

NeuroXL Predictor

Unleashing the Power of Artificial Intelligence
for Microsoft Excel Forecasting and Estimation

A White Paper

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The Value of Neural Network Forecasting and Estimation

Estimating and forecasting future conditions govern many critical business activities, such as inventory control, procurement of supplies, labor cost estimation, and prediction of product demand. Inaccurate or misleading estimates can result in aggravation or total company chaos. Lost sales, inefficient allocation of resources, and bloated inventories are often a direct result of forecasts that failed to predict future conditions. In the financial industry, inaccurate forecasts for stocks and other investments can result in poor trades and lost opportunities for gain. Inaccurate predictions of sporting outcomes can result in poor wagering and resulting losses.

Microsoft Excel provides a built-in tool for predictions, but the accuracy of its results is significantly reduced when non-linear relationships or missing data are present, which is often the case when analyzing historical business, investment, or sports data. *Neural networks* are a proven, widely used technology for such complex prediction problems. Loosely modeled after the human brain, neural networks are interconnected networks of independent processors that by changing their connections (known as *training*) learn the solution to a problem.

One of the main reasons analysts have been slow to use advanced methods such as neural networks to improve forecasts is that such methods can be difficult to master. NeuroXL Predictor removes the psychological and practical barriers by hiding the complexity of its advanced neural network-based methods while taking advantage of analysts' existing knowledge of Microsoft Excel spreadsheets. Since users make predictions through the familiar Excel interface, learning time is minimal, greatly reducing the interval between loading the software and performing useful predictions. The application is extremely intuitive and easy-to-use for beginners yet powerful enough for the most demanding professionals. Also, using NeuroXL Predictor requires no prior knowledge of neural networks.

In summary, these are the key advantages of NeuroXL Predictor:

- Easy to learn and use
- No prior knowledge of neural networks required
- Integrates seamlessly with Microsoft Excel
- Provides proven neural network technology for highly accurate forecasts
- Lowest cost neural network product on the market

Prime applications for NeuroXL Predictor include:

Forecasting Stocks and other Investments: The ability of NeuroXL Predictor to discover non-linear relationships in input data makes it ideally suited for forecasting dynamic systems like the stock market. The price of stocks and other investment vehicles such as bonds, derivatives and options are also influenced by many different factors that are often interrelated. Traditional forecasting methods, such as regression and data reduction models, are limited in their effectiveness as they make assumptions about the distribution of the underlying data, and often fail to recognize the interrelatedness of variables. NeuroXL Predictor, drawing on the latest in artificial intelligence research, recognizes even subtle relationships between variables.

In addition to stock market prediction, NeuroXL Predictor is also ideally suited to making predictions in other financial areas, such as:

- Foreign exchange trading.
- Financial planning.
- Commodity trading.
- Economic forecasting.
- Currency trading.
- Corporate bond ratings.
- Oil and gas trading.

Sales Forecasting: Sales forecasting lets businesses make better purchasing decisions and manage inventory more efficiently. It can also identify new opportunities for increased sales. However, sales forecasting is extremely difficult, since a large number of factors influence sales that are often interrelated.

Price, seasonality, advertising, and competitor behavior are all factors that influence sales. NeuroXL Predictor analyzes historical data to learn the interrelation between these factors, and makes predictions of sales levels for various combinations.

In addition to sales forecasting, NeuroXL Predictor is ideal for many other business activities, including:

- Industrial process optimization.
- Loan approvals.
- Credit scoring.
- Marketing campaign prediction.
- Cost prediction.

Sports Predictions: NeuroXL Predictor's ability to handle multiple non-linear

relationships makes it ideally suited to predicting the outcome of team sports and racing events. For example, with thoroughbred horse racing, NeuroXL Predictor can simultaneously examine the relationship between multiple contenders, resulting in more accurate predictions of winners than traditional estimation techniques. A typical horse or greyhound race involves a complex problem domain, often with 50 performance variables for 6-9 animals. NeuroXL Predictor's robust neural-network-based implementation allows it to detect relevant patterns in such data sets, resulting in high-quality predictions.

The Advantages of NeuroXL Predictor over the Competition

Neural network prediction software typically costs hundreds, sometimes even thousands of dollars per license. NeuroXL Predictor is the first and only solution to offer this advanced technology for *less than one hundred* dollars per month. Most neural network prediction software requires the user to learn about neural networks, complete large tutorials, and/or perform data pre-processing. NeuroXL Predictor requires no prior knowledge of neural networks and hides the complexity from the user, allowing for useful predictions often just minutes after installation.

Users just need to specify input and output references, perform a few mouse movements, and their prediction is returned.

NeuroXL Predictor also offers compatibility with Microsoft Excel-based trading software and with the entire AnalyzerXL product suite.

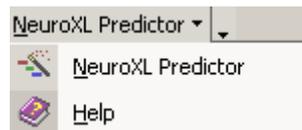
Example: Using NeuroXL Predictor to Predict Stock Prices

Since NeuroXL is an add-on to Microsoft Excel, it can perform predictions on your existing historical data and technical functions already in spreadsheet form. Let's say you have a table with historical stock price data and two technical analysis functions, and you wish to do a prediction of tomorrow's closing price.

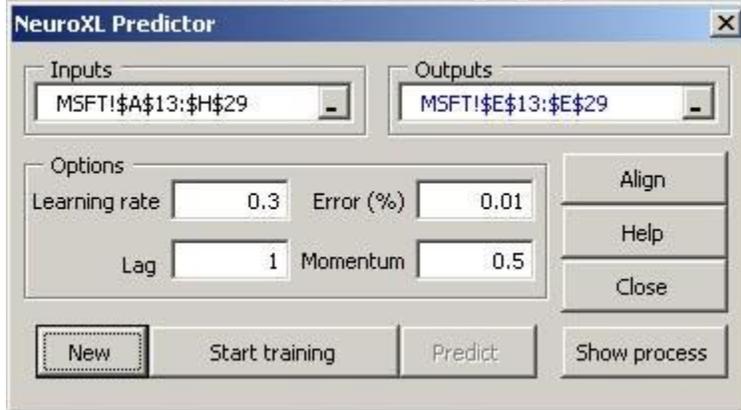
| | A | B | C | D | E | F | G | H |
|----|------------|-------|-------|-------|-------|----------|-----------|---------------|
| 1 | Date | Open | High | Low | Close | Volume | Change(3) | CutlerRSI(12) |
| 2 | 01.05.2002 | 52.16 | 53.19 | 50.66 | 52.75 | 38206500 | | |
| 3 | 02.05.2002 | 52.64 | 54.07 | 51.15 | 51.21 | 39504600 | | |
| 4 | 03.05.2002 | 51.26 | 51.68 | 49.51 | 49.56 | 35814000 | -3.19 | |
| 5 | 06.05.2002 | 49.44 | 50.54 | 48.37 | 48.62 | 33149700 | -2.59 | |
| 6 | 07.05.2002 | 49.18 | 50.29 | 48.35 | 49.47 | 44192700 | -0.09 | |
| 7 | 08.05.2002 | 51.27 | 54.97 | 51.22 | 54.97 | 50621000 | 6.35 | |
| 8 | 09.05.2002 | 54.40 | 55.00 | 51.90 | 52.12 | 41644100 | 2.65 | |
| 9 | 10.05.2002 | 52.53 | 52.67 | 49.99 | 50.05 | 32204400 | -4.92 | |
| 10 | 13.05.2002 | 50.45 | 52.91 | 49.75 | 52.69 | 32409500 | 0.57 | |
| 11 | 14.05.2002 | 54.40 | 55.10 | 53.98 | 54.88 | 32416200 | 4.83 | |
| 12 | 15.05.2002 | 54.49 | 56.44 | 53.86 | 54.75 | 35206000 | 2.06 | |
| 13 | 16.05.2002 | 54.71 | 56.03 | 54.65 | 55.74 | 26703200 | 0.86 | 57.00 |
| 14 | 17.05.2002 | 56.21 | 56.40 | 55.27 | 56.03 | 27323100 | 1.28 | 61.99 |
| 15 | 20.05.2002 | 55.50 | 55.55 | 53.50 | 54.01 | 26057900 | -1.73 | 60.87 |
| 16 | 21.05.2002 | 53.95 | 54.60 | 52.13 | 52.19 | 31560000 | -3.84 | 58.36 |
| 17 | 22.05.2002 | 51.87 | 53.72 | 51.85 | 53.69 | 27084700 | -0.32 | 59.59 |
| 18 | 23.05.2002 | 53.70 | 54.84 | 53.01 | 54.82 | 25706400 | 2.63 | 49.57 |
| 19 | 24.05.2002 | 54.14 | 54.52 | 53.04 | 53.26 | 17991000 | -0.43 | 53.49 |
| 20 | 28.05.2002 | 53.59 | 53.69 | 51.75 | 52.32 | 24801000 | -2.50 | 57.46 |
| 21 | 29.05.2002 | 51.65 | 52.72 | 51.55 | 52.05 | 22696600 | -1.21 | 47.51 |
| 22 | 30.05.2002 | 51.64 | 53.36 | 51.43 | 52.64 | 31606500 | 0.32 | 40.04 |
| 23 | 31.05.2002 | 52.90 | 53.42 | 50.88 | 50.91 | 33234000 | -1.14 | 35.05 |
| 24 | 03.06.2002 | 50.99 | 51.64 | 49.17 | 49.42 | 44219500 | -3.22 | 26.31 |
| 25 | 04.06.2002 | 49.50 | 51.23 | 49.24 | 49.98 | 44004200 | -0.93 | 27.77 |
| 26 | 05.06.2002 | 50.43 | 51.75 | 50.33 | 51.66 | 33484700 | 2.24 | 41.15 |
| 27 | 06.06.2002 | 51.50 | 52.14 | 50.00 | 51.90 | 39351700 | 1.92 | 48.76 |
| 28 | 07.06.2002 | 49.89 | 52.60 | 49.86 | 51.98 | 48917200 | 0.32 | 41.67 |
| 29 | 10.06.2002 | 51.65 | 53.30 | 51.46 | 52.82 | 35912700 | 0.92 | 39.98 |

The steps to predict tomorrow's closing price are:

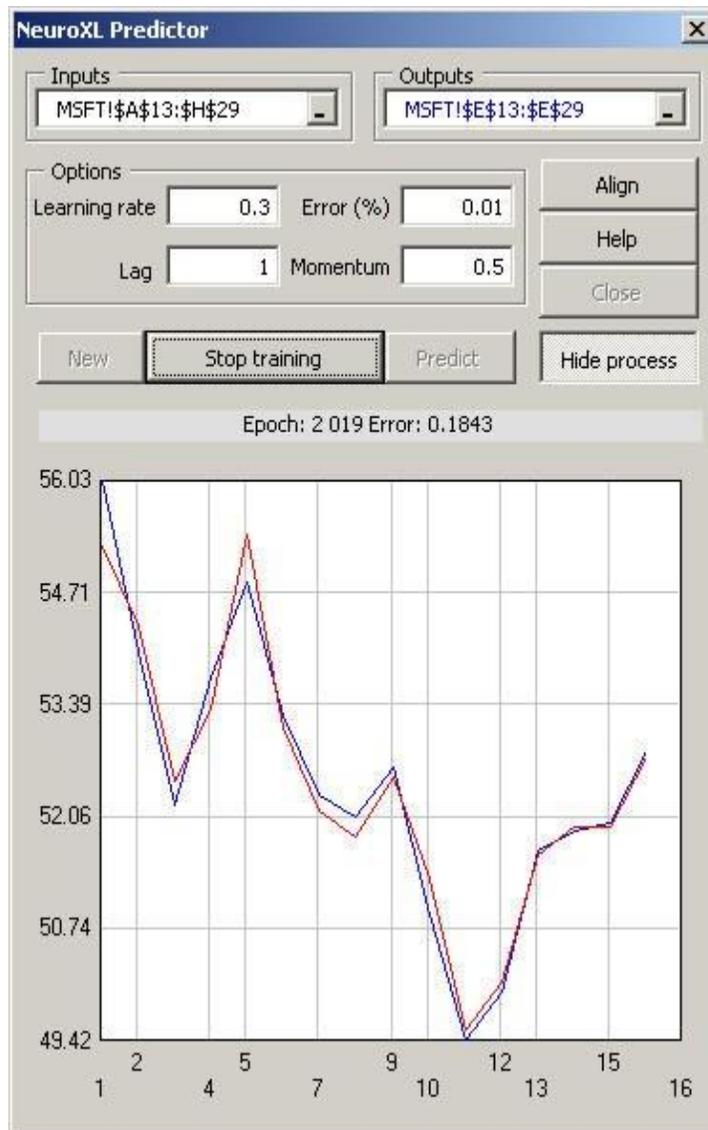
1. Select NeuroXL Predictor from the menu in MS Excel.



This will launch the program, bringing up the NeuroXL Predictor dialog box.

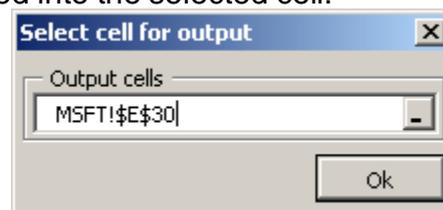


2. Specify the inputs (date, opening price, volume, high, low, etc.) that influence the outputs (closing prices). Since we want to include all the data for which we have values for both technical analysis functions, we set the range of inputs to be all the data from A13 to H29. The outputs are specified as the values from E13 to E29.
3. Set the learning rate, error, lag, and momentum parameters. The lag specifies the number of predicted values to return (e.g. 1 will return tomorrow's predicted closing price, 2 will return tomorrow and the day after, etc.). Momentum and Learning rate both affect the speed and quality of the training (learning) process, and error specifies the point at which the neural network will stop training.
4. Click the "New" button, followed by the "Start training" button. By clicking on "Show process", the NeuroXL Predictor dialog box will display a graph of the training process. The blue line shows the actual values, and the red the predicted ones



- When the training is complete, a notification box will appear. Click the "Predict" button and a dialog box will appear, where you will enter the cell for the output.

The final prediction is inserted into the selected cell.

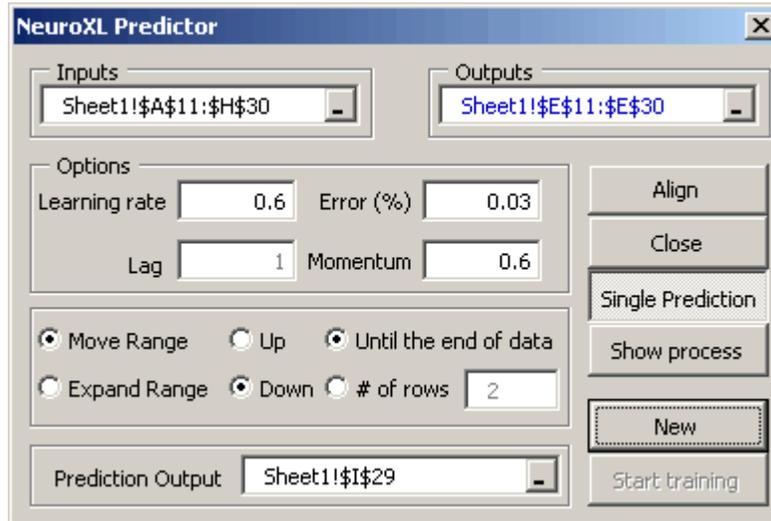


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| 29 | 10.06.2002 | 51.65 | 53.30 | 51.46 | 52.82 | 35912700 | 0.92 | 39.98 |
| 30 | Prediction → | | | | 49.54 | | | |
| 31 | | | | | | | | |

In six steps, we have performed a complex neural network prediction, taking into account non-linear variables and the results of two technical analysis functions. NeuroXL Predictor does the work of determining the relationship between variables and detecting relevant patterns in the data. All the user needs to do is specify the inputs and outputs and set the required parameters.

Bulk Predictions

The latest version of NeuroXL Predictor incorporates support for bulk predictions. Using this feature, a user can leave the computer unattended to make predictions for a large array of data. These predictions are performed using a moving/expanding range function, whose parameters are set using the bulk prediction dialog box:



The screenshot shows the 'NeuroXL Predictor' dialog box with the following settings:

- Inputs:** Sheet1!\$A\$11:\$H\$30
- Outputs:** Sheet1!\$E\$11:\$E\$30
- Options:**
 - Learning rate: 0.6
 - Error (%): 0.03
 - Lag: 1
 - Momentum: 0.6
- Range Selection:**
 - Move Range
 - Expand Range
 - Up
 - Down
 - Until the end of data
 - # of rows: 2
- Prediction Output:** Sheet1!\$I\$29
- Buttons:** Align, Close, Single Prediction, Show process, New, Start training

Conclusion

NeuroXL Predictor is a powerful, easy-to-use and affordable solution for advanced estimation and forecasting. By harnessing the latest advances in artificial intelligence and neural network technology, it delivers accurate and fast predictions for your business, financial, or sports forecasting tasks. Designed as an add-on to Microsoft Excel, it is easy to learn and use yet powerful enough for the most demanding professional.

For more information on NeuroXL Predictor, please visit our Web site www.neuroxl.com or contact our support staff at support@neuroxl.com.