# Neural Network Toolbox Release Notes

There are no major changes in the Neural Network Toolbox (version 4.0.6) for Release 14 SP3.

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**Note**  Neural Network Design by Hagan, Demuth, and Beale, ISBN 0-9717321-0-8, is available from John Stovall at the University of Colorado bookstore, john.stovall@colorado.edu, phone 303-492-3648.

A description of the book, the first four chapters of the book, and transparency overheads designed for use with the book are at

`http://hagan.okstate.edu/nnd.html`

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If you are upgrading from a release earlier than Release 12.1, you should see these sections:

- "Neural Network Toolbox 4.0.1 Release Notes" on page 1-1
- "Neural Network Toolbox 4.0 Release Notes" on page 2-1

### Printing the Release Notes

If you would like to print the Release Notes, you can link to a PDF version.

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# Neural Network Toolbox 4.0.1 Release Notes

# Major Bug Fixes

The Neural Network Toolbox 4.0.1 added several bug fixes, including these particularly important ones.

For information about Neural Network Toolbox 4.0.1 features that are incorporated from Version 4.0, see "New Features" on page 2-2 of the Neural Network Toolbox 4.0 Release Notes.

## Proper Use of Validation and Test Data

The Neural Network Tool now uses the optional validation and test data properly when training.

## Correct Version 3 Object Loading

Neural network objects saved under Version 3 now load correctly under Version 4.0.

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# Neural Network Toolbox 4.0 Release Notes

# New Features

This section introduces the new features and enhancements added in the Neural Network Toolbox 4.0 since the Neural Network Toolbox 3.0.1 (Release 11.0).

## Control System Applications

A new "Control Systems" chapter of the *Neural Network Toolbox User's Guide* presents three practical control systems applications:

- Network model predictive control
- Model reference adaptive control
- Feedback linearization controller

## Visual Interface

A visual interface has been added to the toolbox. This interface allows you to:

- Create networks
- Enter data into the visual interface
- Initialize, train, and simulate networks
- Export the training results from the visual interface to the command line workspace
- Import data from the command line workspace to the visual interface

To open the Network/Data Manager window, type `nntool`.

**Note** This visual interface is not supported on the HP and IBM platforms. You can achieve the same functionality by using the MATLAB command window.

## New Training Functions

The Neural Network Toolbox now has four training algorithms that apply weight and bias learning rules. One algorithm applies the learning rules in batch mode. Three algorithms apply learning rules in three different incremental modes:

- `trainb` – Batch training function
- `trainc` – Cyclical order incremental training function
- `trainr` – Random order incremental training function
- `trains` – Sequential order incremental training function

All four functions present the whole training set in each epoch (pass through the entire input set).

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**Note**  We no longer recommend using `trainwb` and `trainwb1`, which have been replaced by `trainb` and `trainr`. The function `trainr` differs from `trainwb1` in that `trainwb1` only presented a single vector each epoch instead of going through all vectors, as is done by `trainr`.

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These new training functions are relatively fast because they generate M-code. The functions `trainb`, `trainc`, `trainr`, and `trains` all generate a temporary M-file consisting of specialized code for training the current network in question.

## Design of General Linear Networks

The function `newlind` now allows you to design linear networks with multiple inputs, outputs, and input delays.

## Improved Early Stopping

Early stopping can now be used in combination with Bayesian regularization. In some cases this can improve the generalization capability of the trained network.

## Generalization and Speed Benchmarks

Generalization benchmarks comparing the performance of Bayesian regularization and early stopping are provided. Also included are speed benchmarks, which compare the speed of convergence of the various training algorithms on a variety of problems in pattern recognition and function approximation. These benchmarks can aid you in selecting the appropriate algorithm for your problem.

## Demonstration of a Sample Training Session

A new demonstration that illustrates a sample training session is included in the "Backpropagation" chapter of the *Neural Network Toolbox User's Guide*. A sample training session script is also provided. You can modify this script to fit your problem.

# Upgrading from an Earlier Release

This section describes the upgrade issues involved in moving from the Neural Network Toolbox 3.0 to the Neural Network Toolbox 4.0.

## Use of trainwb and trainwb1 Not Recommended

We no longer recommend using `trainwb` and `trainwb1`, which have been replaced by `trainb` and `trainr`. The function `trainr` differs from `trainwb1` in that `trainwb1` only presented a single vector each epoch instead of going through all vectors, as is done by `trainr`.