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Soft Computing implementation in Tourism Sector: A review

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Abstract

The Corona virus epidemic has had numerous detrimental repercussions on the tourism industry. Domestic production and trade have been impeded by the global epidemic and the mitigation efforts implemented when the disease broke out, according to the World Health Organization in particular. The current study looks at how neural networks and soft computing techniques can help provide accurate and effective predictions for the tourism industry, preventing future losses. The study will compare a number of strategies and procedures in order to determine the most successful technology in the tourism industry.

Keywords*:* covid-19; tourism industry; soft computing; neural network; review analysis

1. Introduction

Several studies have confirmed that one of the most important elements of successful tourism industry is knowing the occurrence of change and the mechanism of dealing with it through several factors related to behavior, environment and technology that interact with this field. In both the public and private sectors of the tourism sector, we find that stakeholders face a problem in anticipating the changes facing the tourism sector in a proactive manner (Mamula et al., 2019). Early knowledge of tourism problems, for example, the Corona pandemic, guarantees them to achieve the competitive advantage of their organizations (hotel, travel and tourism office, restaurant and other tourist facilities) and helps them maintain it.

Furthermore, tourism and travel have a vital role in the services industry globally (Abbas et al., 2021). Tourism is the backbone of the economy of many countries of the world, a large and always useful source of revenue and a means of foreign exchange (Kumar, 2020), and any factor that prevents travel can have a strong impact on the tourism industry (Yeh, 2021).

Oman's tourism infrastructure has been designed to encourage economic diversification, protect the country's culture, and contribute to environmental preservation. Work is also being done to turn this industry into a long-term economic and social sector that embodies the Sultanate's cultural history and the spirit of traditional hospitality. Oman's tourist industry also contributes significantly to its GDP. Given the tourism sector's significant contribution of 3% of the Sultanate's GDP, its tremendous growth potential is becoming increasingly crucial in attracting foreign investment and creating job opportunities for the country's citizens. According to the Oxford Business Group's (2015) estimate, tourism stakeholders aim for a value of $20 billion in the sector by 2040, intending to increase its contribution to 5.9% of the Sultanate's GDP (Unctad, 2018).

Until the globe was confronted with a pandemic in the twenty-first century, COVID-19 was one of the world's most important markets (Uğur et al., 2020). It has threatening life and health of millions of people around the globe (Baum et al., 2020), which caused to produced havoc worldwide (Maria et al., 2020) and impairment of travel (Adekunle et al., 2020).

The Omani Ministry of Heritage and Tourism reported that the Covid-19 pandemic caused direct damages to the Sultanate's tourism sector in the amount of half a billion Omani riyals until September 2020. It was underlined that the direct impact on the sector in terms of visa revenues, tourism products, tourist spending, and a tax is included in these losses. The government has taken a number of steps to mitigate the effects of the pandemic on the tourism

industry, including restarting the tourist visa application process. A recovery plan has also been developed, focusing on the recovery plan, the sector's safety. The long-term sustainability of human capital, particularly among Omani cadres, supports the local community, develops tourism programs, increases tourism communication and marketing, and supports investments in the sector with a package of programs and incentives. The Omani government declared in June 2021 that the payment of tourism fees on hotel establishments, totaling 4%, would be postponed until following year, after the commencement of the recovery of these facilities from the pandemic's effects (Al-Hasni Z, 2021).

Significant increases in the number of tourists appear mostly due to the rapid development of the social economy and the improvement of the standard of living of individuals. On the other hand, there were also setbacks due to various phenomena, including Covid-19, and from this point of view, there must be predictions for the tourism field. These forecasts must be accurate because of the great importance of this sector in contributing to the economy. Accurate predictions contribute to making good decisions (Claveria & Torra, 2014).

The approaching tourism influx has been predicted using a variety of soft computing techniques, including linear models and machine learning models. Soft computing is a set of powerful mathematical algorithms that aim to find solutions to complex real-life problems, tolerant of imprecision, uncertainty, partial truth, and approximations. (Yousif, J., 2015; Yousif & Abdalgader, 2022). However, for tourism influx prediction, any sort of deep neural network remains the most suited model undecided (Li & Cao, 2018). In this paper, different models of soft computing and neural networks mechanisms and methods of their application in the tourism field will be discussed.

2. The problem Statement

The Coronaviruses pandemic has had numerous detrimental repercussions on the tourism industry. According to the World Health Organization in particular, domestic production and trade have been impeded by the global epidemic and the mitigation efforts implemented when the disease broke out. Food prices rose in April 2020 due to border closures and panic buying, but have since fallen since the gates reopened in early June. As of March 15, 2020, Oman has taken these steps by suspending all tourist visas. As a result, Oman's occupancy rates have declined significantly, with several hotels reporting large drops in rates. The tourism industry has suffered environmental losses as a result of the epidemic, while specialists have yet to provide exact data on the pandemic's economic impact on the Omani tourism business (Al-Hasni Z, 2021).

Oman must devise methods to combat the pandemic while also reviving its tourism industry. As a result, the study challenge entails identifying and selecting certain strategies that can assist Oman in achieving positive results in the

tourism sector during the uncertain era of the coronavirus pandemic (Al-Hasni Z, 2021). The current study looks at how neural networks and soft computing techniques can help provide accurate and effective predictions for the tourism industry, preventing future losses. The study will compare a number of strategies and procedures in order to determine the most successful technology in the tourism industry.

3. Related Work

The soft computing techniques including Artificial Neural Networks (ANN), Fuzzy Logic models, and genetic algorithms are widely used for simulating and predicating the behavior of complex system in different fields, such as engineering (Yousif et al., 2020; Yousif et al., 2011, Yousif J, 2016), and in the medical sector (Fekihal, & Yousif, 2012; Yousif et al., 2021). In a study by (Jaipuria et al., 2021), the researchers discussed the aspects of the impact of the Corona virus on the tourism sector in India. Where, researchers classified it as one of the human disasters that greatly affected people and companies around the world. The study indicated that in 2020, there was a significant decrease in the number of tourists heading to India. Artificial Neural Networks (ANN) were employed by the researchers to estimate the number of international tourists visiting India. The study analyzed monthly data from the ANN model to come up with proposals based on the predicted arrival of international tourists and FEE, as well as the quantity of foreign tourists and currency rates. According to the analysts, there was a 68 percent decline in the number of tourists visiting India in March 2020 when compared to prior months. One of the most popular proposals was that instead of adding more resources and boosting investment, tourism professionals (stakeholders) should think about making the current resource more efficient and effective.

From January 2004 to December 2013, artificial neural networks models were used in a study by (Claveria & Torra, 2014) to model and forecast tourism demand in Mozambique. As a metric of tourism demand, the number of overnight hotel stays was used. A variety of independent variables were examined in the model's input, including the Consumer Price Index, Gross Domestic Product, and Outbound Tourism Market Exchange Rates. The best model obtained has a Pearson correlation coefficient of 0.696 and a Mean Absolute Percentage Error of 6.5 percent. The study found that the model is accurate and can be proven effective in forecasting economic agents in order to know the future growth of this sector of activity, as it is critical for stakeholders to provide products, services, infrastructure, and hotel establishments that are appropriate for their level of tourism demand.

A study by (Claveria et al., 2014,b) studied the impacts of data preprocessing on the prediction performance of neural network models were investigated. Three artificial neural network techniques were employed to anticipate

tourist demand: multi-layered cognition, radial basis function, and Elman neural networks. The network is designed using the Multiple Input Multiple Output (MIMO) approach. Using official statistical data for international visitor demand in Catalonia, the researchers evaluated forecasts using four input vector processing methods for networks: levels, growth rates, seasonally adjusted levels, and seasonally adjusted growth rates (Spain). Incorporating seasonally adjusted data improves the net business's prediction performance, highlighting the need of unbalancing time series when using neural networks for forecasting. When using seasonal data, the researchers discovered that working directly with seasonally adjusted levels increases neural network performance.

A study by (Karahuta et al., 2017) looked at how artificial neural networks can help with administrative decision-making and how they can be used in hotel administration. According to the study, tourism development is extremely vital today and plays a critical part in the economy's growth. The suggested model allows for balanced classification and forecasting utilizing financial and non-financial indicators, as well as the use of artificial intelligence, to achieve a high degree of efficacy and accuracy in assessing the financial and non-financial health of enterprises in this industry. The study concluded that the proposed model enhances the manager's ability to comprehend complex circumstances and make better decisions for future development. For in-depth investigation, it also brings a new management and scientific point of view. It can also aid in the development of tourism by implementing current management approaches based on scientific principles, allowing science and practice to be better integrated.

A study by (Li & Cao, 2018) discussed that the accurate tourism flow projections are one of the most difficult challenges in the smart tourism system, especially in the short term. On the other hand, current models such as ARMA are largely based on linear models and are unable to represent the stochastic and non-linear nature of tourism flows. This study uses long-term memory neural network (LSTM) methods to predict tourism flow, and experiments show that LSTM methods outperform the automated regression moving average model (ARIMA) and back propagation neural network methods (BPNN). For the first time, LSTM NN has been utilized to forecast tourism flow.

A study by (Mamula et al., 2019) provide a comprehensive overview of the importance of Artificial Intelligence, namely Artificial Neural Networks (ANN), as well as its application and implementation in the hotel business. Technological advancements, growing business trends, globalization, and changes in tourism behavior, according to the report, necessitate new techniques to analyze and anticipate business performance. The ability to gather, analyze, and interpret vast volumes of data is one of the main advantages of applying ANN in the hotel business. Furthermore, ANN can develop advanced business models and projections automatically. Human labor can be transferred to more

productive activities thanks to these characteristics. ANN's expanded in-depth quantitative analysis and digitization help the hotel industry improve its business performance dramatically. The study concludes that the potential of ANN as a data analysis and forecasting tool for improving business performance. Innovative technologies are becoming more essential since they deliver better data analysis and forecasting results than any other way of quantitative forecasting.

In a study by (Damanik & Setyohadi, 2021) discussed that Covid-19 outbreak, which began in China, has now spread to all continents, including Indonesia, according to the experts. In February 2020, Indonesia became the first country to be infected with the Covid-19 virus, resulting in a big online crowd, mainly on Twitter. Everyone is allowed to express their opinions on Covid-19, resulting in a diverse spectrum of viewpoints, not just positive or neutral, but also unfavorable. Social networking is now used for a wide range of objectives, including making new friends and acquaintances. The purpose of this research was to create a sentiment analysis approach for the COVID-19 epidemic on Twitter that was as accurate and efficient as possible. This study used the Naive Polynomial Bayes method, which is one of the approaches for sentiment analysis and text mining with the support vector machine. The results of the Support Vector Machine and the Naive Bayes Multinomial method used for sentiment analysis are valuable for collecting information and knowledge about Covid-19. The Indonesian people's view of Covid-19 is better and neutral than negative, according to the research, with an average of 40% positive and neutral and 20% unfavorable. The Support Vector Machine technique is the best model in this study for estimating the average value of F-1, with a score of 93 percent. There isn't much of a difference with the 92 percent Naive Bayes Multinomial method.

In a study by (Claveria et al., 2014) the researchers looked at the performance of several artificial neural network methods to estimate tourist demand. A multilayer perceptron, a diagonal basis function, and an Elman network were all put through a prediction accuracy test by the researchers. They also put the memory effect to the test by repeating the experiment with a different topology and different delays. The study used tourists from all around the world who were visiting Catalonia. When no additional built-in delays are present, the authors found that multi-layered and radial basis function models beat Elman networks, with the radial basis function design producing the best forecasts. These findings suggest that when dynamic networks are employed for prediction, there may be instability. They also discovered that with bigger memory, prediction performance for longer horizons improved, implying that increasing dimensions is important for longer-term prediction.

According to a study by (Hu, 2017), effective forecasting of foreign tourist numbers is necessary for any government to conduct sustainable tourism development plans. For dealing with tourism time-series data, gray-Markov models based on a gray model with a first-order differential equation and one variable, GM (1, 1), could be effective. To improve the prediction accuracy of Gray-Markov models, this study includes soft computing strategies for estimating an adjustable range of the projected value and creating the individual state borders of the Markov chain. A new residual value is obtained by adding the transition probability matrices with different stages. The proposed gray forecast model was used to forecast international travelers using historical annual data from the Taiwan Tourism Bureau and the China National Tourism Administration. The results of the experiments show that the proposed Gray Markov prediction model outperforms the other Gray Markov models that were examined.

A study by (Srivastava & Srivastav, 2020) offered an intelligent information system with the goal of arranging the selected tourist spots in Varanasi in the most efficient manner possible. This system serves as a referral system for travelers, tour operators, and tourism-related administrative authorities, as envisioned. The proposed model in this study is the fuzzy solutions (fuzzy positive ideal solution (FPIS) and fuzzy negative ideal solution (FNIS). The study concludes by the result that tourists, tour operators, and tourism-related administrative authorities will be able to use this system as a recommendation system.

A study by focused on the application of dimensionality reduction and aggregation techniques to examine data linked to tourism company operations. A case study has been found that looks at the elements that are most important to the combined operations of small and medium-sized businesses in Ecuador's tourism sector. The data used in this analysis dates from 2015, which is the latest official data accessible. To simplify the complexity of multidimensional spaces, principal component analysis (PCA) is used as a dimensionality reduction method. The k-mean clustering technique is also used to evaluate the data set, discovering separate sets based on comparable properties. The report provides data on the operations of tourism enterprises in Ecuador prior to the COVID-19 outbreak as a tool for "strategic decision-making," with the goal of revitalizing the industry through data-driven decisions.

In a study by (Hong et al., 2011), according to the researchers, artificial neural networks are attracting attention to tourism demand estimates because of their nonlinear mapping capabilities. Unlike most traditional neural network models, which use the principle of experimental risk reduction to reduce training error, vector regression support (SVR) reduces the upper bound of generalization error using the concept of structural risk reduction. A CGA model based on the chaotic optimization method was provided by the researchers. GAs was utilized to overcome premature

local optimization in picking three parameters of the SVR model. GAs takes advantage of the internal unpredictability of chaotic iterations to overcome premature local optimization. Finally, the tourism results from this study reveal that the SVRCGA model outperforms other approaches.

A study by (Fenza et al., 2011) the researchers believe that in the tourism industry, it is beneficial to offer appropriate combinations of appealing destinations, attractive events, and so on. This paper describes a context-aware recommendation system that tries to provide tourists with relevant points of interest (POIs). The study's strategy is heavily reliant on the synergy of soft computing and data mining approaches. Soft computing approaches are primarily used to support the activity of unsupervised users and classify locations of interest, according to the researchers. Data mining techniques, on the other hand, are used to derive rules capable of matching user profile attributes and context to a qualified collection of suggested points of interest. Finally, the study's empirical findings reveal the performance in terms of recommendation accuracy.

A study by (Nilashi et al., 2016), the goal of this study is to increase the accuracy of recommendations for tourism recommendation systems using cooperative filtering approaches. The C fuzzy algorithm is used to construct a recommendation system for user-based and item-based models in this study. In both user- and object-based models, two measures of similarity, Pearson correlation and cosine, are employed in the similarity computations for users and items. In comparison to the item-based recommendation model with MAE = 0.73, the testing findings revealed that the user-based recommendation model utilizing the fuzzy C algorithm greatly increases the accuracy of recommendation prediction with MAE = 0.72. The proposed recommendation system will be a promising recommendation approach for the item recommendation task in tourism since it increases the accuracy of collaborative filtering techniques.

A study by (Chen et al., 2015) the researchers relied heavily on support vector (SVR) regression to solve nonlinear time-series prediction difficulties, but they came into complications with parameter selection and seasonal slope influence. The AGA-SSVR method, which combines the SVR model with the Adaptive Genetic Algorithm (AGA) and seasonal index modification, provides a strategy for predicting daily holiday tourist flow. In addition, daily holiday visitor flow data for Huangshan Mountain in China is used as a numerical example to validate the proposed model's performance from 2008 to 2012. According to the testing results, the AGA-SSVR model is more efficient and accurate than other alternative models such as AGA-SVR and Back Propagation Neural Network (BPNN).

In a study by (Srivastava et al., 2021), according to the researchers, is to develop a model of an intelligent information system that would identify qualitative data as an object based on sustainability criteria in order to define the local government's policy on budget assistance for entrepreneurial activity. The simulation of the "smart rating system" for the creation of the local budget was based on activity in community tourism (CBT). The system in the study evaluates four sustainability aspects based on the relevance of local government action using nine criteria, the ambiguous values of which are determined using expert assessments under six language variables. Using standardized answers from India as an example, a simulation of future budgeting trends was built for use in domestic tourism. The researchers concluded that the rating system model would be effective for service-oriented activities where customer perceptions are a critical necessity for development.

In a study by (Atsalakis et al., 2014) the researchers used this study to answer issues like: How have forecasting methodologies evolved over time, how accurate are they, and how can they be used to assess tourism demand? The adaptive neural fuzzy inference system was used to make predictions (ANFIS). Eighty percent of the data was used to train the prediction models, while the remaining twenty percent was used to evaluate them. The performance of the model is determined by computing several well-known statistical errors. The accuracy of the ANFIS model is compared to two conventional prediction models: the autoregressive (AR) and autoregressive motion average (ARMA) models. Despite the fact that the data gathered was insufficient, the results were satisfactory. Other time series models were outperformed by the ANFIS model. Finally, in estimating tourism demand, the accuracy of the ANFIS model forecasts was found to be critical.

A study by (Vyklyuk, 2014) the researchers highlighted the significance of prophecy in the tourism industry and the need to develop an effective prophecy tool. The fragmentation approach was created to anticipate socio-economic processes such as city and settlement development, green tourism, infrastructure, population division by interests and activities, and recreation. All of this is based on the fuzzy attraction potential field's fractal crystal formation procedures. At the end, the study demonstrated the efficacy of the suggested model and its ability to forecast the geometric shape as well as the internal organization of settlements, as well as the development of tourism strategies.

A study by (Yu, H., 2021) said that to develop a neural network for tourism demand prediction, the suggested system uses a combination of neural networks and FPGA convolution. Traditional statistical methodologies, predictive models, and soft computing techniques for artificial intelligence are among the most advanced tourist research methods in the country. Please improve tourist research and modeling approaches that provide high accuracy

predictions for artificial intelligence methods. The results reveal that traditional statistical approaches and methods can enhance prediction accuracy when compared to, including, including the traditional FPGA convolution core of the neural network. This method is a superior option since it provides a more accurate model for estimating travel demand. Create and compare classifiers based on convolutional neural networks (CNN) and long-term memory networks (LTMN) (LSTM). These classifiers were trained and evaluated using data from hotels on the island of Tenerife. According to our findings, the most accurate and resilient estimators are those based on LSTM recurrent neural networks.

The difficulty of gathering heterogeneous data from different websites with opinions about high-end hotels into a database was examined in a study by (Carrasco & Villar, 2012). The researchers proposed a semantic translation-based strategy as a mechanism for obtaining linguistic summary. This model's properties include the management of heterogeneous input data (including natural language), the production of high-accuracy and interpretable linguistic results, and the use of unbalanced linguistic term sets described by trapezoidal membership functions to define primary linguistic terms. The data analyst can use this information to do a range of analysis with high accuracy and ease of linguistic interpretation.

4. Results

4.1. Critical Analysis

The key information supplied in the literature survey about soft computing approaches employed in the tourism sector for the goal of predicting demand for improved future performance is summarized in Table 1. Different types of neural networks were implemented to predict the demand such as Fuzzy algorithms and techniques, Mathematical models, SVR, ANFIS, Multilayer perceiver, Gray Prediction Model, PCA and K-mean and SVM which are tasted and evaluated.

Table 1: Competition of different soft computing techniques applied in tourism sector of related researches work

Author	Method\Technique	Dataset	Result
Herrera et al., 2021	PCA and K-mean	In Ecuador, small and medium-sized businesses in the tourism sector collaborate.	The model is effective in studying the information of the operations of tourism companies and effective in providing support for the development of strategic decisions to revitalize the tourism sector.

Jaipuria et al., 2021	Artificial Neural Networks (ANN)		In March 2020, when compared to previous months, it was found that there was a 68% decrease in the number of tourists heading to India.
Damanik & Setyohadi, 2021	Support Vector Machine (SVM)	Twitter users for social networking in Indonesia	With a score of 93 percent, the Support Vector Machine approach is the best model in this investigation. With the 92 percent Naive Bayes Multinomial approach, there isn't much of a difference.
Srivastava et al., 2021	Fuzzy logic	India societal tourism data.	The rating system model would be effective for service-oriented activities where customer perceptions are a critical necessity for development.
Yu, H., 2021	FPGA convolution neural network	China Tourism	This method is a superior option since it provides a more accurate model for estimating travel demand.
Srivastava & Srivastav, 2020	Fuzzy Solutions	Varanasi tourism destinations.	Tourists, tour operators, and tourism-related administrative authorities will be able to use this system as a recommendation system.
Mamula et al. 2019	A thorough review of the existing literature was conducted.	Hotels industry	ANN as a data analysis and forecasting tool for improving business performance
Li & Cao, 2018	Long-Short Term Memory neural network	Small wild goose visits data provided by Xi'an museum	In comparison to other neural network models, the LSTMs model was found to be simpler and more successful in the study.
Karahuta et al, 2017	Artificial Neural Network	Hotel Services (Slovakia)	Enhances the manager's ability to comprehend complex circumstances and make better decisions for future development
Hu, Y, 2017	Gray Prediction Model	China National Tourism Administration and Taiwan Tourism Bureau	The proposed model functioned well with given GA parameters, such as population size, generation number, crossover, and mutation parameters.
Nilashi et al., 2016	Fuzzy Algorithm	TripAdvisor Website visitors	Effectiveness of the suggested model for offline data training and online application of the user-based approach.
Claveria et al, 2016	A multilayer neural network.	Hotels and Restaurants	The technique used is high effective in forecasting economic agents.

Chen et al., 2015	Support Vector (SVR) Regression	Daily holiday tourist flow data for Huangshan Mountain in China	The AGA-SSVR model is more efficient and accurate than other alternative models such as AGA-SVR and Back propagation Neural Network, according to the experimental results (BPNN).
Claveria & Torra, 2014,	Multilayer perceiver, diagonal basis function and Elman network.	Tourists coming to Catalonia	When dynamic networks are utilized for predicting, there is instability. The prediction ability for longer horizons improves with higher memory, suggesting the necessity of increasing dimensions for long-term prediction.
Claveria et al., 2014,	Multi-layered cognition, Radial basis function, Elman neural networks.	Tourists in Mozambique	Working directly with seasonally adjusted levels improves the performance of neural networks when employing seasonal data.
Vyklyuk Y, 2014	Fuzzy Logic mathematical tools	Previous experimental dataset	The study demonstrated the efficacy of the suggested model and its ability to forecast the geometric shape as well as the internal organization of settlements, and the development of tourism strategies.
Atsalakis et al., 2014	Neural Fuzzy Inference System (ANFIS)	Monthly tourist arrivals in Greece by air, train, sea, and road from January 1996 to September 2011.	The accuracy of the ANFIS model predictions was found to be critical in projecting tourism demand.
Carrasco & Villar, 2012	Fuzzy Model based semantic translation	Luxury hotels in Granada (Spain)	The data analyst can use this information to execute a variety of analyses with ease of linguistic interpretation and high accuracy.
Hong et al., 2011	Support Vector Regression (SVR)	Tourism Data	The empirical results of this study's tourism results show that the SVRCGA model outperforms other techniques.
Fenza et al., 2011	Mathematical model	20 users and 200 POI's	The study's empirical findings reveal the performance in terms of recommendation accuracy.

4.2. Evaluation and Discussion

This study compares the performance of several soft computing techniques and artificial neural networks for forecasting tourist demand, as investigated in numerous studies and researches around the world. The current study examined 20 studies with varying levels of prediction accuracy.

Previous research looked at a variety of data relating to the operations of tourism businesses. One of them employed soft computing to analyze data, focusing on dimensionality reduction as well as clustering approaches. To accomplish so, a case study has been developed that examines the most important variables in the combined operations of small and medium-sized firms in the tourism sector (Herrera et al., 2021). To simplify the complexity of multidimensional spaces, principal component analysis (PCA) is used as a dimensionality reduction method. The k-mean clustering technique is also used to evaluate the data set, discovering separate sets based on comparable properties (Herrera et al., 2021). Due to the efficiency of soft computing and its methodologies in the accuracy of forecasts and the formulation of plans based on reliable data, this study is one of the most recent studies undertaken to evaluate the influence of Covid-19 on the tourism sector using neural networks.

Furthermore, according to the majority of those studies, the number of tourists is rising in lockstep with the rapid growth of the social economy and the development of people's living conditions. Because of the industry's significant economic significance, accurate tourism forecasting is critical. (Fenza et al., 2011). In order to avoid risk in decision-making, planning is strongly relied on accurate forecasts to a large extent. For decades, effective tourism flow modeling has remained a challenge because to its stochastic and non-linear nature (Li & Cao, 2018).

The model proposed by (Li & Cao, 2018) said that LSTM NN was used to forecast tourism flow. The researchers compared the prediction performance of ARIMA, BPNN, and two LSTM models, finding that LSTMs are simpler and more effective than the others. The researchers emphasized that the LSTM should be tested with more hidden states, and that the variable length of the temporal sequence input could aid the LSTM in automatically selecting the best time period.

5. Discussion

The actual potential of artificial neural networks in tourist analysis and prediction has yet to be researched and exploited, according to the research highlighted. In this view, the value of the practical application is undervalued. The current study introduced several prior studies, and the application potential of neural networks in the hotel business was mentioned. Still, there were also some outstanding concerns linked to artificial neural networks. The traditional methods for analyzing the hotel business are prone to several flaws, necessitating the development of models and methodologies that may overcome these flaws. In this regard, research has demonstrated that implementing new inventive methods, such as artificial neural networks, can address several crucial challenges those older methods cannot handle. Artificial neural networks promise multi-heterogeneous data processing because they

can deal with inaccurate data and infer knowledge even when data is lost. Due to its complex data, the tourist and hotel industry cannot be investigated as a homogeneous sector. As a result, artificial neural networks can help future decision-making processes understand tourist and hotel determinants more correctly as part of artificial intelligence. In both a theoretical and practical sense, this research highlights the primary benefits of using artificial neural networks, addresses some of the challenges linked with them, and opens up new areas for their study.

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