Function Reference

Analysis Functions

- **Errsurf**: Error surface of a single input neuron.
- **Maxlinlr**: Maximum learning rate for a linear neuron.

Distance Functions

- **Boxdist**: Distance between two position vectors.
- **Dist**: Euclidean distance weight function.
- **Linkdist**: Link distance function.
- **Mandist**: Manhattan distance weight function.

Graphical Interface Function

- **Nntool**: Neural Network Tool - Graphical User Interface.
Function Reference

Layer Initialization Functions
- Initnw: Nguyen-Widrow layer initialization function.
- Initwb: By-weight-and-bias layer initialization function.

Learning Functions
- Learncon: Conscience bias learning function.
- Learngd: Gradient descent weight/bias learning function.
- Learngdm: Grad. descent w/momentum weight/bias learning function.
- Learnh: Hebb weight learning function.
- Learnhd: Hebb with decay weight learning rule.
- Learnis: Instar weight learning function.
Function Reference

Learning Functions

- Learnk: Kohonen weight learning function.
- Learnlv1: LVQ1 weight learning function.
- Learnlv2: LVQ2 weight learning function.
- Learnos: Outstar weight learning function.
- Learnp: Perceptron weight and bias learning function.
- Learnpn: Normalized perceptron weight and bias learning function.
- Learnsom: Self-organizing map weight learning function.
- Learnwh: Widrow-Hoff weight and bias learning rule.

Line Search Functions

- Srchbac: One-dim. minimization using backtracking search.
- Srchbre: One-dim. interval location using Brent’s method.
Function Reference

Line Search Functions (Con.)
- Srchcha: One-dim. minimization using Charalambous’ method.
- Srchgol: One-dim. minimization using Golden section search.
- Srchhyb: One-dim. minimization using Hybrid bisection/cubic search.

Net Input Derivative Functions
- Dnetprod: Product net input derivative function.
- Dnetsum: Sum net input derivative function.

Net Input Functions
- Netprod: Product net input function.
- Netsum: Sum net input function.
Function Reference

Network Initialization Functions

- Initlay: Layer-by-layer network initialization function.

Network Use Functions

- Adapt: Allow a neural network to adapt.
- Disp: Display a neural network's properties.
- Display: Display a neural network variable’s name and properties.
- Init: Initialize a neural network.
- Sim: Simulate a neural network.
- Train: Train a neural network.
Function Reference

New Networks Functions

- Network: Create a custom neural network.
- Newc: Create a competitive layer.
- Newcf: Create a cascade-forward backpropagation network.
- NewElm: Create an Elman backpropagation network.
- Newff: Create a feed-forward backpropagation network.
- Newfftd: Create a feed-forward input-delay backprop network.
- Newgrnn: Design a generalized regression neural network.
- Newhop: Create a Hopfield recurrent network.
- Newlin: Create a linear layer.
- Newlind: Design a linear layer.
- Newlvq: Create a learning vector quantization network.
Function Reference

- Newp: Create a perceptron.
- Newpnn: Design a probabilistic neural network.
- Newrb: Design a radial basis network.
- Newrbe: Design an exact radial basis network.
- Newsom: Create a self-organizing map.

**Performance Derivative Functions**
- Dmae: Mean absolute error performance derivative function.
- Dmse: Mean squared error performance derivatives function.
- Dmsereg: Mean squared error w/reg performance derivative function.
- Dsse: Sum squared error performance derivative function.
Function Reference

Performance Functions
- Mae: Mean absolute error performance function.
- Mse: Mean squared error performance function.
- Msereg: Mean squared error w/ reg performance function.
- Sse: Sum squared error performance function.

Plotting Functions
- Hintonw: Hinton graph of weight matrix.
- Hintonwb: Hinton graph of weight matrix and bias vector.
- Plotbr: Plot network perf. for Bayesian regularization training.
- Plotep: Plot weight and bias position on error surface.
- Plotes: Plot error surface of single input neuron.
Plotting Functions (Con.)

- **Plotpc**: Plot classification line on perceptron vector plot.
- **Plotperf**: Plot network performance.
- **Plotpv**: Plot perceptron input target vectors.
- **Plot**: perceptron input target vectors.
- **Plotsom**: Plot self-organizing map.
- **Plotv**: Plot vectors as lines from the origin.
- **Plotvec**: Plot vectors with different colors.

Pre and Post Processing Functions

- **Postmnmx**: Unnormalize data which has been norm. by **prenmmx**.
- **Postreg**: Postprocess network response w. linear regression analysis.
Pre and Post Processing Functions (Con.)

- **Poststd**: Unnormalize data which has been normalized by prestd.
- **Premnmx**: Normalize data for maximum of 1 and minimum of -1.
- **Prepca**: Principal component analysis on input data.
- **Prestd**: Normalize data for unity standard deviation and zero mean.
- **Tramnmx**: Transform data with precalculated minimum and max.
- **Trapca**: Transform data with PCA matrix computed by prepca.
- **Trastd**: Transform data with precalc. mean & standard deviation.
Function Reference

Simulink Support Function
- Gensim: Generate a Simulink block for neural network simulation.

Topology Functions
- Gridtop: Gridtop layer topology function.
- Hextop: Hexagonal layer topology function.
- Randtop: Random layer topology function.

Training Functions
- Trainb: Batch training with weight and bias learning rules.
- Trainbr: Bayesian regularization.
- Trainc: Cyclical order incremental update.
- Traincgb: Powell-Beale conjugate gradient backpropagation.
Function Reference

Training Functions

- Traincfgf: Fletcher-Powell conjugate gradient backpropagation.
- Traincgp: Polak-Ribiere conjugate gradient backpropagation.
- Traingd: Gradient descent backpropagation.
- Traingda: Gradient descent with adaptive lr backpropagation.
- Traingdm: Gradient descent with momentum backpropagation.
- Traingdx: Gradient descent with momentum & adaptive lr backprop.
- Trainlm: Levenberg-Marquardt backpropagation.
- Trainoss: One step secant backpropagation.
- Trainr: Random order incremental update.
Function Reference

Training Functions (Con.)

- Trainrp: Resilient backpropagation (Rprop).
- Trains: Sequential order incremental update.
- Trainscg: Scaled conjugate gradient backpropagation.

Transfer Derivative Functions

- Dhardlim: Hard limit transfer derivative function.
- Dhardlms: Symmetric hard limit transfer derivative function.
- Dlogsig: Log sigmoid transfer derivative function.
- Dposlin: Positive linear transfer derivative function.
- Dpurelin: Linear transfer derivative function.
- Dradbas: Radial basis transfer derivative function.
Function Reference

Transfer Derivative Functions (Con.)
- Dsatlin: Saturating linear transfer derivative function.
- Dsatlins: Symmetric saturating linear transfer derivative function.
- Dtansig: Hyperbolic tangent sigmoid transfer derivative function.
- Dtribas: Triangular basis transfer derivative function.

Transfer Functions
- Compet: Competitive transfer function.
- Hardlim: Hard limit transfer function.
- Hardlims: Symmetric hard limit transfer function.
Function Reference

Transfer Functions (Con.)
- Logsig: Log sigmoid transfer function.
- Poslin: Positive linear transfer function.

Training Functions
- Purelin: Hard limit transfer function.
- Radbas: Radial basis transfer function.
- Satlin: Saturating linear transfer function.
- Satlins: Symmetric saturating linear transfer function.
- Softmax: Softmax transfer function.
- Tansig: Hyperbolic tangent sigmoid transfer function.
- Tribas: Triangular basis transfer function.

Utility Functions
- Calca: Calculate network outputs and other signals.
- Calca1: Calculate network signals for one time step.
Utility Functions (Con.)

- Calce: Calculate layer errors.
- Calce1: Calculate layer errors for one time step.
- Calcgx: Calculate weight and bias performance gradient as a single vector.
- Calcjejj: Calculate Jacobian performance vector.
- Calcjx: Calculate weight and bias performance Jacobian as a single matrix.
- Calcpd: Calculate delayed network inputs.
- Calcperf: Calculate network outputs, signals, and performance.
- Formx: Form bias and weights into single vector.
- Getx: Get all network weight and bias values as a single vector.
Function Reference

- **Setx**: Set all network weight and bias values with a single vector.

**Vector Functions**
- **Cell2mat**: Combine a cell array of matrices into one matrix.
- **Combvec**: Create all combinations of vectors.
- **Con2seq**: Converts concurrent vectors to sequential vectors.
- **Concur**: Create concurrent bias vectors.
- **Ind2vec**: Convert indices to vectors.
- **Mat2cell**: Break matrix up into cell array of matrices.
- **Minmax**: Ranges of matrix rows.
- **Normc**: Normalize columns of matrix.
- **Normr**: Normalize rows of matrix.
- **Pnormc**: Pseudo-normalize columns of matrix.
Function Reference

- Quant: Discretize value as multiples of a quantity.
- Seq2con: Convert sequential vectors to concurrent vectors.
- Sumsqr: Sum squared elements of matrix.
- Vec2ind: Convert vectors to indices.

Weight and Bias Initialization Functions

- Initcon: Conscience bias initialization function.
- Initzero: Zero weight and bias initialization function.
- Midpoint: Midpoint weight initialization function.
- Randnc: Normalized column weight initialization function.
- Randnr: Normalized row weight initialization function.
- rands: Symmetric random weight/bias initialization function.
Function Reference

Weight and Bias Initialization Functions
- **Revert**: Change ntwk wts. and biases to prev. initialization values.

Weight Derivative Function
- **Ddotprod**: Dot product weight derivative function.

Weight Functions
- **Dist**: Euclidean distance weight function.
- **Dotprod**: Dot product weight function.
- **Mandist**: Manhattan distance weight function.
- **Negdist**: Negative distance weight function.
- **Normprod**: Normalized dot product weight function.
Function Reference

Transfer Function

- **Compet**: Competitive transfer function.
- **Hardlim**: Hard limit transfer function.
- **Hardlims**: Symmetric hard limit transfer function.
- **Logsig**: Log sigmoid transfer function.
- **Poslin**: Positive linear transfer function.
- **Purelin**: Linear transfer function.
- **Radbas**: Radial basis transfer function.
- **Satlin**: Saturating linear transfer function.
- **Satlins**: Symmetric saturating linear transfer function.
- **Softmax**: Softmax transfer function.
- **Tansig**: Hyperbolic tangent sigmoid transfer function.
- **Tribas**: Triangular basis transfer function.