

# Explorations in Neural Networks

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## Abstract

Artificial neural networks model the circuitry of biological neurons. Inspired by the brain, they may share common properties with their biological counterparts, although they may be distinctly different. For example, the topology of the connections of neurons in an Adaline network (single-layered backpropagation network) will not be the same as those in a multi-layer backpropagation network. The size and number of layers in a neural network also influence its accuracy in its applications. In this project, different variations on neural networks will be tested and evaluated on their performance in recognizing handwritten characters. Genetic algorithms and fuzzy logic may be used for various applications.

## Background

Neural networks model biological neural systems. Although each component is simple, because the entire network is highly connected, neural networks can model highly complex, nonlinear systems and can be proficient in classification and pattern recognition.

Research on neural networks has been in existence for several decades. In particular, the use of neural networks for classification has been used. Le Cun et al at AT and T laboratories has demonstrated that with a particular set of connections with a multi-layered perceptron, handwritten digit recognition can be done extremely efficiently.

## Procedure and Methods

Neural networks will be written in JAVA. Different variations on neural networks will be written and tested to see how well they can recognize handwritten characters. After a neural network is created, it will be trained on a set of data, and then tested using a different set of data. The data set will be made up of images in black and white of low resolution. Handwritten text samples will be scanned (or retrieved from the internet) and then parsed into a readable form and used to train the neural networks.

## Results and Conclusion

This section cannot be completed at the moment.

## Testing

The project will be deemed successful if the neural networks created can successfully identify handwritten characters.

To test if the program works, a neural network will be trained with test data. Then, the network will be tested with data that was not from the training sample. If the program can accurately identify the characters, it will be successful.

