Develop Tourism Demand Forecasting Model using Artificial Neural Network

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Abstract

Tourism demand plays a significant role in development of tourism sector. As Malaysia is a multiracial country with a rich heritage, it consists of 13 states and three federal territories. Malaysia is presenting an average 26.13 millions of tourist arrivals with the average RM69.84 billions of tourist receipts. The performance of Malaysia tourism sector is in prospect with the improvement of every field which is related to tourism sector. Therefore, to boost the improvement and development, the researcher proposes to identify the best forecasting technique for forecast the tourism demand and choose Sabah as the research place in this study because of its motley of cultures. On top of that, Sabah tourism is one of the major contributors to Sabah's economy. There are two forecasting techniques will be applied which are ANN approach. The results will be compared for purpose to identify the best forecasting technique for forecast the tourism demand of Sabah, Malaysia. Besides, the interview conducted in order to comprehend the reasons that influence tourist arrivals in Sabah. Based on the results of the study, the researcher concluded that the Artificial Neural Network is the best forecasting technique for forecast the number of tourist arrivals in Sabah for the future. This information provided an outline for develop tourism policy to increase tourism demand and Sabah's economic status. From this study, it will effectively give a boost to growth the nation's economy indirectly

Keywords

Tourism demand, Forecasting Model, ANN, Sabah

1. Introduction

Tourism is one of the major business sectors and it is representing 7% of the total world exports. Meanwhile, tourism is also a growing market (Höpken et al., 2017). The tourism industry prospers on information (Benckendorff et al., 2014). Aruna (2013) says that "tourism has proven to be a catalyst for development and these dynamics have turned the industry into a key driver for economic growth". There is a lot of effort that worked by the Ministry of Tourism and Culture Malaysia as well as the local citizens in order to boost the tourism sector and nation culture to the worldwide. The government is trying to put greater effort in order to boost the tourism field by increasing the yield per tourist to attract the higher yield segment (Aruna, 2013). The

main element that has to concern and take note is the tourism demand of the country. In order to comply the effort, the Tourist Development Corporation of Malaysia (TDC) was founded on 10 August 1972. It was an organization that under the prior Ministry of Trade and Industry.

A few years later, on 20 May 1987, with the establishing of the Ministry of Culture, Arts and Tourism, TDC was relocated to this new ministry; and soon, it through the Malaysia Tourism Promotion Board Act 1992 to become the Malaysia Tourism Promotion Board (MTPM). It is fully focusing on promoting Malaysia nationally and globally (Tourism Malaysia, 2017).

In addition, tourism demand forecasting or predicting is a well-developed research area. Indeed, it has been many studies in the tourism and hospitality field (Li et al., 2016). There are a few forecast techniques that can be selected to adopt into the prediction. Among the forecast techniques are time series, econometric models, artificial intelligence approaches, and hybrid methods (Li et al., 2016). In this study, the researcher will use to explore the forecasts for the tourism demand in order to develop the tourism demand forecasting model as well as to compare the forecasting outcomes that developed by using the different methods. The two methods that will be used in this study are autoregressive integrated moving average and artificial neural network. The intention of this study is to explore the most accurate model for forecasting the tourism demand in Sabah. In this regard, this will assist to boost the economic status in Sabah in the near future.

2. Research Methodology

Artificial Neural Network (ANN)

Artificial neural networks consist the simplest networks with no hidden layers as well as equivalent to linear regression. there is a linear regression with four predictors in the neural network version. The “weights” as the coefficients which attached to the predictors. The prediction is received through a linear combination of the inputs. the weights are chosen in the neural network framework by applying a “learning algorithm” that keep down a “cost function” such as MSE.

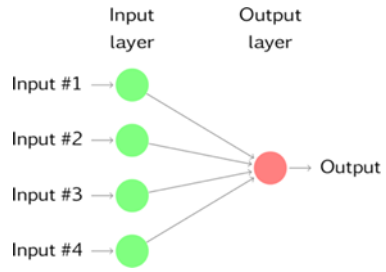

Figure 1 A simple neural network equivalent to a linear regression

Source: (Rob & George , 2013)

The multilayer feed-forward network involved an intermediate layer with hidden neurons. Therefore, the neural network becomes non-linear. The multilayer feed-forward network where each layer of nodes obtains the inputs from previous layers. The principle of the theory is the outputs of nodes in one layer are the inputs for the next layer. Whereas the inputs to each node are combined by using a weighted linear combination. Thus, the results are then modified by a nonlinear neuron j.

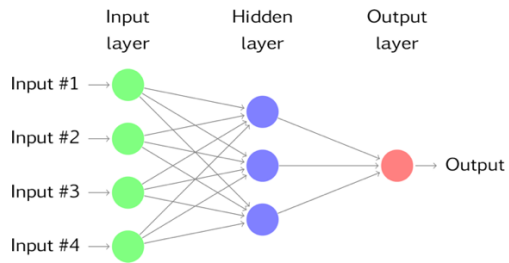

Figure 2. A neural network with four inputs and one hidden layer with three hidden neurons

Source: (Rob & George , 2013)

The inputs into hidden neuron j in Figure 3 above are linearly combined to give

$$z_j = b_j + \sum_{i=1}^{4} w_{i_j} x_i$$

Whereas the hidden layer, this is the modified using nonlinear function that used in this process.

$$s(z) = \frac{1}{1+e^{-z}}$$

In order to give the inputs to next layer, the modified applying nonlinear function. This computation will help to reduce the effect of extreme input values (Rob & George , 2013).

3. Results and Discussions

Data editing and coding

Sequel to data collection, the data was classified, coded and grouped in batches related to the dates for the preparing of the data for analysis. It is imperative to ensure the editing and coding of the data in order to certify omission, completeness and consistency of the data. Hence, any missing data has been considered as missing values. Coding (either considered pre-coding or post coding) was used to assign numbers for each data, which allow for easy transfer of the data to MATLAB. The coding procedure began with the establishing of a data file in Excel. The data editing procedures were undertaken to detect any errors in data entry, and out-of-range values were corrected by referring to the original data. The essence of this procedure is to enable a clean data could usable for the subsequent analysis.

Results of China Tourists

Results of China Using Artificial Neural Network (ANN)

The researcher chose the data of tourists from China to develop this model dated January 2013 to December 2017 yielding 60 months. The researcher also used Artificial Neural Network to forecast the tourists vsitors in from China to Malaysia. However, the output layer of the ANN is a linear weighted sum. Thus, it is much faster and easier than to run the network as well as it has better result on nonlinear mapping.The model below shows the actual as well as the forecasted number of tourist arrivals from China to Malaysia by using ANN.

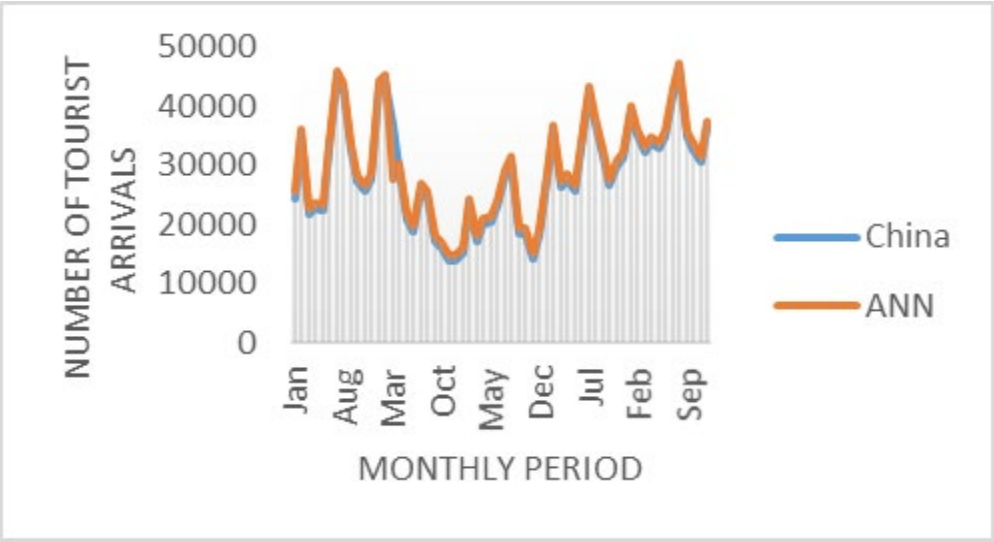

Figure 3. The actual and forecasted movement of tourist arrivals from China to Sabah in the period of 2013 until 2017 using ANN approach

In the above model, the researcher used the number of tourist arrivals from China to Malaysia to forecast the future tourist arrivals to Malaysia in advance. According to the above result, the test performance was 41.3 while the train performance was 8.8 respectively.

Results of Norway Tourists

Results of Norway Tourist Using Artificial Neural Network (ANN)

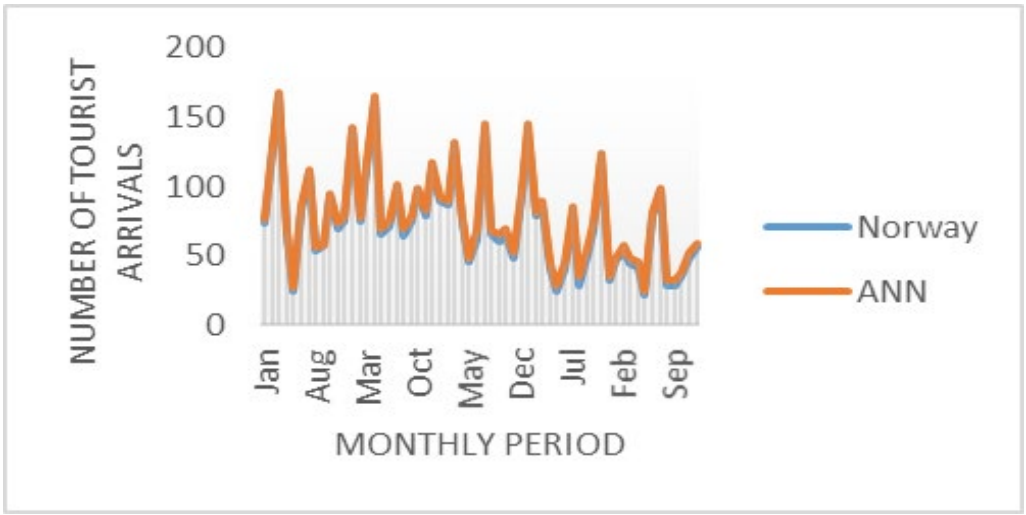

Figure 4. The actual and forecasted movement of tourist arrivals from Norway to Sabah in the period of 2013 until 2017 using ANN approach

In the above model, the researcher used the data of tourist arrivals from Norway to Malaysia to forecast the future tourists to Malaysia. Axis-Y illustrated the number of tourist arrivals from Norway and the axis-X illustrated the monthly period started from the January of 2013 to December of 2017 which consist of 60 months. According to the above result, the test performance was 38.4 while the train performance was 9.5 respectively.

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Biographies

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