



**Synapse
June 2002**

NeuralWare in China

Late in 2001, China became a full member of the World Trade Organization (WTO). As regular visitors to the NeuralWare web site know, Jack Copper, NeuralWare's CEO, has been traveling to Asia, and concentrating on China, since October 2000.

As a result of Jack's travels, in 2001 Jack was asked to serve on the Advisory Board for the 20th Anniversary celebration of the Sister City relationship between Wuhan, China and Pittsburgh, and his many trips to Wuhan are now beginning to show results.

In mid-May of 2002, Jack and his Chinese-American attorney, Ms. Heidi Zhang of Cohen & Grigsby in Pittsburgh, were invited to attend a ceremony in Wuhan to celebrate the establishment of the Wuhan Iron and Steel Engineering and Technology Company (WISSET). Jack was also asked to speak at the ceremony to demonstrate that WISSET and its parent company are serious about applying Western technology in a variety of application domains.

Within the next two months, NeuralWare will sign a Technology License Agreement with the Instrumentation and Control Company of Wuhan Iron and Steel Company, one of the largest Steel producers in China. In addition, Jack has had substantive discussions with other Chinese companies that are also preparing to develop relationships with Western companies based on Intellectual Property law that has resulted from WTO membership.

If you'd like to experience for yourself the high level of friendship and cooperation between Pittsburgh and Wuhan as well as between individual companies in the two cities, please contact NeuralWare for information about the 20th Anniversary Celebration that will be held in Pittsburgh during the week of September 16, 2000. In addition to a wide range of business relationship topics on the agenda, there will be Dragon Boat races to celebrate the Autumn Moon Festival on September 21, and the Beijing Opera will perform as part of its tour of the United States. We hope to see you in September!

NeuralWare Celebrates 15 years

NeuralWare, founded in the summer of 1987, is pleased to announce our celebration of 15 years of providing advanced analysis technology for users around the world. During this exciting time period, we have seen our neural network technology evolve from a high end research and development tool, to technology used in real world applications. With tens of thousand of copies of our software installed around the globe, we want to take the opportunity to thank all of you for your assistance in helping us grow! We recently announced a referral program to help us start our next 15 years. Contact sales@neuralware.com for specifics of our referral program.



Congratulations Cal Co., LTD.

Congratulations to our Japanese Distributor, Computer Applications Laboratory Co. Ltd. (CAL Co., Ltd), for successful participation at the Business Show 2002 in Tokyo, Japan. CAL demonstrated both our NeuralWorks Predict and Professional II/PLUS software. CAL is now preparing for the Data Warehouse & CRM Expo. CAL will be demonstrating a Japanese translated version of NeuralWorks Predict. We want to wish all at CAL the best of luck with the Data Warehouse & CRM Expo.

Training

Register by June 30th for a NeuralWare course from the July through September 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.

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 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 at <http://www.neuralware.com/training.jsp>, look for comments from previous attendees.

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 if you register by June 30 for a July-September course. Contact us today!

Current training schedule

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

July 15 – 19

September 23 - 27

Advanced Neural Computing (3.5 days)

August 12 – 15

Tech Tip

Both NeuralWorks Predict and NeuralWorks Professional II/PLUS may be used to address the time series models you describe. While there is no explicit handling of time series data by either product, there are approaches that can be taken. Consider the following data example:



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Time	Temperature	Pressure	Flow	Yield
3:00	temp-9	psi-9	flow-9	yield-9
4:00	temp-8	psi-8	flow-8	yield-8
5:00	temp-7	psi-7	flow-7	yield-7
6:00	temp-6	psi-6	flow-6	yield-6
7:00	temp-5	psi-5	flow-5	yield-5
8:00	temp-4	psi-4	flow-4	yield-4
9:00	temp-3	psi-3	flow-3	yield-3
10:00	temp-2	psi-2	flow-2	yield-2
11:00	temp-1	psi-1	flow-1	yield-1
12:00	temp-0	psi-0	flow-0	yield-0
				yield+1

In the above example the Time field is unused, and serves only as a row marker. Assuming a maximum lag time of 3 time steps, then the yellow highlighted data is a complete input data record, and the green highlight is a target output data point. There are 8 complete 3-time-step records in the above data. Record number one inputs are from time 3:00, 4:00 and 5:00 and are used to predict yield at 6:00 (yield-6). Record number 2 inputs are 4:00, 5:00 and 6:00, to predict the yield at 7:00 (yield-5); record 3 is 5:00, 6:00 and 7:00 to predict 8:00 yield, and so on.

Using NeuralWorks Predict in the Excel interface, you can select a matrix of cells for the input or output data ranges. Cells containing 'temp-9' through 'flow-7' are the First Example Input Range, select cell 'temp-8' as the beginning of the Second Example Input data range, select cell 'yield-6' as the First Example Output range, and select 'temp0' (or even more correctly, cell 'temp-2') as the All Input Data range.

The NeuralWorks Command-Line Interface, and also Professional II/PLUS data files, requires each complete data record (input and output pair) to be on one line. So the above file would need to become as shown below for these interfaces:

```
*****
temp-9 * psi-9 * flow-9 * yield-9 * temp-8 * psi-8 * flow-8 * yield-8 * temp-7 * psi-7 * flow-7 * yield-7 * yield-6
temp-8 * psi-8 * flow-8 * yield-8 * temp-7 * psi-7 * flow-7 * yield-7 * temp-6 * psi-6 * flow-6 * yield-6 * yield 5
temp-7 * psi-7 * flow-7 * yield-7 * temp-6 * psi-6 * flow-6 * yield-6 * temp-5 * psi-5 * flow-5 * yield-5 * yield 4
temp-6 * psi-6 * flow-6 * yield-6 * temp-5 * psi-5 * flow-5 * yield-5 * temp-4 * psi-4 * flow-4 * yield-4 * yield 3
temp-5 * psi-5 * flow-5 * yield-5 * temp-4 * psi-4 * flow-4 * yield-4 * temp-3 * psi-3 * flow-3 * yield-3 * yield 2
temp-4 * psi-4 * flow-4 * yield-4 * temp-3 * psi-3 * flow-3 * yield-3 * temp-2 * psi-2 * flow-2 * yield-2 * yield 1
temp-3 * psi-3 * flow-3 * yield-3 * temp-2 * psi-2 * flow-2 * yield-2 * temp-1 * psi-1 * flow-1 * yield-1 * yield0
temp-2 * psi-2 * flow-2 * yield-2 * temp-1 * psi-1 * flow-1 * yield-1 * temp0 * psi0 * flow0 * yield0 * yield+1
*****
```

In time series predictions you might want to force Predict to keep all input variables. Then again, tests where some variables have been eliminated will give you insights into which inputs are not contributing much to the outcome, and ideas about time lags in each



variable. It is generally better to derive input fields from the time series data, and use those derived inputs instead of the time series itself. For example, perhaps a 2-point moving average, a 5-point moving average and a 10-point moving average captures much of the time dynamics. If so, you could use those 3 fields as inputs to your model, rather than the original n time periods.

All in all the above approach is like a 3-period moving average, but we use a neural network to predict the next point rather than a simple average.

Product

Did you know that the latest version of Predict is now available for evaluation by going to www.neuralware.com/products.jsp and selecting "request an evaluation copy". Once we receive your request, we will email you the link so that you may download and try the latest version. We hope you will give Predict a "test-drive"!

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.

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.

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