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Implementation of Neural Network in Cost Factors of E-Advertisements

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ABSTRACT
E-Advertisements have made possible to allow marketers for approaching target segments in the most measurable, interactive and more essentially, cost-effective ways. However, Neural Network is a forecasting tool for dynamic and changing market environments. A Strong advantage of neural networks is that a properly trained network can be considered experts with regard to the particular output project for which it was designed to examine.

This paper gives brief view about various e-advertisement Payment trends. Various sector wise e-advertisement related data from 2008 to 2013 have been collected from IAB (Internet Advertisement Bureau) and applied the Back Propagation technique of Neural Network for predicting ratio of cost models in E-advertisements. Effective use of data mining will ear mark of E-advertisement in various industries like consumer service, retail, auto, travel, computing, media, financial service, telecommunication etc.

Keywords
E-Advertisements, Neural Networks, Price Models

1. INTRODUCTION
Online advertising has grown exponentially since 1994. While advertising on the Internet recognizes no geographic boundaries, technology is already available to help marketers focus only on specific markets and target segments. Cost decisions (i.e. budget allocations), copy decisions (i.e. what message to use), and media decisions (i.e. what media to employ) are three major decision areas for advertising. Cost efficiency is one of the most crucial aspects of any form of advertising on the Net. The advertiser is always looking at the ways of stretching his money by getting the most out of it and more importantly, this object warrants the minimizing of all forms of wastage. In this paper, the main emphasis is given on cost factors of e-advertisements.[1] The cost can be calculated in terms of –

(a) Price per thousand of users who see the banner of advertisement (cost per Mille, CPM); Advertisers pay for exposure of their message to a specific audience.

(b) Price per order, Performance based Model advertising is based on each time an order is transacted.

(c) Combination of a and b both, Hybrid Model[2]

A Neural Network can be trained for executing a particular function in various fields, including pattern recognition, identification, classification, speech, vision, and control systems The network is adjusted by adjusting the values of the weights between elements. It is based on a comparison of the output and the target, until the network output matches the target. Many such input/target pairs are needed to train a network. It is trained from the historical data to discover hidden dependencies and able to use them for predicting into future.[3]

Neural Network fall under the wider class of Adaptive system which learns from data samples to self-organize internal parameters using an learning algorithm. Learning algorithms may or may not use a teaching input in which case they are supervised or unsupervised.[4] The advantage of the usage of neural networks for prediction is that they are able to learn from examples only and that after their learning is finished, they are able to catch hidden and strongly non-linear dependencies, even when there is a significant noise in the training set. The disadvantage is that NNs can learn the dependency valid in a certain period only. The error of prediction cannot be generally estimated.[5]

2. DESIGNING ARITIFICAL NEURAL NETWORK MODEL
The data analysis may be performed by neural networks. There is one neural network model used in this research: backpropagation networks. It provides a computationally efficient method for changing weight in a feed forward network, with differentiable activation function units. The training of a network by backpropagation involves three stages: the feedforward of the input training pattern, the calculation and backpropagation of the associated error and adjustment of the weight.[6] There are three major steps in the neural network: Preprocessing, Architecture, and Postprocessing. [7]

In *preprocessing*, information are collected that could be used as the inputs and outputs of neural networks. These data are first normalized or scaled for reducing the fluctuation and noise.

In *architecture*, a variety of neural network models are built that could be used to capture the relationships between the data of inputs and outputs.

In *postprocessing*, different strategies are applied to the forecasting results to maximize the capability of the neural network prediction.

2.1 Designing ANN models
Designing ANN models follows a number of systemic procedures. In general, there are five basics steps: (1) collecting data, (2) preprocessing data, (3) building the network, (4) train, and (5) test performance of model.[8]

2.1.1 Data collection

Collecting and preparing sample data is the first step in designing ANN models. As we have collected International data as shown in Table 1 from Interactive Advertisement Bureau (IAB) that is International Authorized organization. Through the reports of these organizations, data has been collected from 2008 to 2013. [9] to [14]

Table 1: E-Advertisement Pricing Model Details from 2008 to 2013

	CPM	Performance	Hybrid
2008	39	57	4
2009	37	59	4
2010	33	62	5
2011	31	65	4
2012	32	66	2
2013	33	65	2

* Source: IAB (Interactive Advertisement Bureau) Revenue Reports 2008 to 2013

2.1.2 Data pre-processing

After data collection, three data preprocessing procedures are conducted to train the ANNs more efficiently. These procedures are: (1) solve the problem of missing data, (2) normalize data (3) randomize data.[15] The missing data are replaced by the average of neighboring values. Normalization procedure is generally a good practice before presenting the input data to the network, since mixing variables with large magnitudes. [16]

2.1.3 Building the network

At this stage, we identifies the number of hidden layers, neurons in each layer, transfer function in each layer, training function, weight/bias learning function and performance function. [17]

In this network, off-line Learning methods are used by collecting all the given patterns together to determine weights. [18]

2.1.4 Training the network

When training multilayer networks, firstly the data is divided into three subsets. The first subset is the training set, which is used for computing the gradient and updating the network weights and biases. The second subset is the validation set. The error on the validation set is examined during the training process. The validation error normally decreases during the initial phase of training, as does the training set error. However, when the network begins to overfit the data, the error on the validation set typically starts to increase. The network weights and biases are accumulated at the minimum of the validation set error.[19]

During the training process, the weights are adjusted for making the actual outputs (predicated) that is close to the target (measured) outputs of the network [20]. In this study, 6-years data period from 2008 to 2013 are used for training.

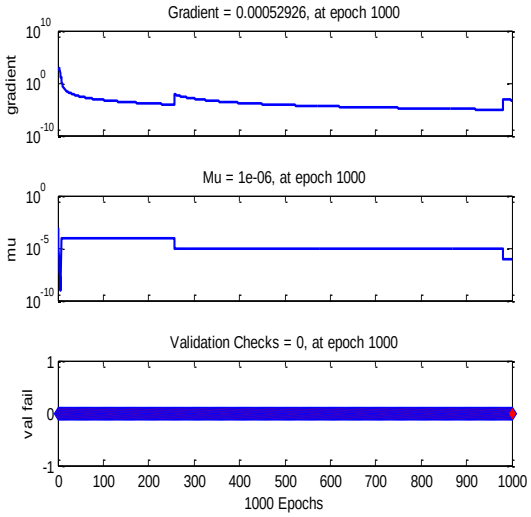

Fig 1: Training State

2.1.5 Testing the network

The next step is to test the performance of the developed model. At this stage unseen data are exposed to the model. To calculate the performance of the developed ANN models quantitatively and verify whether there is any underlying trend in performance of ANN models. [21]

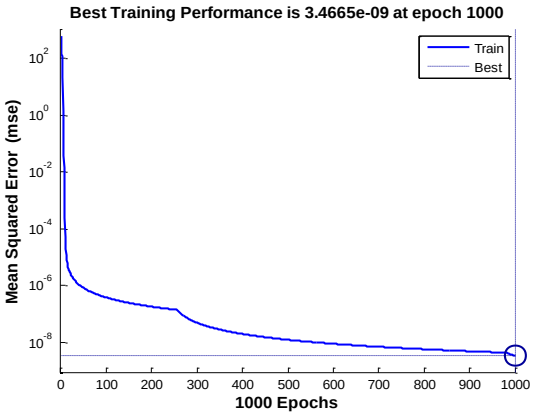

Fig-2 Performance State

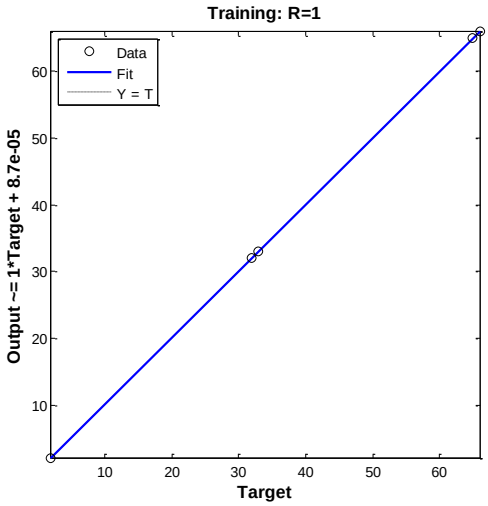

Fig-3 Regression State

These regression figures are similar to those of the command-line solution. Here are the regression plots for the output with respect to training, validation, and test data and the output tracks the targets very well.[22]

Ad_ct_outputs=[32 65.9999 2.0001; 33 65 2.0001]

The calculated output shows that the maximum preferred Pricing model is Performance based (approx 66%) and Cost per Mille Model is less preferred than Performance based Model (approx 32%) and Hybrid Model is using approximately negligible (approx 2%). [23]

3. CONCLUSION

Neural Network Technology has seen many application areas in business especially when the problem domain involves classification, recognition and predictions. With the capabilities of neural networks, hidden trends and relations among data which are previously unseen can be deduced. Neural networks can be used for prediction with various levels of success.[24] The advantage of it includes automatic learning of dependencies only from measured data.

It is observed that Performance-based pricing model has gained more interest and chose in comparison with various other Cost Models and Hybrid Model is very less preferred by advertisers.

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