

MATHEMATICA[®]

NEURAL NETWORKS

*Train and analyze neural networks
to fit your data*

Artificial neural networks have revolutionized the way researchers solve complex, real-world problems in engineering, science, economics, and finance. The new *Neural Networks* package will help you utilize this cutting-edge technology with the computational power and flexibility of *Mathematica*.

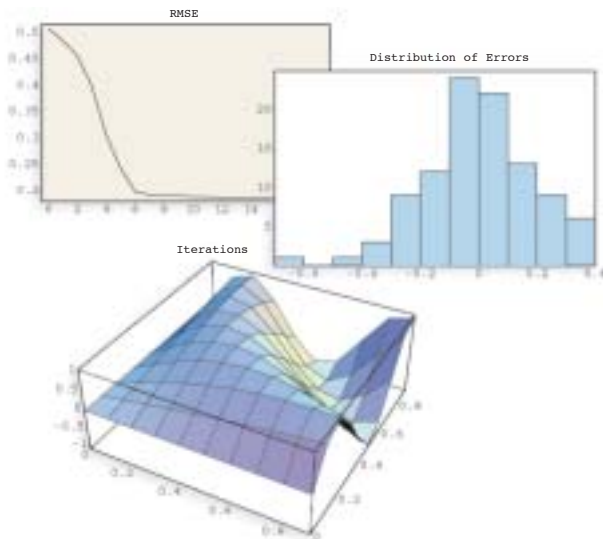
Neural Networks is designed to give professionals and students the tools to train, visualize, and validate neural network models. It supports a comprehensive set of neural network structures and implements state-of-the-art training algorithms while taking full advantage of *Mathematica*'s number-crunching and visualization capabilities. It also includes special functions to address typical problems in data analysis, such as function approximation, classification and detection, clustering, nonlinear time series, and nonlinear system identification problems.

Neural Networks builds on a user-friendly command structure. Most neural network types rely on a few common commands easily accessed through the built-in palettes that facilitate the input of any parameter for the analysis, evaluation, and training of your data. *Neural Networks* also provides numerous options to modify the training algorithms. The default values have been set to give good results for a large variety of problems, allowing you to get started quickly using only a few commands. As you gain experience, you will be able to customize the algorithms to improve the performance, speed, and accuracy of your neural network models.

With *Neural Networks* and *Mathematica*, you will have access to a robust modeling environment that will let you test and explore neural network models faster and easier than ever before.

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Fit the network to your data, visualize the fitted network, and view the distribution of errors with only a few commands.

Whether you are an engineer, a financial analyst, a researcher, or a student, *Neural Networks* offers you an easy, convenient, and comprehensive environment in which to analyze neural network models. It allows you to perform analyses that are far more sophisticated than those offered by other neural networks packages.

Professionals and students with little or no background in neural networks will benefit from the comprehensive online documentation and the large number of examples. The interactive online tutorial contains a number of detailed examples that demonstrate the use of the different neural network models. You can solve many problems simply by applying the example commands to your own data. The tutorial will allow users to quickly acquire the knowledge and skills necessary to understand and solve many data-fitting problems, making *Neural Networks* an excellent teaching tool either for independent study or for use in neural networks courses.

Experienced neural network users will find *Neural Networks* ideal for exploring and prototyping new training algorithms. With a large set of flexible function options, *Neural Networks* offers numerous possibilities to modify the provided algorithms. Advanced users will also be able to develop their own training algorithms using any commands available in *Mathematica* to further extend the capabilities of the package.

FEATURES

EASY TO USE AND LEARN

- Small number of functions constructed so that only the minimum amount of information has to be specified by the user
- Well-organized palettes with command templates, options, and links to online documentation
- Intelligent initialization algorithms to begin the training with good performance and speed
- Extensive documentation including an introduction to neural network theory as well as highly illustrative application examples

SUPPORT FOR PROVEN NEURAL NETWORK PARADIGMS

- Support for most of the commonly used neural network structures including radial basis function, feedforward, dynamic, Hopfield, perceptron, vector quantization, unsupervised, and Kohonen networks
- Support for advanced training algorithms including Levenberg-Marquardt, Gauss-Newton, and steepest descent, as well as for traditional algorithms including backpropagation with and without momentum
- Support for typical neural network applications including function approximation, classification, dynamic systems modeling, time series, auto-associative memory, clustering, and self-organizing maps

FAST AND RELIABLE

- Optimization of expressions before numerical evaluation to minimize the number of operations and reduce computational load
- Compile command to send compiled code directly to *Mathematica* to increase computational speed
- Special performance-evaluation functions included to validate and illustrate the quality of a mapping

POWERFUL MODELING ENVIRONMENT

- Visualization tools for viewing network models, the training process, and network performance
- Special network object to identify the type of network and list its parameters and properties
- Special training record to keep intermediate information from the learning process
- Functions equipped with a large number of advanced options to modify and control the training algorithms
- Support for neural networks with any number of hidden layers and any number of neurons (hidden neurons) in each layer
- Access to all the capabilities of *Mathematica* to prototype new algorithms or to perform further manipulations on neural network structures

Neural Networks is designed for use with *Mathematica* 4 or later and is available for Windows 95/98/Me/NT/2000/XP, Mac OS, Mac OS X, Linux (PC, Alpha, PowerPC), Solaris, HP-UX, IRIX, AIX, Compaq Tru64 Unix, and compatible systems.

The *Mathematica Applications Library* is a continually expanding collection of software used in conjunction with *Mathematica*. Some of the packages available are: *Time Series* • *Wavelet Explorer* • *Control System Professional Database Access Kit* • *Parallel Computing Toolkit* • *Structural Mechanics* • *Mathematica Link for Excel*

www.wolfram.com/products

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