Predicting The Number Of Passengers On CV. MAKMUR Using The Backpropagation Method

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Abstract

Often, the number of passengers up and down at the CV company. Backpropagation is one solution to the problem. The number of passengers can be predicted so that the company CV. Prosperous have a large income. Based on the research, it was stated that MSE at the time of training predicted the number of passengers on CV. Makmur Medan was 0.000999. Based on the coefficient value in the training process, it can be concluded that ANN can predict the number of passengers well.

Keywords: Prediction, Number of Passengers, Backpropagation Method

INTRODUCTION

Rapid economic development must now be balanced with transportation and communication tools that can support the high mobility of economic actors who demand efficient transportation and communication services. Makmur is one of the companies engaged in land transportation in Medan. Bus transportation that is safer and more comfortable for passengers is being carried out to determine the extent of passenger satisfaction and demand for buses during peak and non-peak hours[1]. There is a very strong influence between the components involved in the implementation of urban transportation, namely passengers, operators, and the government[2]. Land transportation is a modern means of transportation and can contribute the most to meeting the needs of the community. Increasing the number of passengers, the company must be responsive to meeting their needs and increase the number of fleets[3]. Makmur is a company engaged in the transportation of passengers between cities within the province, where the transportation routes include the cities of Medan and Pekanbaru. Makmur already has many bus fleet units classified as Super executive, Royal AC, Patas, Non AC, Ecolet (Economy Toilet), and Economy non-toilet. The types of vehicles used are Mercedes Benz and Chevrolet. This bus is equipped with TV, video, snacks, AC, and toilet facilities. The provision of service and satisfaction for every passenger who gets on from the station is given a snack and every passenger's belongings are in the baggage. A name tag is made which is useful for identifying goods/bags or suitcases so that there is no wrong drop off or people are confused.

Predict the number of passengers Makmur is very necessary because of the surge in passengers that may occur during the holiday period, and can prevent a large number of passengers not being transported by the fleet by providing the number of passengers. The implementation process goes through 3 stages, namely data preprocessing, network

training, and network testing[4]. Forecasting well. An Artificial Neural Network is a method whose working principle is adapted from a mathematical model[5]. Jaringan syaraf tiruan merupakan model yang meniru cara kerja jaringan neural biologis [6]. Data to predict the number of passengers can be determined by artificial neural networks[7]. Forecasting is a branch of science that predicts events that may occur in the future based on events that have occurred in the past[8]. What has been known previously through a forecasting system that has been designed using the backpropagation method?[9]. The forecasting method used is using an artificial neural network (ANN) with the Backpropagation method[10].

METHODS

Passenger Number Prediction

Tariff is one of the most significant variables that will be considered by the community when deciding whether to utilise public transportation or private transportation services. The rates that may be utilised are either uniform or graded, depending on the situation. Furthermore, tariff development may be carried out in order to encourage people to utilise public transportation more often. Changes to the basic price and ticket purchasing mechanism may be used to determine the kind of fare development that will be implemented. The purpose of this research is to identify what kind of tariff development may be used to encourage people to utilise public transportation. It is possible to observe tariff elasticity and variations in tariff payment methods in the literature study that was performed in order to identify the kinds of development plans that might be used.

Artificial Neural Network

An Artificial Neural Network (ANN) is an information processing system that has characteristics resembling a biological neural network (ANN). An Artificial Neural Network was created as a generalization of a mathematical model of human cognition. Ticket prices are varied and relatively affordable for all levels of society. Many choices of destinations and departure schedules are available[11]. The Artificial Neural Network (ANN) method is an information processing paradigm inspired by the biological nervous system, such as information processing in the human brain[12].

Backpropagation method

The Backpropagation Neural Network Method is an excellent method for the pattern recognition process considering its ability to adapt network conditions to the data provided by the learning process[13]. The Backpropagation Neural Network Method is an excellent method for the pattern recognition process considering its ability to adapt network conditions to the data provided by the learning process[14]. Backpropagation is where the Backpropagation model has a hidden layer between input and output[15].

Backpropagation process algorithm :

1. Retrieve data
2. The First Iteration To The End Of The Training Data
3. Training and Determining Network Parameters
4. Calculation Error Output
5. The Process of Testing the Backpropagation Algorithm
6. Results.

RESULTS & DISCUSSION

Testing Data with Matlab

In conducting training and testing the results of the prediction of the number of passengers CV. Makmur Medan, then the data processing will also be tested on a computerized system. Previously, the data to be tested must be divided into two parts, where the first part is for training data and the second part is for test data.

Table 1: Testing Data for Predicting the Number of Passengers

Jan	Feb	Mar	Apr	Mei	Juni	Juli	Augus	Sep	Okt	Nov	Des	Target
0.48	0.32	0.16	0.3	0.3	0.48	0.80	0.48	0.16	0.16	0.32	0.64	0.40
0.32	0.16	0.3	0.3	0.48	0.80	0.48	0.16	0.16	0.32	0.64	0.40	0.20
0.16	0.3	0.3	0.48	0.80	0.48	0.16	0.16	0.32	0.64	0.40	0.20	0.20
0.3	0.3	0.48	0.80	0.48	0.16	0.16	0.32	0.64	0.40	0.20	0.20	0.40
0.3	0.48	0.80	0.48	0.16	0.16	0.32	0.64	0.40	0.20	0.20	0.4	0.20
0.48	0.80	0.48	0.16	0.16	0.32	0.64	0.40	0.20	0.20	0.4	0.20	0.40
0.80	0.48	0.16	0.16	0.32	0.64	0.40	0.20	0.20	0.4	0.20	0.40	0.20
0.48	0.16	0.16	0.32	0.64	0.40	0.20	0.20	0.4	0.20	0.40	0.20	0.4
0.16	0.16	0.32	0.64	0.40	0.20	0.20	0.4	0.20	0.40	0.20	0.4	0.48
0.16	0.32	0.64	0.40	0.20	0.20	0.4	0.20	0.40	0.20	0.40	0.48	0.48
0.32	0.64	0.40	0.20	0.20	0.4	0.20	0.40	0.20	0.4	0.48	0.48	0.3
0.64	0.40	0.20	0.20	0.4	0.20	0.40	0.20	0.4	0.4	0.48	0.3	0.9

Matlab (matrix laboratory) is a software specially designed as a solution to work on problems related to mathematics..

Figure 1: Command Window

Artificial Neural Networks with the backpropagation method are formed by generalizing the training and testing rules in the Windrow-Hooff model by adding a hidden layer. The standard backpropagation method uses a gradient descent algorithm. Variations on the standard model are done by replacing the algorithm with another algorithm. The experimental results show that an artificial neural network with the backpropagation method that has been trained and tested properly will provide a reasonable output if given input that is similar to the pattern used for training and testing. This nature of generalization makes training and testing more efficient because it doesn't need to be done on all the data.

Data Training Using Matlab

After the training data and test data are prepared, programming is carried out to conduct network training. The artificial neural network architecture used is 6-3-1, which means it consists of 6 input values (data on the number of passengers for 12 months), 3 neurons in

the hidden layer, and 1 output value, namely data on the number of passengers for the following month.

Figure 2: Backpropagation Network Using Matlab

In making ANN with MATLAB, it provides values to influence the training process, namely:

```
>>net.trainParam.epochs=2000;
```

This parameter is used to determine the maximum number of training epochs.

```
>>net.trainParam.goal=0.001;
```

This parameter is used to determine the MSE value limit so that the iteration is stopped. The iteration will be terminated if the MSE limit is specified in net.trainParam.goal or the number of epochs is specified in net.trainParam.epochs.

```
>>net.trainParam.Lr=0.1;
```

This parameter is used to determine the rate of understanding (= learning rate). Default = 0.1. The greater the value, the faster the testing process. However, if the value is too large, then the algorithm becomes unstable and reaches the local minimum point.

```
>>net.trainParam.show=20;
```

This parameter is used to display the MSE change frequency (default: every 25 epochs)

To see the results issued by the network, use the following command:

```
,Perf]=sim(net,p,[],[],t)
```

In this training epoch, the error goal (MSE) is 0.000956 and in this test epoch the error goal (MSE) of 0.00098656 was achieved in the 2000 epoch, as shown in the image below:

Figure 3: Training Epoch 2000. Error Goal (MSE) Value

Then the iteration is carried out again so that the minimum error is determined in this training epoch. The error goal (MSE) is 0.000999. In this test epoch, the error goal (MSE) of 0.0008657 is achieved at the 2500 epoch as shown in the picture below.

Figure 4: Training Epoch 2500. Error Goal (MSE) Value

Then the iteration is carried out again. The minimum error is determined in this training epoch. The error goal (MSE) is 0.000999. In this test epoch, the error goal (MSE) of 0.00089939 is achieved at the 2500 epoch as shown in the picture below.

Figure 5: Epoch 3000. Error Goal (MSE) Training

Figure 6: Testing The Epoch Goal (MSE) Epoch 3000. Value

Of the three different epoch models used by the author in the process of training an artificial neural network system with the Backpropagation Method using MATLAB 6.1 with a sample data of the number of passengers. The comparison data from each model can be seen as follows:

Table 2: Comparison of MSE and Three Epochs

	Epoch 2000	Epoch 2500	Epoch 3000
MSE	0,000997	0,000999	0,000999

It can be concluded that with different iteration processes (epochs) during training, with epoch=2500, MSE achievement during training predicts the number of passengers in CV. Makmur Medan is 0.000999. Based on the coefficient value of 0.000999, it is explained that the Epoch 2500 is the best.

CONCLUSION

Based on the discussion and evaluation of the previous chapters, it can be concluded that the data collection process on CV. Makmur Medan still uses manuals. The coefficient value in the training process. It can be concluded that ANN can predict the number of passengers well. The number of passengers prediction training on CV. Prosperous Medan is 0.000999

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