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New Ways for The Compression of Data Using Artificial Neural Network for Transmission

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Abstract

The transmission of information across communication methods is a fashionable method in respect time and information measure. information compression is sometimes obtained by work a shorter image for a creative image within the supply information, that ought to contain a similar info however with a smaller illustration long. the aim of this paper is to indicate that neural networks is also promising tools for information compression while not loss of data. we have a tendency to mix neural nets, standard statistical compression ways like Huffman coding and arithmetic coding. This paper uses Artificial Neural Network (ANN) based mostly techniques offer new ways that for the compression of information at the transmitter and decompression at the receiver with safer manner. during this paper, security of the info will be obtained on the communication path because it isn't in its original type on the communication line.

Key Words*: Artificial Neural Network (ANN), statistical compression method, Back-propagation (BP), Hidden layer architecture, Weight matrix etc.*

1. Introduction

This paper presents a way to compress character image kind information exploitation neural network. one learning rate is employed throughout the coaching method in standard neural network, however here we have a tendency to planned a separate learning rate for every output somatic cell, relying upon the sign of gift error gradient and their distinction.

We area unit taking the output of hidden layer because the compressed output of the info and this is often send to the remote location together with the load matrix of hidden to output layer. This weight matrix acts as a key to decrypt the compressed information. clearly {the information|theknowledge|the information} regarding the amount of hidden somatic cell ought to be notable to reconstruct the initial data. we have a tendency to introduce a model that produces higher compression than common Limpel-Ziv compressors (zip, gzip, compress), and is competitive in time, space, and compression quantitative relation with PPM and Burrows-Wheeler algorithms, presently the simplest notable.

2. Secure Compression of knowledge and Transmission

The transmission of knowledge across communication methods is a fashionable method in respect time and information measure. information compression provides Associate in Nursing choice for decrease the amount of characters or bits in transmission. it's become more and more importance of most laptop networks, because the volume of information/data traffic has begun to exceed their full capability for transmission. Artificial Neural Network (ANN) based mostly techniques offer new ways that for

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the compression of knowledge at the transmitter and decompression at the receiver with safer manner. the protection of the info will be obtained on the communication path because it isn't in its original type on the communication line. the aim of this paper is to gift application of Artificial Neural network in information compression with distinctive secret writing for transmission.

3. Neural Network

Neural network consists of a bunch or teams of with chemicals connected or functionally associated neurons. one neuron may be connected to several alternative neurons and therefore the total variety of neurons is also extensive. A hierarchical neural network model is solely model and has some layers of somatic cells and each neuron links neurons in mere next layer. Every neuron has value

$$y = \sum x_i W_i M = \sum a_k N_k$$

where a_k(k=1,2,B) is value from neuron in previous layer and N_k(i=1,2,B) is weight which mean strength value of links. In the artificial intelligence field, artificial neural networks have been applied successfully to speech recognition, image analysis and adaptive control, in order to construct software agents (in computer and video games) or autonomous robots. Most of the currently employed artificial neural networks for artificial intelligence are based on statistical estimation, optimization and control theory.

The cognitive modeling field involves the physical or mathematical modeling of the behavior of neural systems; ranging from the individual neural level (e.g. modeling the spike response curves of neurons to a stimulus), through the neural cluster level to the complete organism.

In hierarchical neural network model, when the number of neurons of the first and the last are same and the middle layer is fewer than others and learning with output data identity with input data

3.1 Detail architecture of neural network.

We are compressing bitmap of characters having 9 rows and 7 columns. Bit map is made like this

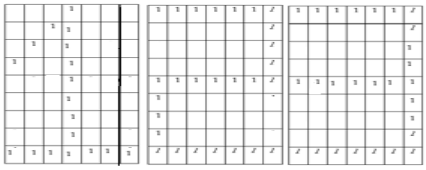

Fig1: matrix in row manner

We give input whole matrix in a row manner. The input neuron of the neural network is 63 (because 9 x 7 =63) after lots of experiment we came to conclusion about using 25 neurons in the hidden layer. We can use any no. of neuron from 25 to 63 in the hidden layer. But at least we have to use 25 in the hidden layer. And at last 63 neurons in the output layer. The algorithm is as follows:-

Step 1 :- We make an identical mapping of the input to the output. Then we store the hidden layer to the output layer weight matrix. The weight training in this layer is done with the variable alpha for each output neuron.

Step 2 :- We have trained 26 letters of capital A-Z. Then the weight matrix 25 x 63 is stored in the remote location.

Step 3 :- Once again we feed the required bitmap-characters to the trained neural Network once and stored the output of the hidden layer in a file.

This is the file which we have to send to the remote location through internet or network. The compression ratio we get is around 25/63.We can vary the no. of hidden layer to get our required compression ratio. But our experience suggests that anything above 25 neuron should be used to get reasonable recovery of the original data. If we use 30 or more than that number of neuron in the hidden layer it would be better in terms of recovery.

Step 4 :- We interchange the 1st 10 column with the last 10 column, to ensure more encryption measure. And also we add the sign (no of char) to every element of the hidden layer

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output matrix to make it more difficult to understand.

Step 5 :- In the remote location the structure is of 25 x 63. The weights of the output are the weights

Step 6 :- The calculated during training purpose inputs to the neurons are those generated during the compression of the Bitmap characters. At first it is being read in a matrix. It will form a matrix of Order N x 63 where N is the number of characters compressed. We then follow the reverse procedure to get back the original data.

- Subtract sign(N) from every element
- Interchange 1st 10 column with last 10 column
- Finally we get the input to be given to the neural network in the reconstruction process.

Step 7 :- In a single iteration we can reconstruct the desired bitmap characters.

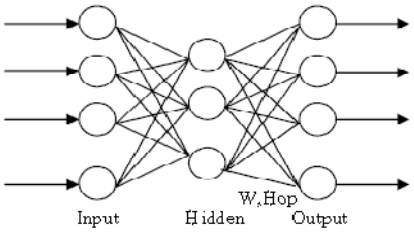

Fig2. *Hidden layer architecture*

We are storing hidden layer weight in the remote location and hidden layer output along with the necessary security conversion is stored in the file which is the desired compressed data.

3.2 information Compression Mistreatment Artificial Neural network

Artificial Neural Networks are applied to several issues, and have incontestable their superiority over classical ways once managing crying or incomplete information. Neural networks appear to be suited to the current explicit operate, as they need a capability to preprocess input patterns to provide easier patterns with fewer elements. This Compressed data (stored in an exceedingly hidden layer) preserves the total data obtained from the external setting. The compressed options could then exit the network into the external setting in their original uncompressed type.

3.3 Back-propagation Neural Network

The Back-propagation (BP) algorithmic program has been one in all the foremost palmy neural network algorithms applied to the matter of information compression. the information compression downside within the case of the BP algorithmic program is exhibit as associate encoder downside. the information or image to be compressed passes through the input layer of the network, and so after through a really tiny variety of hidden neurons. it's within the hidden layer that the compressed options of the image square measure keep, thus the smaller the quantity of hidden neurons, the upper the compression quantitative relation. The output layer after outputs the decompressed image to the external setting. it's expected that the input and output information square measure identical or terribly shut. If the image to be compressed is incredibly massive, this could generally cause issue in coaching, because the input to the network becomes terribly massive. thus within the case of huge pictures, they'll be diminished into smaller, sub-images. every sub-image could then be accustomed train a private ANN. Experiments are conducted that have with success compressed and decompressed character ikon information with spectacular compression ratios, and tiny or no loss of information.

4. Network security tool for information encryption/decryption

The downside of security of data is major problem in data and communication system existed since information has been managed. However, as analysis and invention give new technology for data management systems become additional and additional powerful tool for handling this downside the huge use of the communication networks for varied functions within the last 2 decades has exhibit new serious security threats and inflated the potential injury that violations

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could cause. currently each trade and institute are increasing their work on network environments, they're changing into additional vital Issue to secure data on network. each public and company sectors over ever these days rely on the data network. these days several network security tools square measure mistreatment for transmission of data over network however all that tools aren't offer 100% security Advances in artificial neural networks (ANNs) give effective solutions to the current downside ANNs. the protection downside is taken into account here because the downside of keeping communications over the network non-public. Thus, protection of data is needed against doable violations that may compromise its secrecy (or confidentiality). Secrecy is compromised if data is disclosed to users not licensed to access it. whereas the coding theme employed in this work is predicated on mathematical logic, the cryptography theme here is predicated on neural network techniques that use back propagation learning algorithmic program.

5. Compression of information

Feature of this technique is following:

1. The Strength of links of neurons tells US that information influence to compression elements.
2. In principal element analysis or correlational analysis, we have a tendency to decide the quantity of elements once checking results. however in neural network model, we will decide
the number of compression elements before analysis, due to we have a tendency to decide the quantity of neurons in middle layer.

6. Result and Output

Fig3. *Input Pattern displayed*

Fig 4.output pattern displayed

7. **Learning rate and momentum**

The learning procedure requires that the change in weight is proportional to $\partial E^p / \partial w$.True gradient descent requires that innitesimal steps are taken. The
constant of proportionality is the learning rate . For practical purposes we choose a learning rate that is as large as possible without leading to oscillation. One way to avoid oscillation at large , is to make the change in weight dependent of the past weight change by adding a momentum term:

$$\Delta w_{jk}(t+1) = \gamma \delta_k^p y_j^p + \alpha \Delta w_{jk}(t),$$

where t indexes the presentation number and F is aconstant which determines the effect of the previous weight change. Although, theoretically, the back-propagation algorithm performs gradient descent on the total error only if the weights are adjusted after the full set of learning patterns has been presented, more often than not the learning rule is applied to each pattern separately, i.e., a pattern p is applied, Ep is calculated, and the weights are adapted (p = 1, 2,..... P). There exists empirical indication that this results in faster convergence. Care has to be taken, however, with the order in which the patterns are taught. For example, when using the same sequence over and over again the network may become focused on the rest few patterns.

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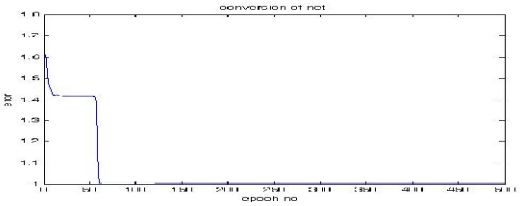

Fig5. *Learning Rate*

8. Conclusion

In this paper we provide the security by data compression using neural network. It was shown that it is practical to use neural networks for text compression, an application requiring high speed. Among neural models, the best one found combines long and short-term learning rates to achieve a balance between using the entire input history and favouring the most recent data to adapt to changing statistics.

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