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Analysis Speed of Sending HL7 Data with use of TrainLM Algorithm in Medical Informatics

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Abstract: ***In this paper, analysis the speed of sending message in Healthcare standard 7 with the use of back propagation in neural network. Various algorithms are define in backpropagtion in neural network we can use trainlm algorithm for sending message purpose. This algorithm appears to be fastest method for training moderate sized feedforward neural network. It has a very efficient matlab implementation. The need of trainlm algorithm are used for analysis, increase the speed of sending message faster and accurately and more efficiently. The proposed work is used in healthcare medical data. With the use of backpropagation in health care standard seven (HL7) sending message between two systems. To increase the speed of the healthcare sending data we can use Train LM algorithm. Train LM algorithm is more fastest algorithm it can be increase efficiency and improve accuracy of the system and also provide real time application. Calculating mse value with less time. More efficiently, accurately sending message.***

Keywords: medical informatics, HL7, backpropagation, TrainLM

1. Introduction

Medical informatics is a sub-discipline of health informatics that directly impacts on patient and physician-relationship. It focuses on the information technology that enables the effective collection of data using technology tools to develop medical knowledge and to facilitate the delivery of patient medical care. The goal of medical informatics is to ensure access to critical patient information at the precise time and place it is needed to make decision. It also focuses on the management of medical data for research and education.

2. Healthcare Standards

Healthcare standard provides a framework for sending or exchanging data from one system to another with specific set of rules. It is used for integration, sharing and retrival's of electronic health records (EHR). Healthcare provides seven standards to perform various functionality. HL7 is a standard series of predefined logical formats for packaging heath care data into messages to be transmitted among computer system. The OSI seventh layer applications are mainly used in the HL7. This application layer used various application protocols for communication between system and also exchange data between systems. HL7 is one of several American National Standards Institute (ANSI)-accredited standard Developing Organization (SDOs) operating in heath care.

Message Structure:

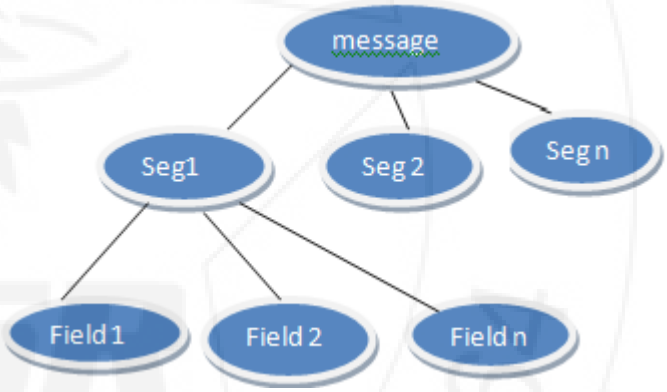


Table 1

MSH	Message Header	Information about message.
EVN	Event Type	Event information
PID	Patient Identification	Information about Patient
NK1	Next of Kin	Information about patients other related parties.
OBR	Observation Request	Information about an order.
OBX	Observation Report	Information about a result.

Types of Messages:

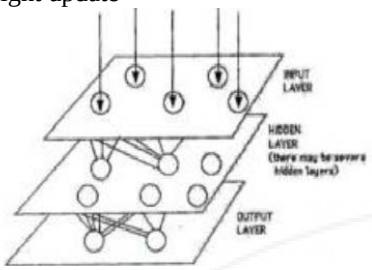
- ACK (general acknowledgement message)
- ORM (general order message)
- ORR (general order response message)
- ORU(unsolicited transmission of observation)

Back Propagation

It is an abbreviation for "backward propagation of errors" is a common method of training artificial neural network. It is an error function and supervised learning method and generalization of the delta rule. It requires a dataset of the desired O/P of many I/Ps making up the training set. It is most useful for feed forward network. For better

understanding, the back propagation learning algorithm can be divided into 2 phases::

• Phase1- Propagation
• Phase 2- Weight update



Processing steps:

- Based on the problem domain, step up the network.
- Randomly generate weights Wij.
- Feed a training set, into BPN.
- Compute the weighted sum and apply the transfer function on each node in each layer. Feeding the transfer data to the next layer until the output layer is reached.
- The output pattern is compared to the desired output and an error is computed for each unit.
- Feedback the error back to each node in the hidden layer.
- Each unit in the hidden layer receives only a portion of total errors and these error then feedback to the input.
- Go to step 4 until the error is very small.
- Repeat the step3 again for another training set.

Various algorithms in back propagation neural network:

1) **Backprogation using Gradient Decent**
   It is relative simply implementation, standard method and generally work well but slow and inefficient.
2) **Simulating Annealing**
   It is a global minimum can guarantee of optimal solution but it is slower than gradient decent and also much more complicated implementation.
3) **Genetic Algorithm**
   Faster than simulated annealing and also less like to get stuck in local minima but it is slower than gradient descent and also memory intensive for large network.
4) **Simplex Algorithm**
   It is similar to gradient decent but faster and easy to implement but does not guarantee a global minima.
5) **Train LM Algorithm**
   It is much faster than all algorithm and also used to calculate performance easily implement in matlab. It used to solve the fitting problem and also provide fastest many mode sizes feed forward network.

All of these algorithms trainLM are the best algorithm for fastest speed. With the use of trainlm algorithm we can improve performance of the system. It is also used for improving the fitting problem. TrainLM algorithm best used for smallest network it is not used for largest network. Trainlm is the default training function because it is very fats but it requires a lot of memory to run. If you get an out of memory error when training try on them.

Levenberg- Marquardt Backpropagation

It is a network training function that updates weight had bias value according to Levenberg Marquardt optimization.

[net, TR]= trainlm (net,Pd,Tl,Ai,TS,VV,TV)
net- neural network
Pd- Delayed I/P vectors
Tl- layer target vectors
Ai-intial I/P delay Conditions
Q-batchsize
TS- time steps

3. Methodology

Healthcare data are used in medical field. The healthcare standards are defined some standard formats for those data. Healthcare seven standards are defined. We can use the last standard means latest standard seven that are based on OSI network seventh layer means application layer. These standard are mainly used for transmitted or exchange data between systems. These standard are mainly used the purpose of communication between sender and receiver. When we can send the HL7 formatted data with the use of some software we can check their speed, efficiency and accuracy of data. HL7 used logical formatted data with the set of rules. The healthcare data send between systems. Firstly we create a database which store large number of medical patient data which is in healthcare standard format. Then sending HL7 formatted data between the systems with the use trainlm. Then finding the best results with less MSE calculate with less time. Levenberg train LM algorithm used when sending data to improve the speed and accuracy of the system. To improve the speed and accuracy of sending message we can change the weight value in the hidden layers. Weight value is in the hidden layer.

4. Results

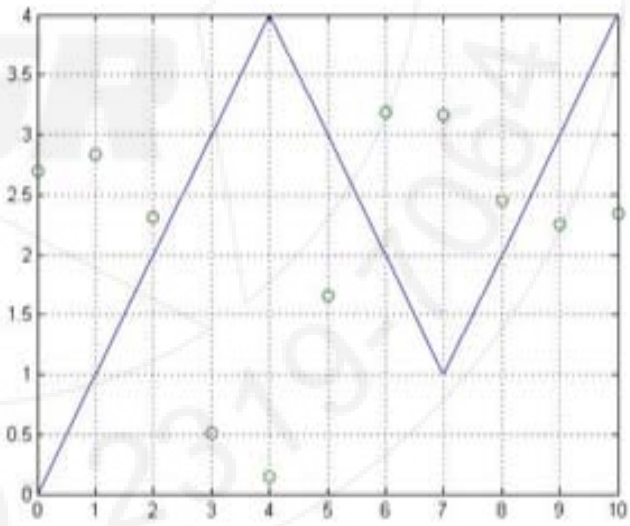


Figure 1

Training with TrainLM:

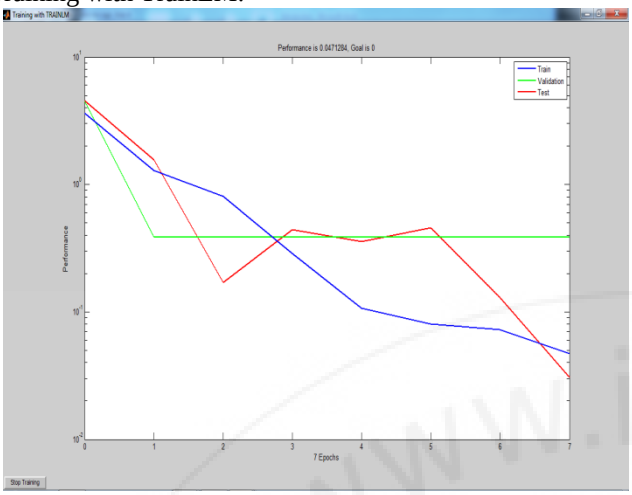


Figure 2

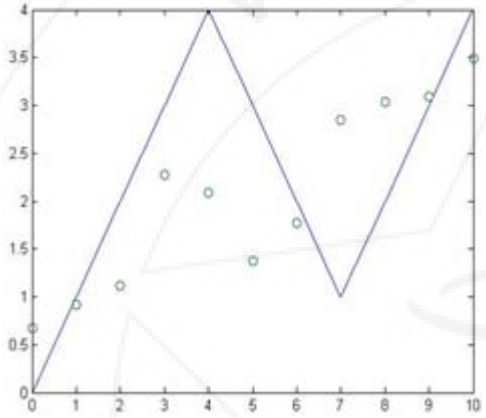


Figure 3

In the above figures, first show the input data and train those data with 10 epochs and calculate the performance on the bases of epochs and time. Calculating minimum mean square error (MSE) with less time and The Result output calculate MSE 0.0471284 and Elapsed time is 0.418071 seconds.

5. Conclusion

To analyzing the speed of sending messages between the systems. Improving the quality and accuracy of the message sending in HL7 standard. Less time require exchanging data between systems. It can be based on real time application. Provide efficient and accurate data. Train LM algorithm easily implement in matlab and provide better result as compare to all other back propagation algorithms. Fastest method for training moderate sized feed forward neural network. In the future we can also work on Dicom images to increase the speed of sending image fastly and best quality with use of this algorithm.

6. Future Scope

In future work, also more improve the speed of sending message with some another network and also more distortion measures and feature domains will be used as the image samples. Also, the relationship between the metrics adopted for the combination will be further investigated to find the best combination among them. More experiments are needed to validate properties of the network such as it optimum number of neurons in hidden layers, validation etc. Performance comparison of LMBP with other networks should also be discussed.

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