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## Synapse July 2003

Summer greetings from all of us at NeuralWare. Synapse is NeuralWare's newsletter with the latest information for friends and customers of NeuralWare. In this issue, we will cover the following:

- The 2003 training schedule including a new, never before offered course
- Tips from our Technical Support Group
- NeuralWare signs technology agreement with Lightbridge
- Submit your own case study and receive credits towards purchases
- Other miscellaneous tidbits

### NeuralWare signs technology agreement with Lightbridge

In the United States, **Lightbridge Inc.** of Burlington, Massachusetts ([www.lightbridge.com](http://www.lightbridge.com)) has licensed the **NeuralWorks Predict** and **NeuralWorks Professional II/PLUS** advanced neural network desktop model development environments for use in its next generation family of fraud detection and loss prevention solutions for the mobile communication industry. **Lightbridge** risk management solutions lower fraud losses and bad debt by identifying high risk prospects and fraudsters before they become customers, thus improving profitability. Results are available in seconds – fast decisions on new customers increase customer satisfaction which then leads to higher revenue with reduced risk. **Lightbridge** is a global enabler of mobile business solutions that increase productivity, revenue, and loyalty throughout the customer life cycle.

### Training

NeuralWare is pleased to announce the release of our new training course, Developing Neural Network Applications. This three-day neural computing course focuses on the practical aspects of creating and deploying neural network applications using NeuralWare development tools. It provides an overview of the NeuralWare product line, and describes the software architecture of each application and library. It also identifies the functional and architecture relationship among the products. Next, the course presents an overview of the methods that can be used to deploy neural network models, including standard NeuralWare .nnd and .npr files, FlashCode™, Designer Pack, and use of NeuralWare library components. Additional information and a syllabus are available on our website at [www.neuralware.com/training.jsp](http://www.neuralware.com/training.jsp).

Register by July 31 for a NeuralWare course from the August - November series and receive a 10% early-bird discount. Courses are taught in Pittsburgh at our conveniently located headquarters just a few miles from downtown Pittsburgh.



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Our regularly scheduled training courses ensure that our customers are knowledgeable about neural network technology and using our software effectively. See the schedule below to select the course that best fits your schedule. Make sure to visit our website [www.neuralware.com/training.jsp](http://www.neuralware.com/training.jsp) or talk with our sales department to get complete course information before making your final selection.

Class size is limited to offer participants personalized instruction when necessary. A well-organized yet informal structure allows flexibility and provides opportunities for real-world information sharing and problem solving. When you visit the training website, look for comments from previous attendees.

If you have several individuals within your company that would like to attend our course, let us know and we will be happy to provide information on our on-site training programs. Contact us via email at [training@neuralware.com](mailto:training@neuralware.com).

If you would like to expand your knowledge of neural network technology using NeuralWare's state-of-the-art tools, plan to attend a course soon. Don't forget the 10% early-bird discount. Contact us today!

### **Current training schedule**

[Applying Neural Networks to Business, Industry and Government](#) (4.5 days)

Aug 11-15

Nov 10-14

Jan 26-30

[Advanced Neural Computing](#) (3.5 days)

Sept 9-11

[Developing Neural Network Applications](#) (3 days)

Oct 20-22

### **Submitting an Article**

If you wish to submit a case study, application note, or technical tip for publication, please contact NeuralWare sales. If we publish your contribution, you will receive a one-year Technical Assistance Program (TAP) subscription for the NeuralWare program that you use - a minimum \$375 value. If you prefer, you may also apply the credit towards NeuralWare products for training! We hope you will consider this exciting opportunity.

### **Tips from our Technical Support Group**

How Good Is My Model?

It's finally happened – you've trained a neural network model. You were successful in recognizing and understanding a problem to solve, obtained the right data, understood



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it's content and format, allocated time to focus on doing the modeling, chosen product parameters, and probably trained the network in an amazingly short time frame. You've used the Test command in NeuralWorks Predict or NeuralWorks Professional II/PLUS and obtained statistical measures such as R Correlation, Average Absolute Error, Root Mean Square Error, or Average Classification Rate.

And then it hits you – so how good is this model? Assuming an R Correlation of 0.88, is this a good model? Is it fantastic? Is it really bad?? How can anyone tell the difference!?

Of course "good" is a relative term, meaning better than average. So you build model after model, keeping the best one. After building 20 models we can feel good about keeping the best one, which perhaps shows  $R = 0.91$ . At least we know that the  $R=0.91$  model is good compared to our other models, is better than average, but of course this is with respect to the algorithms used, or the parameters used, or even the way data was presented to the products. Isn't possible that another approach might yield even better results? How good is  $R=0.91$  compared to other approaches?

Eleven years ago a study showed that at best there is a tenuous relationship between model accuracy and profit from simulated stock market trading. Several thousand networks models were trained and evaluated, and models having 64% accurate trend predictions (up/down movements) were found to be most profitable. Even more profitable than 78% accurate models. So it is of primary importance to measure a model in its intended usage environment. We cannot rely on statistical measures of success as a final performance evaluation. It's kind of an old, sad joke – "I was 82% correct with stock market moves, and lost all my money".

There is usually a baseline that can be uncovered for comparison reasons. It might be "current models made X dollars last year" or "we saved X dollars in materials" or "we always use R Correlation". You'll usually have to dig a little to get that ever-important piece of information, but it is vital to have some form of baseline to compare your results to.

As a last resort, and without using a proper performance measure such as profit, it is helpful to compare neural network models to linear regression models. Linear regression is a standard statistical technique, and it is good to see how much the added non-linear complexity has lifted results from the more simple approach. If results are close between the two models (neural and linear), then the linear regression model is probably the best choice.

### **Building Linear Regression Models**

NeuralWorks Predict and NeuralWorks Professional II/PLUS users can make linear regression models as well as neural networks. A linear model is simply a neural network without hidden layer nodes, and with a linear output function instead of a non-linear



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(sigmoidal) output. Both can be drawn graphically; both have input and output nodes; both have a bias node (or 'a0 term'); both have weights (or 'coefficients'). The difference is the hidden layer, and the use of non-linear transfer functions upon the hidden layer and (usually) upon the output layer.

Comparing our neural network model Test results like R, RMS or Average Classification Rate to those obtained by a linear regression model at least provides a some baseline performance measure.

Using Professional II/PLUS, select InstaNet / Back Propagation. Enter zero for the number of hidden nodes, select 'Linear Output', and select your training and test files. Use the Run / Learn with any learning rule and train until the error no longer gets smaller (e.g. train until an RMS or other graph stops showing improvement). You can experiment with different random seeds and learning rules to see if a better score such as R Correlation can be found.

Predict users have things to disable to make the comparison as fair as possible. Predict contributes to the overall solution by intelligently separating data records into training and test data sets, by applying data transformations, and by carefully selecting variables. This significant data pre-processing occurs prior to training the neural network. While this is an important part of the final Predict solution, it is not performed by other products and other regression analysis tools. So for linear regression models, shouldn't we turn off features that are unique to Predict? We wouldn't want a regression model to look better than usual, because of the superb job Predict does in data processing!

It is easier to let Predict separate data into training and test sets, so we'll let it do that. You have complete control over this, but it requires a few steps to achieve it... so we'll just let Predict do its default 70% / 30% data split for the regression model.

Make a Predict Linear Regression model as follows:

- specify Excel cell ranges as usual
- set the Noise level to 'clean data'
- set Data Transformations to 'scale data only'
- set Variable Selection to 'no variable selection'
- set the Network Search level to 'comprehensive'
- click on the 'More Parameters' button
- enter 0 for Hidden Architecture Maximum Layer Size
- select 'linear' for the Output Layer Function
- click OK and then click Train.

Predict is still doing some things for you such as text-to-numeric translations, discarding obviously-flawed data fields, clipping outlier values and mean-zero data scaling, but the above disabling of features will make a model more like those produced elsewhere.



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## **Taking a look at Predict for Professional II/PLUS users**

If you're currently a Professional II/PLUS user, have you taken a look at Predict recently? It's easy to request a demo and you will experience first-hand this user-friendly, yet powerful neural networking prediction and classification tool. The front-end data preprocessor uses a genetic algorithm and fuzzy technology to optimize your inputs prior to their going into the neural network. NeuralWare has many customers who rely on both Professional II/PLUS and Predict to solve their development and data modeling challenges. Contact [sales@neuralware.com](mailto:sales@neuralware.com) to order your demo today.

## **Personal License Extension Information**

If you are someone who needs to use your NeuralWare software both at home and at work, you are a candidate for NeuralWare's personal license extension (PLE). With a PLE you can request a second license key for your home or laptop computer for the low one-time cost of \$250. Only users who are on the technical assistance program (TAP) are eligible for this benefit. To take advantage of the TAP/PLE program, contact our sales department for more information at [sales@neuralware.com](mailto:sales@neuralware.com).

## **Canceling your subscription**

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## **Additional Information**

Additional information on NeuralWare is available at [www.neuralware.com](http://www.neuralware.com)! We hope you will visit us!

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