including tourist location information, stay time, movement trajectory, interactive behavior, purchase records, etc. Python's data analysis tools and libraries, such as Pandas, NumPy, and Matplotlib, can be used to process and visualize these data in order to better understand tourist behavior patterns and trends. Secondly, tourist behavior analysis utilizes data science technologies such as data mining and machine learning to uncover deep insights into tourist behavior. The analysis process may include cluster analysis to determine the characteristics and interests of different tourist groups; Correlation analysis to understand the interaction patterns between tourists; And predictive analysis to predict peak and trough tourist traffic. These analyses help scenic spot managers better understand tourist needs, optimize resource allocation, and provide more personalized services and experiences. Finally, the results of tourist behavior analysis can be used to improve attraction management and enhance the tourist experience. For example, an intelligent navigation system based on data analysis can provide personalized visiting suggestions for tourists, customizing tour routes according to their interests and needs. In addition, correlation analysis can also help scenic spots provide better interactive experiences, such as increasing interactive display and navigation services and increasing tourist engagement.

5.2 Optimization of Scenic Area Operations

The optimization of scenic spot operation is a key link in the application of Python-based smart tourism data analysis, aiming to improve the efficiency, sustainability, and tourist satisfaction of scenic spots through data analysis and intelligent decision support systems.

Firstly, optimizing the operation of tourist attractions requires full consideration of their resource management. Through data analysis, scenic spot managers can understand information such as tourist flow, stay time, and pedestrian distribution to better plan resource allocation. For example, they can arrange the working hours of their staff reasonably to ensure sufficient service personnel during peak hours while reducing costs. Secondly, optimizing the operation of tourist attractions relies on improving service quality. By monitoring tourist behavior and feedback, managers can quickly identify and solve problems, improving tourist satisfaction. Data analysis can also help optimize service processes, providing better navigation and interactive experiences. For example, an intelligent navigation system based on data analysis can provide personalized visiting suggestions for tourists, customize tour routes according to their interests and needs, and improve the tourist experience. Finally, optimizing the operation of tourist attractions also includes improving market strategies. Through data analysis, managers can understand the source, budget, and preferences of tourists in order to develop more targeted marketing strategies. They can launch specific promotional activities based on the results of data mining, attract different types of tourists, and improve the visibility and attractiveness of scenic spots.

6. Conclusions

In summary, the intelligent tourism data analysis application based on Python is a comprehensive systematic work that brings new opportunities to the tourism industry. Through precise analysis and application of data, tourism experience can be improved, scenic spot management can be improved, and sustainable tourism development can be promoted. However, in order to fully leverage the advantages of data analysis, it is necessary to continue to pay attention to issues such as data security and privacy protection to ensure the sustainable development and successful implementation of smart tourism.

Funding

This paper is supported by the “Python-based intelligent tourism data analysis system application research” Project (Project No.: 2021GX032). Source: Science and Technology Innovation Development Program of Tai'an City.

References

- [1] Hu Ximin, Mar Derek, Suzuki Nozomi, Zhang Bowei, Peter Katherine T., Beck David A. C., & Kolodziej Edward P. Mass-Suite: A novel open-source python package for high-resolution mass spectrometry data analysis [J]. *Journal of Cheminformatics*, 2023, 15(1).
- [2] Mischler Gavin, Raghavan Vinay, Keshishian Menoua, & Mesgarani Nima. Naplib-python: Neural acoustic data processing and analysis tools in Python [J]. *Software Impacts*, 2023, 17.
- [3] Kolev Mihail. SVM. Friction: A Python based software for calculating, data analysis and modeling the coefficient of friction of aluminum metal matrix composites using support vector regression [J]. *Software Impacts*, 2023, 17.
- [4] Hadian Jazi Marjan & Sadri Alireza. A Python package based on robust statistical analysis for serial crystallography data processing [J]. *Acta Crystallographica. Section D, Structural biology*, 2023.
- [5] Guoxia Sun. Symmetry analysis in analyzing cognitive and emotional attitudes for tourism consumers by applying artificial intelligence python technology [J]. *Symmetry*, 2020, 12(4).