

**Neural Network Simulation Classes  
for the NeXT Computer**

**By: Ralph Zazula**

University of Arizona

[zazula@pri.com](mailto:zazula@pri.com) (NeXT Mail)

*July, 29 1992*

This package contains Classes that can be used to create software simulations of neural network architectures. These were written to facilitate rapid creation of code to explore various network topologies and learning algorithms. The Neuron class implements a number of different types of "activation" functions including: Sigmoidal, Sgn, Tanh and Binary and also allows the use a pseudo-temperature to create a stochastic network for use in things such as simulated-annealing. The Neuron class uses a linked-list structure to store and retrieve weights and connections amongst the Neurons resulting in very fast performance.

Also included in the distribution is the Neuron-HT class. This variation of the Neuron class uses a HashTable structure to store the connections and weights. The HashTable data-structure provides constant-time retrieval of the weights and connections but also introduces some overhead. Experimental results showed that the HashTable exhibited faster performance for very large networks (>256 fully-connected Neurons).

The classes contained are:

- Neuron** Implements a number of different types of neurons
- Neuron-HT** Same as above with HashTable data-structure
- BackPropEngine** Implements a back-propagation network

The Example files are:

- bptest** An example of using the BackPropEngine (BPE) to perform the identity function
- boltz** An example of using stochastic Neurons to implement a

Boltzman machine. This example implements the XOR function

**hoptest** An example of a Hopfield associative-memory network

**weighted\_matching** An neural-network solution to the weighted-matching problem

Other documentation can be found in the Class descriptions, code or example programs. If you have any questions/comments, feel free to write or e-mail me.

An excellent reference on Neural-Networks is: *Introduction to the Theory of Neural Computation* by Hertz, Krogh and Palmer, 1991 - Addison Wesley, Publisher (ISBN 0-201-50395-6)

Ralph Zazula  
zazula@pri.com (NeXT Mail)  
(602)577-1090  
4901 E. Sunrise Dr. Apt. 406  
Tucson, AZ 85718