ANN & R Programming

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Overview

Character Recognition

Many Optical Character recognition softwares (OCR) exist. Their basic functionality is to be able to parse and guess the characters that may be handwritten or typed. But my scope is not as big. In this project a very basic character recognition is implemented. Two learning rules are implemented to guess the correct output. Two kinds of recognition is done in this project.

- Pattern Classification

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- Pattern Classification
- Pattern Association

Overview

- `RSNNS`

All these packages can be installed from the repository using `install.packages(package_name)`

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Overview

My Goal

Very Basic Pattern Recognition

- Accept images from the user

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- Train the network with a few known input images.

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Very Basic Pattern Recognition

- Accept images from the user
- Train the network with a few known input images.
- Make the Network guess the unkown input.

Overview

Encode Input

- From the user get an image of 9*9 pixels.

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- From the user get an image of 9*9 pixels.
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- Transform the input into a matrix of bi-polar numbers which will be fed into the network.

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Decode Output

Pattern Classification

- The network will output a sequence of binary numbers

Pattern Association

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- The network will output a sequence of binary numbers
- Decode this number into an ASCII character

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Pattern Association

- The network will output a sequence of binary numbers
- Decode this number into an pixmap image
- Plot or draw this image on the window

Overview

Learning Rules

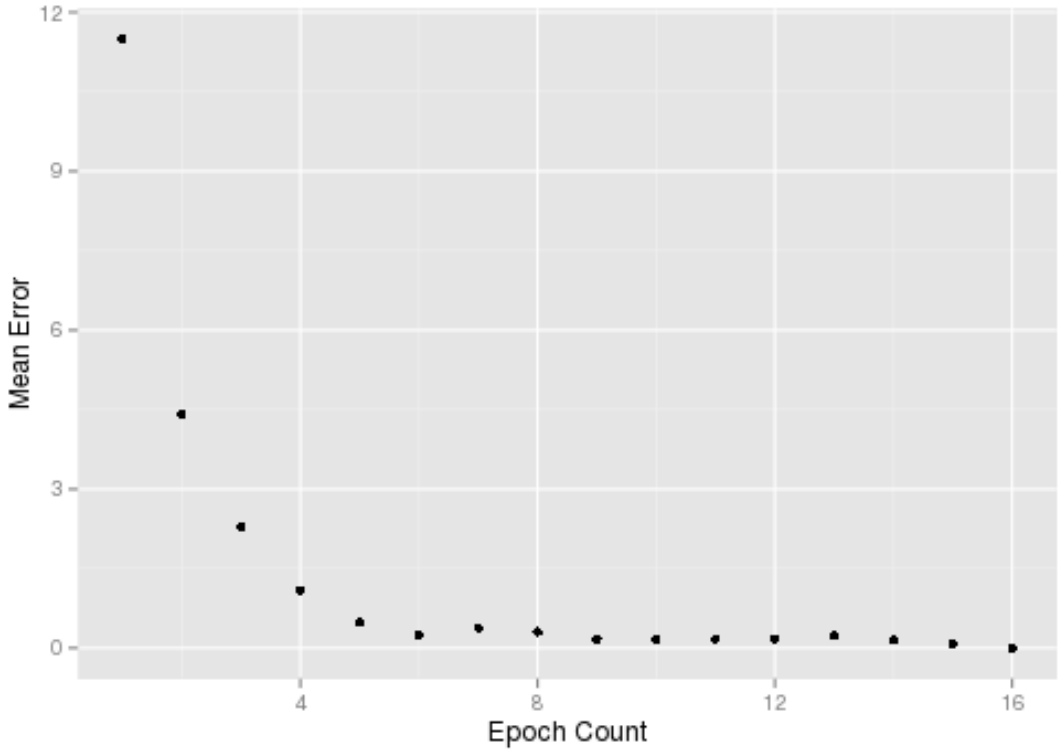
- Hebbian Learning Rule
- Perceptron Rule
- Delta Learning Rule
- Backpropagation

Overview

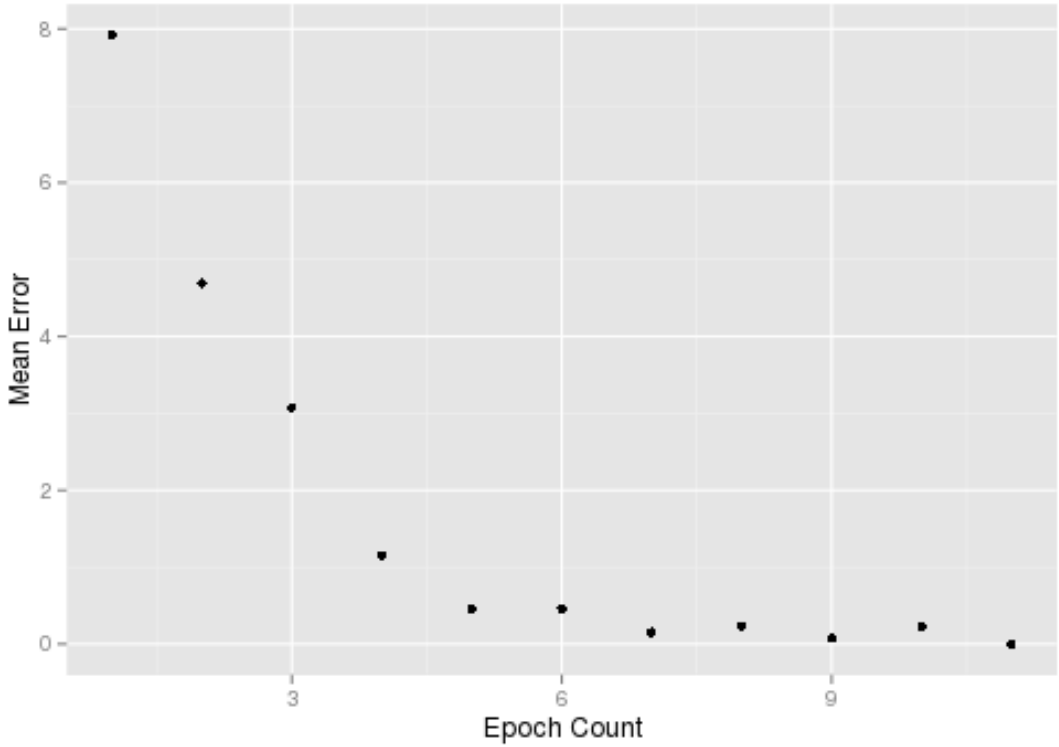
Error Graphs Mean Error against epoch times. The graphs tell us how the learning has taken place.

- MLP Backpropagation (classification)
- My Perceptron Implementation
- Delta Learning
- MLP Backpropagation (association)

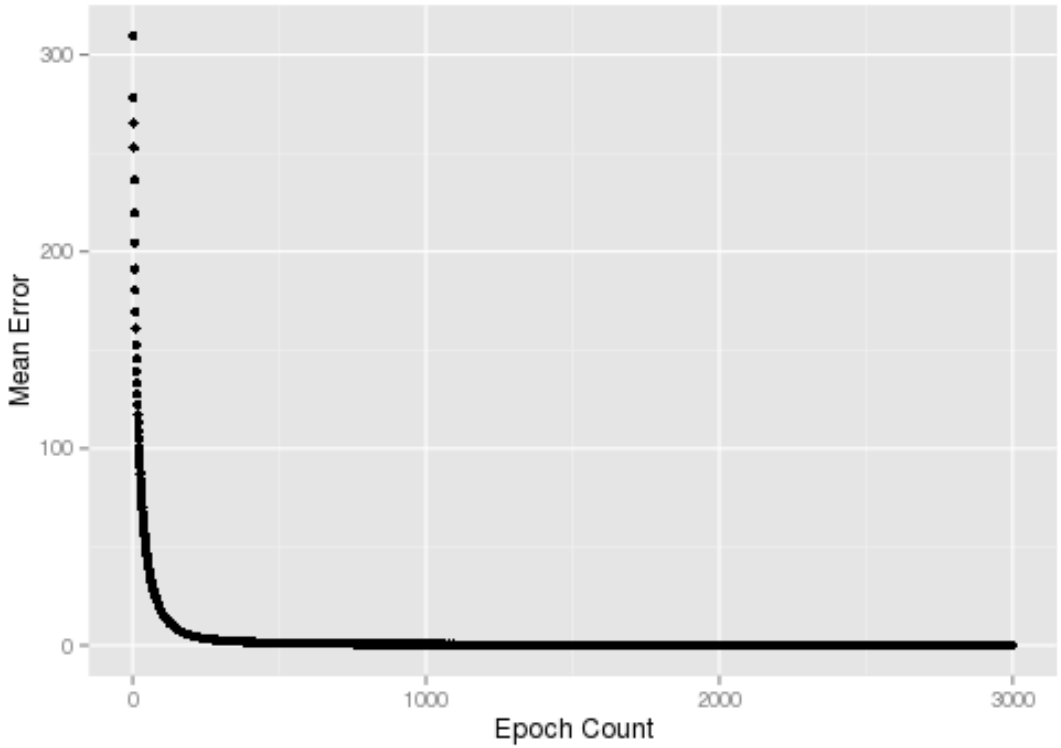
My Perceptron Error Reduction Curve



Delta Rule Error Reduction Curve

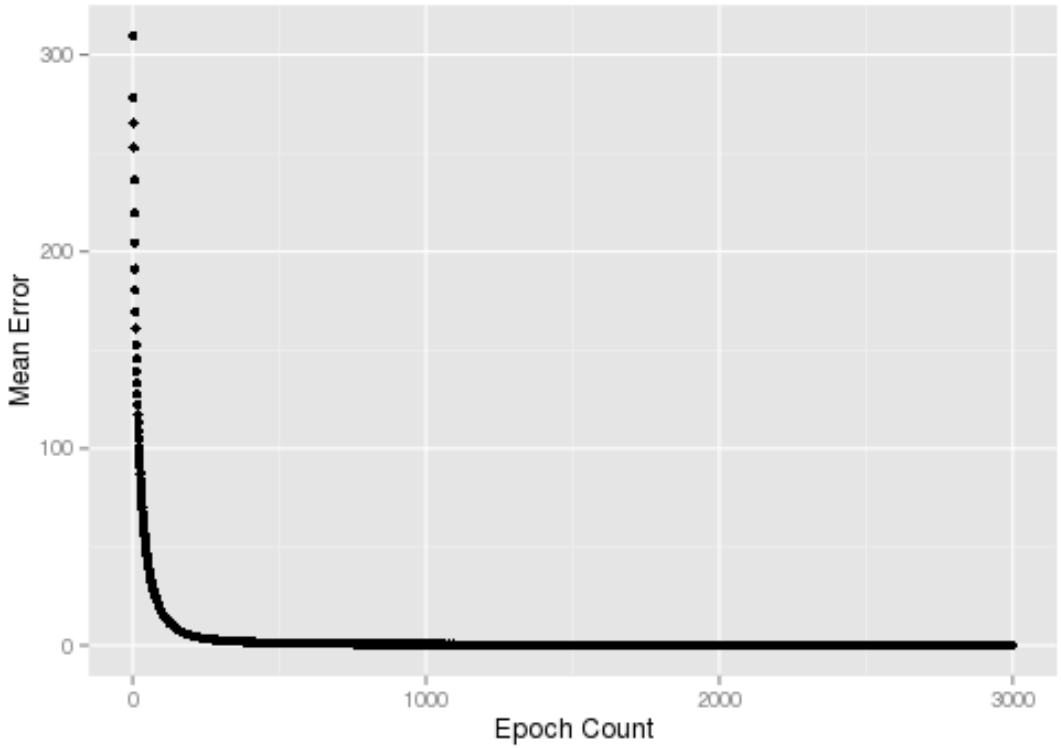


Multi-Layer Perceptron (Classification) Error Reduction Curve



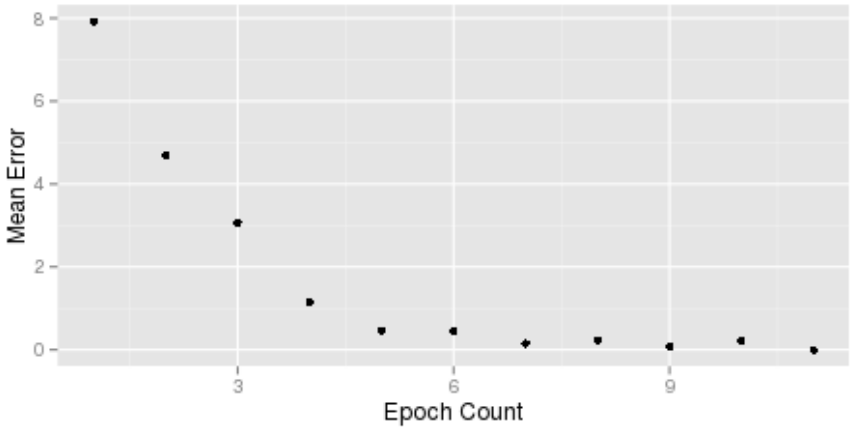
RSNNS Package network

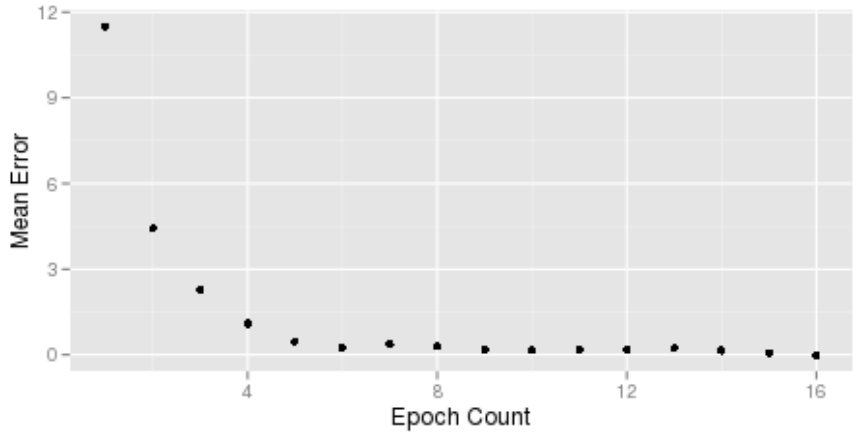
Multi-Layer Perceptron (Association) Error Reduction Curve

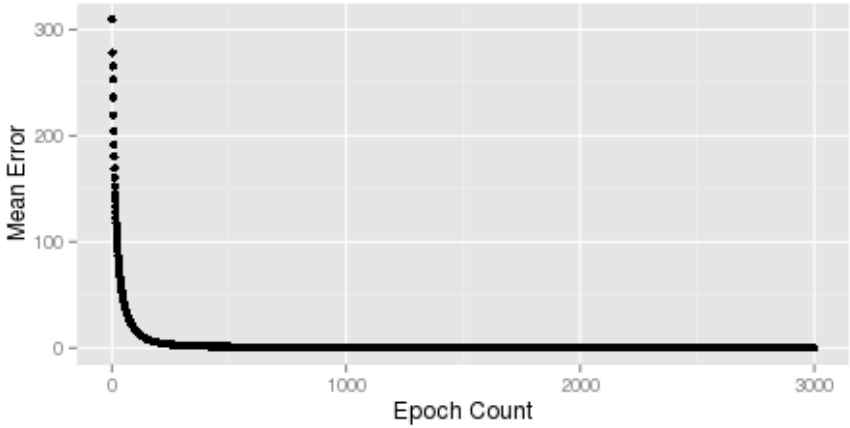


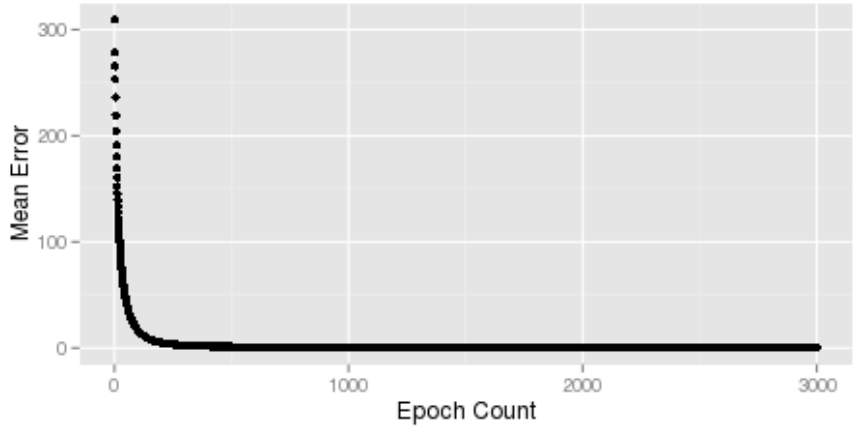
RSNNS Package network

Comparison between all Four









Overview

Performance Times

- MLP Backpropagation (classification) (6.650 sec)
- My Perceptron Implementation (3.155 sec)
- Delta Learning (2.817 sec)
- Hebbian Rule (association) (0.023 sec)
- MLP Backpropagation (association) (8.685 sec)

Overview

References


FundamentalsofNeuralNetworks(LaureneFausett)


Neural Networks in R Using the Stuttgart Neural Network Simulator: RSNNS


Packages manual pages


IntroductiontoNeuralNetworksusingMATLAB

Thank you

Thank You!