Designing a tourism industry model in Iran with the approach of the spatial correlation structure

Golnar Adabi[1], Ali Hajiha[2,*], Farhad Hosseinzadeh Lotfi[3]

Abstract

Studies in the field of the tourism industry are often carried out using classical statistics. While the use of spatial statistics in tourism helps a lot in identifying existing models and trends in the industry and discovering them. Due to the interaction between economic, political, environmental and social elements in tourism activities, analysis methods of spatial statistics can be used by identifying information between samples and using large volumes of information by not indicating the independence of the data, can obtain suitable tourism clusters and help identify the appropriate tourism model in Iran. This study aims at to design a model of the tourism industry in Iran with the approach of the spatial correlation structure. The research method was qualitative and quantitative. To identify the variables affecting the tourism industry, the qualitative meta-analysis method, and to collect the required data in spatial statistics, the data of the Cultural Heritage and Tourism Organization in the summer of 2008-2018 have been used. To determine the model of tourism clusters Moran statistics and to study tourism clusters in all provinces of the country, the best interpolation method of tourism has been determined. ArcGIS software was used to analyze the research data. The results of data analysis showed that tourism data has a spatial autocorrelation and a cluster and regular model in the statistical period of summer 2008 to 2018. The most cluster model of tourism using the Moran spatial autocorrelation index is related to the summer of 2008 with 0.991 and the lowest cluster model of tourism is related to the summer of 2014 with the amount of 0.976. Also, the results of the study of the distribution of tourism direction in the provinces of the country in this statistical period showed that the predominant direction of tourism is with a slight change from northwest to southeast.

Keywords: tourism; spatial statistics; classical statistics; spatial autocorrelation; cluster model.

1. Introduction

Tourism is one of the largest and most diverse industries and at the same time one of the most lucrative and employment-generating industries (Tsai, 2017). Since throughout the history of

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* Corresponding author; ahajiha@gmail.com

[1] Department of Industrial Management, UAE Branch, Islamic Azad University, Dubai, UAE.

[2] Department of Industrial Management, North Tehran Branch, Islamic Azad University, Tehran, Iran.

[3] Department of Mathematics, Science and Research Branch, Islamic Azad University, Tehran, Iran.

human life, their movement and migration and travel from one land to another have played a key role in the creation and expansion of civilizations, this industry undoubtedly as the most important human movement has a direct impact in the growth and promotion of knowledge, economy, and culture and plays a key role in building understanding between countries, especially world peace (Wood, 2018). From the economists' point of view, tourism is one of the fastest ways to return capital, and experts say that it has the highest rate of capital accumulation. Also, the growth of tourism is associated with economic development, which includes improving employment and creating appropriate social conditions for the development of society (Liu and Wu, 2019). In addition to creating diverse activities in society, tourism brings dynamism in various economic sectors and has a constructive impact on creating a currency balance (Prakash, Kumar and Gautam, 2020).

Tourism, as one of the important economic branches, has a special place in the competition with other commercial products of each country and is considered as one of the income sources and the largest service industry in the world (Titu, Răulea & Țîțu, 2016). This industry, while is a paradoxical and complex phenomenon, is lucrative, balances economic development at the regional level, establishes a fair distribution of income, and has a key role in creating jobs and complementary direct and secondary sources of income (Nguyen & Funck, 2019). Currently, tourism and other sub-sectors are one of the largest economic sectors in the world, which is considered in many countries and as a result, one of the most important activities in the economic cycle of the countries, especially in terms of employment, currency production and the prosperity of different regions which besides that, it has communication, political, cultural benefits and special international influences (Boley, Strzelecka & Woosnam, 2018).

Today, the tourism industry is so important in the socio-economic development of countries that economists call it "invisible exports". Many countries consider this industry as the main source of income, job creation, private sector growth, and infrastructure development (Jadhav, 2020). According to the statistics of the World Tourism Organization (WTO), the tourism industry in the world will grow significantly by 2020, so that this industry will probably be able to equalize the oil industry in terms of revenue (Diakonidze, 2019). Currently, in developed countries such as Iran, the use of all facilities and capabilities to achieve sustainable and comprehensive development, as well as the replacement of new sources of income is considered necessary and essential (Khoshnevis Yazdi, Homa Salehi, and Soheil Zad, 2017). According to the experts, this industry is the third fastest growing and most dynamic economic phenomenon after the oil and automobile industries, and as a result, its development has a significant impact on strengthening the social foundation in terms of economics (Nunkoo, Seetanah, Jaffur, Moraghen & Sannassee, 2020) and this caused that the development, growth, and promotion of this industry are set on the agenda of governments so that to be able to be placed as an alternative to other industries such as the oil industry and its related economy in the development of Iran (Lashkarizadeh, Kashmir, Gashti and Shahrivar, 2012).

Iran is one of the five countries in the world in terms of climate diversity and one of the ten countries in the world in terms of history and culture, which with its rich historical and geographical attractions, is a country prone to attract foreign tourists. The tourism industry for Iran, which has a strong reliance on oil revenues, can significantly help to get rid of problems such as unemployment, single-product economy, etc. (Ebrahimi and Ale-Morad Jabdaraghi, 2011). It is noteworthy that although in recent years the industry has had a relatively growing situation, but this growth has been very small compared to the country's ability to attract tourists. So that to achieve global standards, we need careful planning and the use of methods that help us to determine the factors and components affecting the growth of the tourism industry, as well as suitable points for investment in this industry. Therefore,

attention to tourism is on the one hand due to its economic values and on the other hand due to its cultural, political, and social effects. Due to the use of tourism potential and capability in each region, a dynamic and active ground can be provided for its development, so especially the analysis of these potentials and capabilities geographically will be necessary.

The purpose of this study is to design a model of the tourism industry in Iran with a spatial correlation structure approach. Most studies in the field of the tourism industry have been fulfilled using classical statistics. In classical statistics it is assumed that the observations of the samples are independent of each other; but in many cases, this assumption does not so established in practice and the observations are interdependent. Ignoring this dependence will cause a lot of information to be lost and, as a result, statistical analysis will be far from reality. Sometimes the dependence of data pertains to their position in space, and in fact, their dependence is a function of their distance from each other. Therefore, the use of spatial statistics helps a lot in identifying the existing models and trends of the tourism industry and discovering them. Theoretically, recognizing the spatial model of data is important in that and it leads to macro decisions about the factors affecting the growth of the tourism industry so that these decisions reduce costs and increase productivity due to the correlation of regions. From a practical point of view, this issue is important because Iran is in the period of sanctions and has the opportunity to earn money from areas other than natural resources. Therefore, considering that Iran has many potentials and tourist attractions that have not been addressed yet, setting to the tourism industry can save the country's economy from being a single product. With the accurate analysis of tourism clusters in Iran, detailed planning can be carried out at the national and regional levels.

2. Theoretical foundations and research background

Tourism is one of the most important tools of development in the world and the last century was predicted to be the largest industry in the world in the 21st century (Sebele, 2010, 137). According to the forecast made by the Tourism Organization in 2020, about one billion and five hundred and sixty million people are tourists, and revenues from international tourism will reach one and half-trillion dollars this year (Tan, 2008, 190). The tourism industry has been growing in recent decades and has had a great impact on the economies of countries. Tourism in general, due to the nature of its interdisciplinary, has the ability of different attitudes, which has led to many definitions of it. In the initial definitions, more emphasis was placed on the distance dimension, and tourists were classified based on the distance they had from the place of residence. So that according to the American National Tourism Commission (1973) in the definition of domestic tourism, the distance is fifty miles, which includes all travels except travel for work (Gartner, 1996: 5). Definitions of distances, regardless of errors and mistakes, were accepted only because they prepare an economic and statistical quantity for the phenomenon of tourism. Whereas these definitions of distance alone could not describe tourism well. They focus only on the demand side and ignore supply as well as the effects of tourism. Hence, tourism needs other definitions. Based on this, other definitions are presented, each of which describes tourism in different dimensions. In the geographical dimension, tourism is defined as the activity of leisure or recreation activities that require an overnight absence from a normal place of residence (Skinner, 1999: 280). Socially, the definition of tourism includes the intersection between the normal life of indigenous peoples and the unusual life of tourists (Bernard, 1996: 552)

The first attention to spatial data was made in 1686 by Holly, the English geographer and astronomer, who mapped agricultural lands near the tropics to study the monsoon winds, and added the direction of the monsoon winds then tried to determine their natural causes. Earth science uses statistics in geology and geography. In other words, statistics science is spatial.

Geostatistical methods use mathematical and statistical functions in interpolation and are based on the statistical properties of the data. This technique predicts unknown points based on the self-correlation between the measured points and their spatial structure. Geostatistical interpolation is an inaccurate or probabilistic interpolation where the predicted points differ from the actual sizes. Yaser Hakimdoost and Ali Mohammad Pourzeidi (2016) in their research concluded that the most accurate method in interpolation operation is geostatistics, which has been able to increase the accuracy of estimation with scientific models. Of course, rural tourism will also have negative economic consequences that must be considered in rural tourism planning.

Safar Ghaed Rahmati and Naghmeh Daneshmandi (2018) in their research by analyzing the neighborhood of priority areas addressed to locate future tourism spaces with the help of the medial center analysis of the priority area to provide the services needed by tourists. Using the Neighborhood Analysis Map, he identified some areas that have priority for creating future tourism spaces. Also, using the map of the center, they determined the average area that has the highest priority to provide or increase the services and facilities needed by tourists. According to other studies related to the analysis of tourism spaces in Iranian cities, these spaces are usually influenced by the historical context of cities-which have access to urban service centers, facilities, and equipment.

Hassan Afrakhteh and Mohammad Taghi Rahnamaei (2016) stated that spatial analysis of tourism development in different regions and provinces is one of the important requirements for sustainable development of tourism and avoiding the creation and development of spatial inequalities. The results of their research show that the spatial model of development of tourism elements and resources among the cities of the province is a heterogeneous model; In other words, the inequality of accommodation facilities and other elements of tourism has not followed the tourist attractions.

Mohsen Kalantari and Marzieh Malek (2015) stated that by examining the model of communication infrastructure and spatial distribution of tourist attractions, it shows that the amount of tourist attractions decreases with the reduction of the area of communication infrastructure ranking zones. The distribution of tourist attractions in the cities of Khour and Biyabanak does not fit with the spatial model of communication infrastructure and road network distribution, and this issue needs special attention.

In 2003, Dendo et al. conducted a study on the application of tourism planning in GIS in Zimbabwe. Due to the instability in the agricultural sector, as well as the instability of weather conditions and fluctuations in agriculture and production in the international market, the government's attention was focused on the tourism industry. Based on this, various information related to tourism facilities, national parks, roads, statistics and the like has been prepared for the applicant. The project aims at to find a suitable tourism destination for Zimbabwe's future development.

3. Research methodology

In this study, to identify the variables affecting the tourism industry, a qualitative meta-analysis method has been used. Meta-analysis is one of the descriptive methods that evaluate the research done and statistical analysis of many studies and individual researches in a certain field is used to combine and integrate their results in the meta-analysis. Simply a meta-analysis is a comparison of the results of other people's research. That is, to provide another analysis of existing research and the results obtained from them, or in other words, to show a combined analysis of information that has not been shown in the original information. What has added to the importance and application of this research method is its role in combining and integrating researches that have been conducted individually and sparsely.

Methodologically, meta-analysis clearly shows the gaps, problems, and shortcomings of research and studies. The reliability of this type of research is achieved through the confrontation of research findings and their validity through the test of their compatibility with reality, and both of these are due to the accumulation of knowledge and its development in meta-analysis.

Table 1 presents the results of a qualitative meta-analysis. In this regard, after studying the literature review and related research, 26 studies were identified that were directly related to the variables affecting the tourism industry. Then, according to the nature of the introduced variables and by analyzing these studies, the variables were classified into three physical dimensions: ecological, socio-demographic, and institutional economics.

Table 1. Results of a qualitative meta-analysis

No.	Author	Physical Ecological								Scio-demographic							Institutional economics										
		Tourism Infrastructure	Noise Pollution	Water Pollution	Air Pollution	Environmental Pollution	Urban Services	Energy	Transportation	Number of Tourists	Hotel and Accommodation	Participation	Local Guides	Security	Satisfaction	Health	Employment and Unemployment	Investments	Prices	Incoming Capital of Foreign Tourist	Entrepreneurship	Tourism Expenditures	Taxes	GDP	Ethics Laws	Rules and regulations	Information and communication infrastructure
1	EU Sustainable Tourism Report (2001)	*	*	*	*	*		*	*			*		*	*	*	*		*			*			*	*	*
2	ASEAN Tourism Report	*	*	*	*	*		*	*			*		*	*				*			*	*		*	*	*
3	Sustainable Tourism Indicators Ecotourism Encyclopedia (2001)	*		*		*			*	*		*		*	*		*	*	*	*		*				*	*
4	South Asia Sustainable Tourism Report (2009)	*		*		*		*	*			*		*	*	*	*		*	*						*	*
5	World Bank Sustainable Tourism Report	*		*	*	*			*			*		*	*	*	*	*	*	*					*	*	*
6	World Tourism Organization Indicators (2006)	*	*	*	*	*		*	*			*		*	*	*	*		*			*			*	*	*
7	Seasonal tourism spaces in Estonia: Case study with mobile positioning data (2005)	*						*	*	*									*								
8	Gravity models for tourism demand: theory and use (2014)								*					*					*					*			
9	A Spatial Analysis of Tourism Activity in Romania (2015)	*							*					*					*					*			
10	A Geographic Analysis of Optimal Signage Location Selection in Scenic Area (2016)	*								*					*												
11	Travel and tourism competitiveness index (2019)	*			*	*				*			*	*				*					*	*			
12	Analysis of travel and tourism index (2019)						*	*	*			*	*	*			*	*	*			*	*	*			
13	"Tourism, Security, Development" Morteza Zarehpour and Hadith Vafadar (2015)		*	*		*		*	*	*		*	*	*	*	*	*	*	*		*				*	*	
14	"The role of security in tourism					*				*	*	*	*				*	*				*					

No.	Author	Physical Ecological								Scio-demographic							Institutional economics										
		Tourism Infrastructure	Noise Pollution	Water Pollution	Air Pollution	Environmental Pollution	Urban Services	Energy	Transportation	Number of Tourists	Hotel and Accommodation	Participation	Local Guides	Security	Satisfaction	Health	Employment and Unemployment	Investments	Prices	Incoming Capital of Foreign Tourist	Entrepreneurship	Tourism Expenditures	Taxes	GDP	Ethics Laws	Rules and regulations	Information and communication infrastructure
	development" Mojtaba Lotfifar and Hossein Yaghfouri (2012)																										
15	"Obstacles to tourism development in Iran; Challenges and Solutions" Ali Asghar Shalbafian and Hamidreza Pourbrat	✳						✳	✳	✳	✳			✳	✳	✳	✳		✳	✳		✳	✳			✳	
16	"Analysis of Challenges and Solutions in the Field of Tourism" Zahra Nikkhah Farkhani	✳					✳		✳	✳	✳	✳		✳	✳		✳	✳	✳	✳				✳		✳	
17	"Tourism and its factors with a review of religious tourism" Masoumeh Aghajani and Saeed Farahani Fard		✳	✳	✳		✳	✳	✳	✳	✳	✳	✳	✳	✳	✳	✳	✳	✳	✳		✳	✳				✳
18	"Pathology of Tourism Research in Iran" Maryam Eslah Konha and Mohammad Hossein Foroughi								✳							✳	✳							✳			✳
19	"The Role of Tourism in Security Development (South Khorasan Province)" Vahed Aghaei	✳			✳		✳		✳	✳	✳	✳		✳	✳	✳	✳					✳				✳	
20	"Tourism Industry in Iran" Dr. Ali Akbar Amin Bidakhti									✳							✳	✳		✳	✳						
21	"Economic pathology of tourism development in rural areas of Langroud city" Naghmeh Sahebi and Isa Pourramazan						✳		✳	✳	✳			✳		✳	✳		✳								
22	"Explaining the problems of the tourism industry of the Islamic Republic" Hossein Zarei Matin, Seyed Reza Seyed Javadin, Ali Rahimpour, Moslim Bagheri	✳					✳	✳	✳	✳	✳					✳	✳			✳						✳	
23	"Sustainable Tourism in Iran: Functions, Challenges and Solutions" Reza Mohseni	✳			✳					✳				✳	✳	✳	✳		✳					✳	✳	✳	✳
24	"Foreign Tourism Policy in Iran: Finding the Best Model" Mohammad Reza						✳		✳	✳		✳	✳	✳			✳			✳		✳	✳		✳		✳

No.	Author	Physical Ecological								Scio-demographic							Institutional economics										
		Tourism Infrastructure	Noise Pollution	Water Pollution	Air Pollution	Environmental Pollution	Urban Services	Energy	Transportation	Number of Tourists	Hotel and Accommodation	Participation	Local Guides	Security	Satisfaction	Health	Employment and Unemployment	Investments	Prices	Incoming Capital of Foreign Tourist	Entrepreneurship	Tourism Expenditures	Taxes	GDP	Ethics Laws	Rules and regulations	Information and communication infrastructure
	Najibi																										
25	"Explaining Strategies for Promoting the Tourism Industry of the Islamic Republic of Iran" Moslim Bagheri, Hassan Zarei Matin	✱						✱	✱	✱	✱			✱			✱			✱							✱
26	"Study of tourism industry development policies in Iran using the system dynamics approach" Hamidreza Fartotak and Sima Esfandiarpour Boroujeni	✱								✱				✱	✱		✱		✱	✱		✱			✱		✱

Table 2 presents the output obtained from the results of a qualitative meta-analysis in the form of dimensions and influential variables used in the present study. As can be seen from the table, in this study, 3 dimensions and 27 variables were introduced.

Table 2. Dimensions and variables of research

Physical Ecological	Demographic Sociological	Economic Institutional
Tourism infrastructure Noise pollution Water pollution Air pollution Environmental pollution City Services Energy Transportation	Number of tourists Hotel and accommodation Participation Local guides Security Satisfaction Sanitation and Health Security	Employment and unemployment The number of investments Prices Incoming capital of foreign tourists Entrepreneurship Tourism costs Taxes GDP Principles of Ethics Rules and Regulations Information and communication infrastructures

After determining the variables by meta-analysis method, data related to these variables were collected from the Statistics and Tourism Information Center of the Cultural Heritage and Tourism Organization in the period 2008-2018, and using spatial statistics, data were studied and analyzed. ArcGIS software was used for spatial exploratory analysis of data, statistical inference, and spatial modeling of tourism industry data.

4. Moran statistic

This statistic, also known as "spatial dependency", is one of the most useful tools for analyzing spatial data. Using this statistic, the degree of scattering or concentration of spatial features or data in space can be measured (Arun, 2013). Gareth & Tomoko (2013) argue that in the classification of spatial models, whether clustered or scattered and random, it is possible to arrange the order of centralized zone units and measure the similarity and

dissimilarity of each pair of regional adjacent units. When these similarities and differences are summarized for spatial models, a kind of spatial autocorrelation is formed. The hypotheses used in connection with Moran I statistic are:

Zero Hypothesis$^{(H_.)}$: There is no spatial clustering in the studied feature values for effects.

Opposite Hypothesis$^{(H_\backslash)}$: There is a spatial model in the property values studied for the effects.

The value of Moran I is calculated from the following equation:

$$I = \frac{m \sum_i^m \sum_j^m \omega_{ij}(y_i - \bar{y})(y_j - \bar{y})}{\left(\sum_i^m \sum_j^m \omega_{ij}\right) \sum_i^m (y_i - \bar{y})^2}$$

In the above relation, $w_{i,j}$ is the spatial weight between feature i and j, n is the total number of geographical features in the study area, y_i and y_j are the observed values of the variable in area i and j, respectively, and $\bar{y}$ is the average of the observed values.

Values close to +1 indicate a clustering model and values of -1 indicate a scattered pattern. Finally, values close to zero indicate the absence of a spatial model (Moran, 1948). At the same time, it should be borne in mind that the range of variation of Moran's I statistic is not exactly proportional to [-1, 1] and differs from the usual correlation coefficient.

5. The geographical location of the study area

Iran is located in the northern hemisphere between 25 and 40 degrees north latitude of the equator and between 44 and 63.5 degrees east longitude. Table 3 and Figure 1 show the geographical location of the logic under study.

Table 3. Location of the studied provinces

| Province	Latitude	Longitude	Province	Latitude	Longitude	Province	Latitude	Longitude
Arak	34.36	49.46	Khorramabad	33.26	48.17	Shahrekord	32.17	50.51
Ardabil	38.15	48.17	Shiraz	29.32	52.36	Qazvin	36.15	50.3
Urmia	37.4	45.3	Ahwaz	31.2	48.2	Qom	34.42	50.51
Isfahan	32.37	51.4	Alborz	35.55	50.54	Bojnourd	37.28	57.16
Rasht	37.19	49.37	Kerman	30.15	56.58	Kermanshah	34.21	47.9
Zahedan	29.28	60.53	Zanjan	36.41	48.29	Gorgan	36.54	54.24
Bandar Abbas	27.13	56.22	Bushehr	28.54	50.49	Mashhad	36.16	59.38
Birjand	32.52	59.12	Hamedan	34.52	48.32	Sanandaj	35.2	47
Tabriz	35.5	46.17	Semnan	35.35	53.25	Ilam	33.38	46.26
Tehran	35.41	51.19	Yazd	31.54	54.17	Yasuj	30.41	51.33
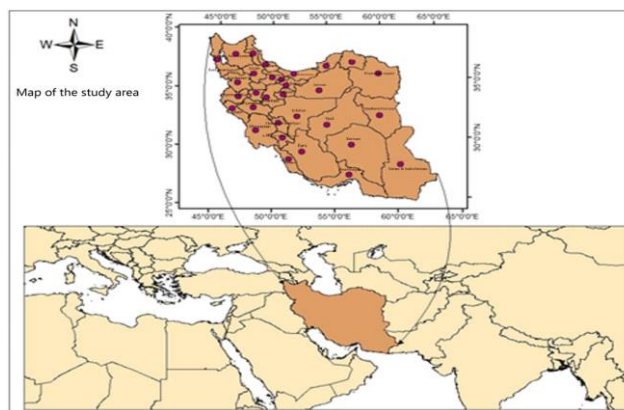
Figure 1. Location of the study area

6. The appropriate model of tourism spatial interpolation:

In this study, to zoning tourism, data related to the number of tourists in the study area were entered into the GIS information database. Then, a geo-statistical analysis was used to determine which of the interpolation methods produces the least error as a result. Methods of Radial Basis Function, Inverse Distance Weighted with different powers, ordinary Kriging and simple Kriging with different equations have been applied to hydrometric data and by examining experimental semivariogram, semivariogram model and Cross-Validation diagram and also by determining the second Root Mean Square (RMS) functions of each method, the method with the lowest RMS was used as the best method for internalizing tourism data. The results of examining different interpolation methods are presented in Table 4. The inverse weighting method with RMSE=0.74 (the second root function of the mean square error) was the best model for zoning tourists.

Table 4. Results of map evaluation with different spatial interpolation methods

Method	Model	RMSE
RBF	Fully regular spline	0.87
	Thin page spline	0.76
	Inverse Multiple Quadricular	0.93
	Multi-Quadric	0.75
	Spline with traction	0.75
IDW	1	0.74
	2	0.83
	3	0.82
Kriging	Spherical	0.80
	Circular	0.82
	Exponential	0.80
	Gaussian	0.79
SK	Spherical	0.85
	Circular	0.87
	Exponential	0.86
	Gaussian	0.87

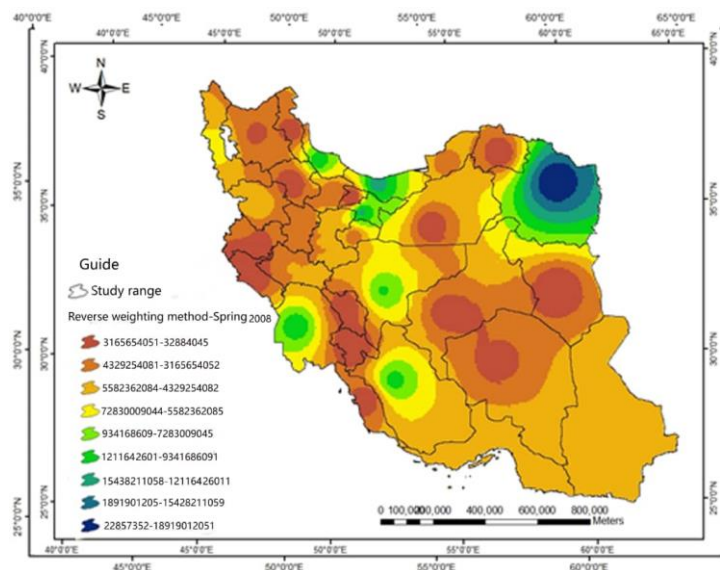The results of interpolation in the period under study can be seen in Figure 2.

Figure 2. Tourists interpolation map in the studied statistical period

7. Spatial analysis of tourism in summer 2018

In tourism analysis with Moran statistic, the index value is 0.988. Therefore, tourism data in the summer of 2018 has a spatial autocorrelation and a cluster model. Because the more the coefficient tends to number 1, the higher the concentration. This statistic is based on this hypothesis:

Zero Hypothesis (H_0): There is no spatial clustering between the desired tourism values.

Opposite Hypothesis (H_1): There is a spatial clustering between the desired tourism values.

As can be seen from Table 5, since the calculated P-value is zero and the calculated Z value is very large, the null hypothesis can be rejected. The type of tourism data cluster model is shown in Figure 3.

Table 5. Summary results of spatial analysis of tourism in summer 2018

Moran's Index:	0.988860
Expected Index:	-0.000025
Variance:	0.000001
z-score:	996.866271
p-value:	0.000000
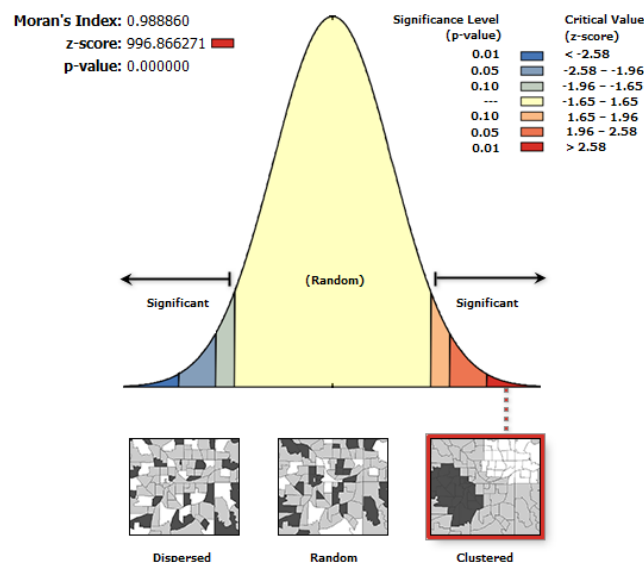
Figure 3. Spatial tourism correlation report of tourism in summer 2018

According to Figure 4, prepared with the help of Moran statistics, a place for tourism data in the summer of 2018, the results were obtained that tourism clusters with a 99% probability are observed which is scattered in parts of the north, northeast, south, and center of the country.
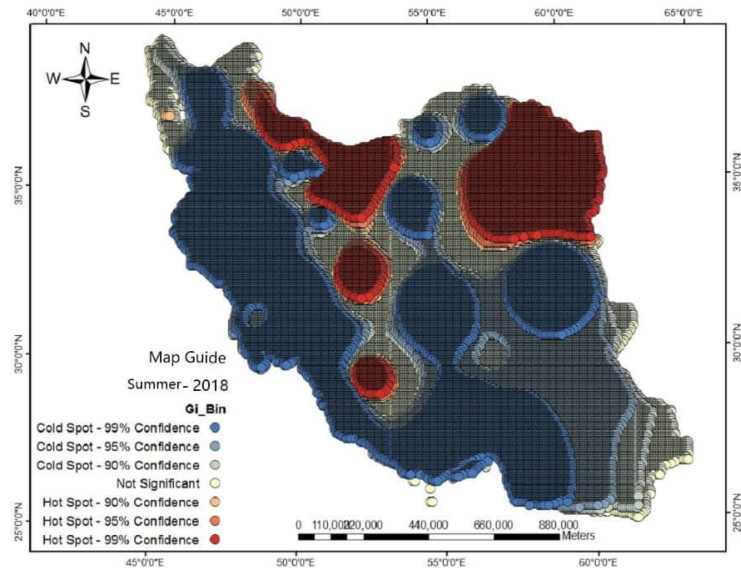
Figure 4. Spatial autocorrelation of tourism in summer 2018

The mentioned trend has been the same in all the studied years, the results of which are summarized in Table 6.

Table 6. Spatial analysis of summer tourism with a cluster mode during the years 2008 to 2018 in Iran

Month/ Year	Index	Regions
Summer 2008	0.991	North/Northeast/Northwest/Center
Summer 2009	0.990	North/Northeast/South/Centre
Summer 2010	0.989	North/Northeast/South/Center
Summer 2011	0.988	North/Northeast/South/Center
Summer 2012	0.984	North/Northeast/Southwest/South/Center
Summer 2013	0.987	North/Northeast/Northwest/Southeast/South/Center
Summer 2014	0.976	North/Northeast/South/Center
Summer 2015	0.988	North/Northeast/South/Center
Summer 2016	0.985	North/Northeast/South/Center
Summer 2017	0.990	North/Northeast/South/Center
Summer 2018	0.988	North/Northeast/South/Center

8. Incoming capital of foreign tourists

Today, tourism development has been considered by economic, governmental and private planners of all countries. Many countries are increasingly realizing, that they need to find new ways to increase their incomes to improve their economic situation. The development of the tourism industry is especially important for developing countries, which face problems such as unemployment, limited foreign exchange resources, and a single-product economy. In countries that face limited domestic resources for economic development, the use of foreign resources for investment and increase tourism revenues is essential (Mehnatfar, 2016). Figure 5 shows the inflow of foreign tourists. As it is clear from the map, most of the inflow capital is seen in the northern, northwestern, southern, southwestern parts and Tehran, Fars, Khorasan Razavi and Isfahan provinces.
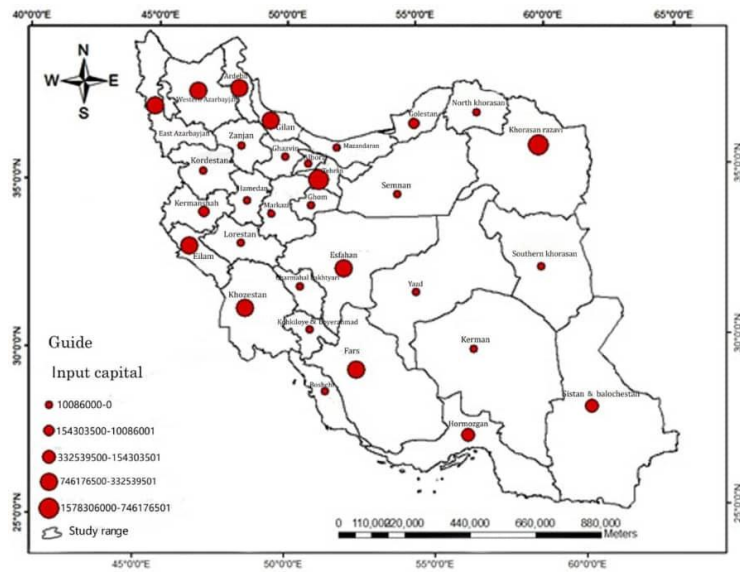
Figure 5. Incoming capital of foreign tourists

9. Conclusion

In this study, using spatial statistics in tourism, a set of exploratory data analysis methods were performed. Subsequently, the spatial correlation structure of tourism industry data in Iran was examined. The resulting model made it possible to explore and interpret the relationships of variables affecting the growth of the tourism industry by considering the correlations and relationships between different regions of Iran and the facilities related to this issue. This model also made it possible to predict the growth of the tourism industry according to the facilities and policies adopted for each region.

To study tourism clusters in all provinces of the country, first, the best method of tourism interpolation was determined, which showed that the reverse weighting method with a value of RMSE=0.74 is the best model for tourism zoning. Moran statistics and spatial correlation were used to determine the model of tourism clusters. The results of the tourism cluster model analysis indicate that tourism is a cluster in the statistical period of 2008-2018. The highest model of tourism clusters is related to the summer of 2008 (Moran Index=0.991) and the lowest pattern of tourism clusters is related to the summer of 2014 (Moran Index=0.976). Also, the results of the distribution of tourism direction in the provinces of the country in the statistical period of 2008-2018 showed that the predominant direction of tourism is with a slight change from northwest to southeast.

The present study has faced limitations such as lack of resources and information in the field of spatial statistics and lack of database and GIS layers connecting tourism. Based on the research findings, it is suggested that in future research for tourism studies, remote sensing and geographic information system and spatial statistics be used simultaneously. Also, local and applied indicators in the field of tourism that are specific to the desired geographical area, i.e indicators that are relevant in Iran, should be used. Besides, creating and launching tourism databases in the country to study tourism better, familiarize experts with the applications of spatial statistics in tourism and the use of spatial statistics software in tourism studies can be considered as other suggestions.

References

Ali Akbar Amin Beidokhti. "Tourism industry in Iran: capabilities, obstacles and solutions", In: *National Conference on Capabilities, Obstacles and Strategies for Tourism Development in Semnan Province*.

Ali Asghar Shalbafian, and Hamidreza Pourbrat. "Obstacles to tourism development in Iran (challenges and solutions)", In: *The First International Scientific-Strategic Conference on Tourism Development of the Islamic Republic of Iran*.

Arun, P., (2013). Spatial statistics and super-resolution mapping for precision agriculture using VHR Satellite Imagery, Thesis in agriculture master grade, Enscheda University, Nederland.

ASEAN tourism report. Produced by the Philippine Department of Tourism as Lead Coordinator for the ASEAN Tourism Strategic Plan, 2016-2025.

South Asia sustainable tourism report (2009). *South Asian Journal of Tourism and Heritage*, Vol. 2, No.1.

Behnam Morshedi, Hassan, Ahmadi, Dariush, Faraji Sabokbar, Hossein Ali, and Rezvani, Mohammad Reza, (2016). "Spatial zoning of tourism centers to determine the optimal areas of tourism services in Fars province", *Regional Planning Quarterly*, Vol. 6, No. 21, pp. 17-30.

Boley, B.B., Strzelecka, M., and Woosnam, K.M., (2018). "Resident perceptions of the economic benefits of tourism: Toward a common measure", *Journal of Hospitality & Tourism Research*, Vol. 42, No. 8, pp. 1295-1314.

Clive Morley, Jaume Rosselló, and Maria Santana-Gallego, (2014). "Gravity models for tourism demand: Theory and use", *Annals of Tourism Research*, Vol. 48, pp. 1–10.

Constantin, D.L., and Dardala, A.E., (2015). A spatial analysis of tourism activity in Romania.

Daniela Luminita Constantin, Adriana Elena Reveiu, 55th Congress of European Regional Science Association, August 25-29, 2015 Lisbon, Portugal.

Diakonidze, M., (2019). Development of tourism services and employment perspectives: A case study.

Ghaffari, Ramin, and Moradi, Mahmoud, Nickbakht, Davoud, (2011). "Leveling and planning of rural spatial tourism in the central district of Boyer-Ahmad city", *Quarterly Journal of Urban and Regional Studies and Research*, Vol. 3, No. 11, pp. 97-118.

Gareth, W.P., and Tomoko, M., (2015). Modern methodology and applications in spatial-temporal modeling, Springer Press.

Hossein Zarei Matin, Seyed Reza Seyed Javadin, Ali Rahimpour and Moslem Bagheri, Explaining the Problems of the Tourism Industry of the Islamic Republic, *Strategic Management Thought*, 6, Vol. 11, pp. 73-106.

Hamidreza Fartotak, and Sima Esfandiarpour Boroujeni. "A study of tourism industry development policies in iran using the system dynamics approach", *Journal of Public Policy Research*, Vol. 2, pp. 93-119.

Hassan Afrakhteh, and Mohammad Taghi Rahnamaei, (2016). "Analysis of spatial inequalities in the development of tourism resources (case study: Ardabil province)", *Journal of Tourism and Development*, Vol. 7, pp. 107-128.

Jadhav, P., (2020). "Tourism in Maratha Wada: Challenges and opportunities", *Our Heritage*, Vol. 68, No. 11, pp. 502-508.

Kalantari, Mohsen, and Malek, Marzieh, (2014). "Spatial analysis and leveling of tourism attractions and communication infrastructures and road network in desert areas of Iran (case study: Khor and

Biyabank County) ", *Quarterly Journal of Geographical Studies of Dry Areas*, Vol. 5, No. 17, pp. 53-70.

Khoshnevis, Yazdi, S., Homa Salehi, K., and Soheilzad, M., (2017). "The relationship between tourism, foreign direct investment, and economic growth: evidence from Iran", *Current Issues in Tourism*, Vol. 20, No. 1, pp. 15-26.

Lashkarizadeh, M., Keshmir, Z., Gashti, H.P., and Shahrivar, R.B., (2012). "Evaluation of the relationship between tourism industry and economic growth in Iran", *Asian Journal of Business and Management Sciences*, Vol. 1, No. 9, pp. 88-97.

Liu, A., and Wu, D.C., (2019). "Tourism productivity and economic growth", *Annals of Tourism Research*, Vol. 76, pp. 253-265.

Ling, Ruan, Ying Long, Ling, Zhan, Xiao Ling, Wu, (2016). "A geographic analysis of optimal signage location selection in scenic area", The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, Volume XLI-B2, 2016, XXIII ISPRS Congress, 12–19 July 2016, Prague, Czech Republic.

Masoumeh, Aghajani, Saeed, Farahanifard, Fatemeh, Ghorbani Ranjbari, and Mehdi, Mohammadian Tabaghi. "Tourism and its effective factors with a review of religious tourism (case study: Iran)", In: *The First International Conference on Tourism Development Strategies of the Islamic Republic of Iran*.

Maryam, Islahkonha, and Mohammad, Hossein Foroughi. "Pathology of tourism research in Iran", In: *The First International Conference on Tourism Development Strategies of the Islamic Republic of Iran*.

Mojtaba, Lotfifar, and Hossein, Yaghfouri (2012). "The role of security in tourism development (case Study: Chabahar)", In: *The first National Conference on Mokran Coastal Development and Maritime Authority of the Islamic Republic of Iran*.

Mohammadreza, Majidi. "Foreign tourism policy in Iran: Searching for the best model", *Quarterly Journal of Politics, Journal of the University of Law and Political Science*, pp. 272-257.

Mohsen, Kalantari and Marzieh, Malek (2014). "Spatial analysis and leveling of tourism attractions and communication infrastructure and road network in desert areas of Iran (case Study: Khor and Biabanak), *Geographical Studies of Arid Areas*, Year 5, Vol. 17, pp 53-70.

Morteza, Zarehpour, and Hadith, Vafadar, (2015). "Tourism, security, development (case study: Kerman), In: *National Conference on Tourism Culture and Urban Identity*.

Moslim, Bagheri, and Hassan, Zarei Matin. "Explaining strategies for promoting the tourism industry of the Islamic Republic of Iran", *Organizational Culture Management*, Vol. 3, pp 925-944.

Moran, P.A., (2002). "The interpretation of statistical maps", *Journal of the Royal Statistical Society, Series B (Methodological),* Vol. 10, No. 2, pp. 243-251.

Morley, C., Rosselló, J., and Santana-Gallego, M., (2014). "Gravity models for tourism demand: theory and use", *Annals of Tourism Research*, Vol. 48, pp. 1-10.

Naghmeh, Sahebi, Issa, Pourramazan, Mohammad, Baset Qureishi, and Teimur, Amar Haji Shirkia, "Economic pathology of tourism development in rural areas of langrud county", *Quarterly Journal of Economics, Space and Rural Development*, Vol. 3.

Nazarian, Asghar, Karimi, Bebraz, Roshani, Ahmad, (2009). "Evaluation of physical development of Shiraz city with an emphasis on natural factors", *Geographical Quarterly of Zagros Vision*, Vol. 1, No. 1, pp. 5-18.

Nguyen, V.H., and Funck, C., (2019). "Tourism's Contribution to an Equal Income Distribution: Perspectives from Local Enterprises", *Tourism Planning & Development*, Vol. 16, No. 6, pp. 637-656.

Nunkoo, R., Seetanah, B., Jaffur, Z.R.K., Moraghen, P.G.W., and Sannassee, R.V., (2020). "Tourism and economic growth: A meta-regression analysis", *Journal of Travel Research*, Vol. 59, No. 3, pp. 404-423.

Peters, G.W., and Matsui, T., (2015). *Modern methodology and applications in spatial-temporal modeling*, Springer.

Poudyal, A.R.U.N., (2013). *Spatial statistics and super resolution mapping for precision agriculture using VHR satellite imagery*, University of Twente Faculty of Geo-Information and Earth Observation (ITC).

Prakash, B., Kumar, V., and Gautam, R.K., (2020). "The relationship between tourism industry and economic growth in india: evidence from multivariate regression analysis", *Our Heritage*, *68*(30), 13002-13013.

Rein, Ahas, Anto, Aasa, Ular, Mark, Taavi, Pae, and Ain, Kull, (2007). "Seasonal tourism spaces in Estonia: Case study with mobile positioning data", *Tourism Management*, Vol. 28, pp. 898–910.

Reza, Mohseni. "Sustainable tourism in Iran: Functions, challenges, and strategies", *Journal of Geographical Space*, No. 28, pp. 139-171.

Romão, J., and Saito, H., (2017). "A spatial analysis on the determinants of tourism performance in Japanese prefectures", *Asia-Pacific Journal of Regional Science*, *1*(1), 243-264.

Safar, Ghaed Rahmati, and Naghmeh, Daneshmandi, (2018). "Analysis of spatial models of urban tourism (case study: tourism spaces in Isfahan)", *Human Geography Research*, Vol. 50, Vol. 4, pp. 945-961.

Samadi, Ali Hussein, Dehghan, Shabani, Zahra, Moradi, Kochi, Atefeh, (2014). "Spatial analysis of the effect of income distribution inequality on economic growth in Iran", *Journal of Economic Growth and Development Researches*, Vol. 5, No. 19, pp. 57-72.

Sánchez-Galiano, J.C., Martí-Ciriquián, P., and Fernández-Aracil, P., (2017). "Temporary population estimates of mass tourism destinations: The case of Benidorm", *Tourism Management*, Vol. 62, pp. 234-240.

Stankov, U., Armenski, T., Klauco, M., Pavluković, V., Cimbaljević, M., and Drakulić-Kovačević, N., (2017). "Spatial autocorrelation analysis of tourist arrivals using municipal data: A Serbian example", *Geographica Pannonica*, Vol. 21, No. 2, pp. 106-114.

Sustainable tourism indicators ecotourism encyclopedia (2001). First published May 1, research article.

Țîțu, M.A., Răulea, A.S., and Țîțu, Ș., (2016). "Measuring service quality in tourism industry", *Procedia-Social and Behavioral Sciences*, Vol. 221, pp. 294-301.

Tsai, Y.H., (2017). "Travel agency managers' perceptions of tourism industry employability", *Journal of Hospitality, Leisure, Sport & Tourism Education*, Vol. 20, pp. 122-133.

Vahed, Aghaei. "The Role of tourism in security development (case study: South Khorasan province)", In: *South Khorasan National Conference on Order and Security*.

Varesi, Hamid Reza, Mohammadi, Jamal, Shahivandi, Ahmad, (2008). "Locating urban green space using geographic information system (case study: Khorramabad city)", *Quarterly Journal of Geography and Regional Development*, Vol. 6, No. 10, pp. 83-103.

Wood, R.E., (2018). "Tourism, culture and the sociology of development", In: *Tourism in South-East Asia* (pp. 48-70), Routledge.

Yang, Y., and Wong, K.K., (2013). "Spatial distribution of tourist flows to China's cities", *Tourism Geographies*, Vol. 15, No. 2, pp. 338-363.

Yaser, Hakimdoost, and Ali, Mohammad Pourzeidi, (2016). "Spatial analysis of tourism using combined models in gis environment, case study: Ramsar county", *Regional Planning Quarterly*, Vol. 22.

Yu, C.P., Cole, S.T., and Chancellor, C., (2018). "Resident support for tourism development in rural midwestern (USA) communities: Perceived tourism impacts and community quality of life perspective", *Sustainability*, Vol. 10, No. 3, p. 802.

Zahra, Nikkhah Farkhani. "Analysis of Challenges and Strategies in the Field of Tourism", In: *The First International Conference on Tourism Development Strategies of the Islamic Republic of Iran*.