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Television Rating Point Prediction Using Neural Network

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Abstract

Advertising of product in television is an important aspect in order to deal with an high competitive market. However, Its difficult for media stations to quote proper rates for the featured time slots. The basis for rate quotation should also be trustworthy for the customers purchasing the time slots. Therefore , media stations use services of advertising firms to handle their advertising campaigns. This system helps to make prediction on Television Rating Points (TRP), useful for determining the viewership of a television program, in individual time slot. This prediction can help businesses to select slots with the television rating points and advertising budgets which suit their requirements. That can be useful and helpful for advertising businesses and customers to make their business decision on reliable data and increase their profit and audience reach.

Keywords: TRP (Television Rating Points), ANN (Artificial Neural Network).

1. Introduction

Television Rating Points is a criterion that indicates the popularity of a channel or a program broadcasted at a particular time. [1]The main challenge in marketing campaign is to achieve maximum Television Rating Points and maximum audience reach for their advertisements within a specified advertising budget. This system helps advertisement businesses by predicting the Television Rating Points for upcoming season through advertising data of previous seasons. This is achieved through artificial neural networks. The system collects historical and other related data influencing the television rating points. It trains the data collected and obtains a prediction for TRP through the system. This prediction then can be used by media stations and customers for their business analysis and negotiations.

2. Artificial Neural Networks (ANNs)

Artificial Neural Networks (ANN) are a family of statistical learning models inspired by biological neural networks and are used to estimate or approximate functions that can depend on a large number of inputs. [2]The feedforward neural network was the first and simplest type of artificial neural network devised. In this network, the information moves in only one direction, forward, from the input nodes, through the hidden nodes and to the output nodes. There are no cycles or loops in the network.

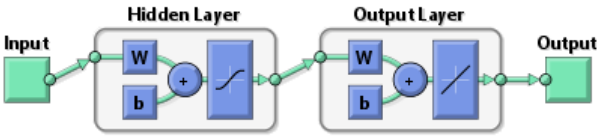

Fig. 1 Feed-forward network

Feed-forward network with sigmoid hidden neurons and linear output neurons (newfit), can fit multi-dimensional mapping problems arbitrarily well, given consistent data and enough neurons in its hidden layer.

The network will be trained with Levenberg-Marquardt backpropagation algorithm (trainlm)Feed Forward Back Propagation Algorithm neural network is used in the system for training data and obtaining an output which specifies predicted TRP.

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3. System Overview

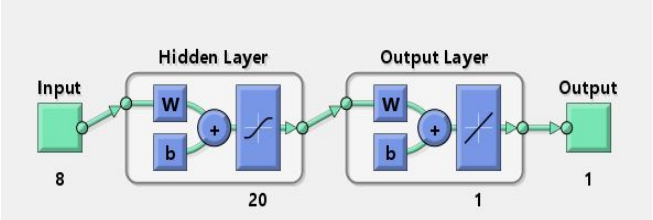

Fig. 2 Feed-forward network

The above diagram shows the overview of this system. There are 8 inputs provided to the neural network which produce about about 20 hidden layers. The hidden layers perform the data training and calculate prediction. These 20 hidden layers give one output layer which gives one output of the input variables. The attributes used for inputs in the system are-
1.Year (Year of airing w.r.t TRP)
2.Week number(52 weeks in a year).
3.Time Slot
4.Serial Name
5.Event
6.Festival
7.New Serial
8. Exhaustion factor
Year, Week number, Time Slot, Serial Name are regular attributes in the input which are used to distinguish the inputs. Event, Festival, New Serial, Exhaustion factor are attributes which affect the TRP due to external factors.

4. Implementation steps

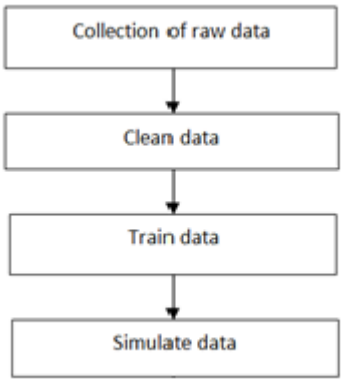

Fig. 3 Implementation Steps

Implementation has been divided into 4 steps.

4.1 Collection of raw data

Collection of raw data represents collection of TRP data of the channel with its individual time slots. The data may not be used directly as inputs to the application.
4. Simulate Data: Data is being simulated for prediction.
5. Predict data and Output: Predicted data is being represented in recognizable format in output.

4.2 Clean Data

MATLAB does not accept string values. Hence, the data is represented in acceptable format for the input..
The input has been numbered and accordingly recognized at the output.
MS Excel has been used to store data for input and output for the system.

4.3 Train Data

Inputs are trained through neural network training in MATLAB training tool 'nntool' using feed forward back propagation algorithm. Data training calculates the error between desired output of data (desired TRP) and obtained output (predicted TRP) for the historical data. The process through which minimum error rate is obtained for historical data is used to train the data for prediction of TRP for upcoming week.

For training of data, variable 'Input' and 'Target' are initialized. Variable 'Input' contains the cleaned input data and Target contains the historical data (TRP) for the particular week.
The parameters used for training are:
epoch- Number of iterations for training
time
goal- Performance goal
max_fail- Maximum validation failures
mem_reduc-Factor to use for memory/speed tradeoff
min_grad- Minimum performance gradient

The trained data is assigned to a variable. This variable represents the training neural network. There are three important parameters used for neural network are-
Training- These are presented to the network during training, and the network is adjusted according to its error. This is set to 70%.
Validation- These are used to measure network generalization, and to halt training when generalization stops improving. This is set to 15%.

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Testing- These have no effect on training and so provide an independent measure of network performance during and after training. This is set to 15%.
From total 936 samples, 656 have been used for training, 140 for validation, 140 for testing.

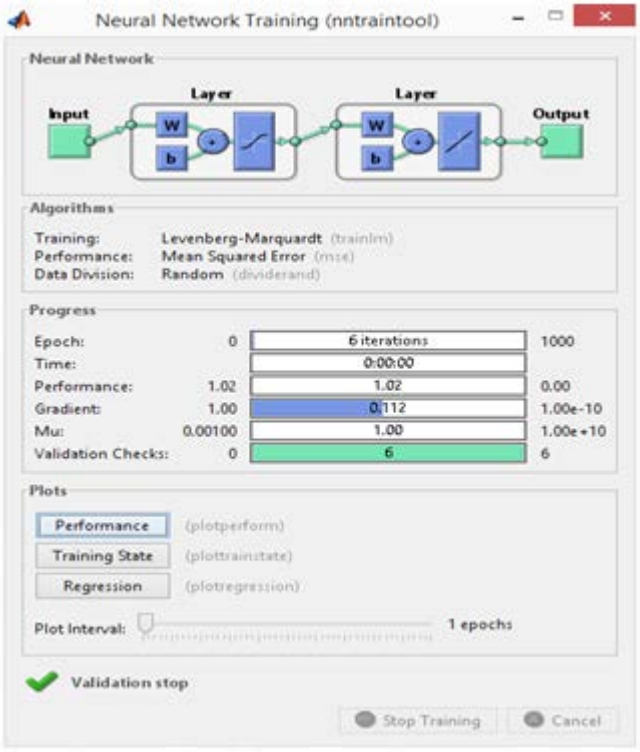

Fig. 4 Neural Network Training Tool

4.4 Simulate Data

The trained data is now simulated for an output to the system. The user provides the necessary conditions for prediction (Week and Year) and the simulated data is now processed through the network to be stored as sample data. Predicted data is derived directly from this sample data. The derived data (Predicted TRP) is now generated as the output for the system.

5. Result & Analysis

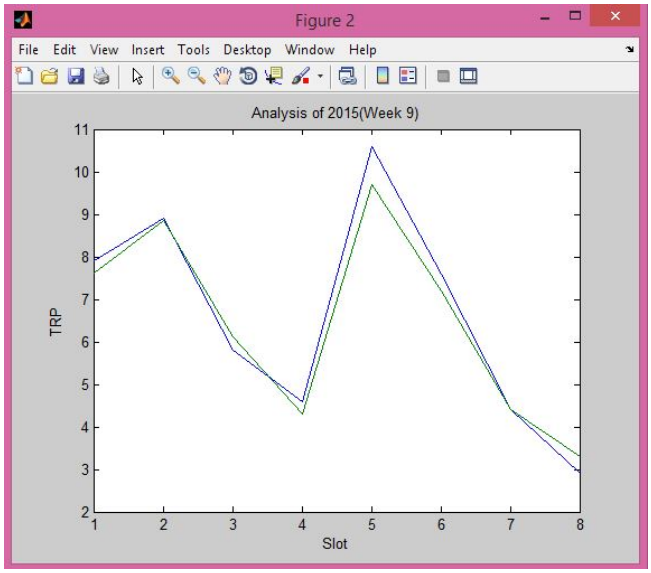

Fig. 5 Analysis of 2015(week 9)

The graph shows two lines with Blue line representing the actual TRP and green line representing the predicted TRP obtained through the application.
The Prediction is quite error-free as represented in the graph and the same hidden layers are to be used for predicting the data for upcoming season.

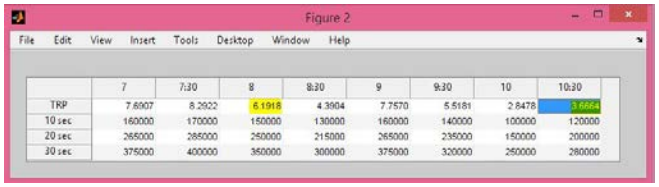

Fig. 6 Predicted TRP (Week no.9)

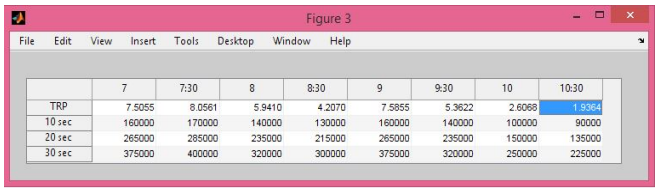

Fig. 7 Predicted TRP (Week no.10)

Observing Fig 6 and Fig 7 and analyzing the TRP, we observe two case studies.

Observation 1: For timing slot 10:30 pm TRP was 3.6664 for week number 9 whereas it dropped drastically to 1.9364 in the following week. Reasons for drastic drop in TRP was the completion of a TV serial from a renowned Bollywood director Ashutosh Gowariker

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'Everest' on week 9 and a new TV serial 'Tere Sheher Mein' was introduced in the respective time slot in week 10.

Observation 2: For timing slot 8 pm TRP was 6.1918 for week number 9 whereas it dropped to 5.9410 in the following week. Reasons for this drop in TRP was the start of sporting event IPL from week number 10. However this drop is not as drastic as the one in case study 1 because the viewer base of Star Plus for time slot 8 pm is largely comprised of ladies and Introduction of a sporting event does not affect the TRP drastically.

6. CONCLUSION

In this paper, we have presented a new way of business model for media business by prediction of Television Rating Points through neural networks. This helps in negotiating for business using a reliable parameter (Predicted TRP). The basis for prediction of TRP is scalable. You can include 'n' number of factors which directly influence TRP prediction in the future and the system does not have limitations in its functioning.

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