

# User's Guide to **Pittnet** Neural Network Educational Software

Brian Carnahan and Alice E. Smith  
Department of Industrial Engineering  
1048 Benedum Hall  
University of Pittsburgh  
Pittsburgh, PA 15261  
aesmith@engrng.pitt.edu

April 1997

Funded by NSF Grant DMI-9502134 (CAREER)

# **User's Guide to **Pittnet** Neural Network Educational Software**

## Table of Contents

<u>Section</u>	<u>Page</u>
A. Introduction	2
A.1 Objectives of the <b>Pittnet</b> Program	2
A.2 Hardware and Software Requirements	2
B. Program Initiation and Main Menu Interface	4
B.1 Starting the Program	4
B.2 Specifying the Type of Network	4
C. Feedforward Network Using Backpropagation	6
C.1 Signal Storage Requirements	6
C.2 Required Inputs for Backpropagation Network Construction	6
C.3 Training the Backpropagation Network	7
C.4 Testing the Backpropagation Network	8
C.5 Storing the Backpropagation Network	9
D. Adaptive Resonance Theory Network (ART 1)	12
D.1 Signal Storage Requirements	12
D.2 Required Inputs for ART 1 Network Construction	12
D.3 Training the ART 1 Network	12
D.4 Testing the ART 1 Network	13
D.5 Storing the ART 1 Network	13
E. Kohonen Self-Organizing Map	16
E.1 Signal Storage Requirements	16
E.2 Required Inputs for Kohonen Self-Organizing Map Construction	16
E.3 Training the Kohonen Self-Organizing Map	17
E.4 Testing the Kohonen Self-Organizing Map	17
E.5 Storing the Kohonen Self-Organizing Map	18
F. Radial Basis Function Network	20
F.1 Signal Storage Requirements	20
F.2 Required Inputs for Radial Basis Function Network Construction	20
F.3 Training the Radial Basis Function Network	20
F.4 Testing the Radial Basis Function Network	21
F.5 Storing the Radial Basis Function Network	22
G. Information Form	24

## **A. Introduction**

### *A.1 Objectives of the **Pittnet** Program*

The purpose of this computer program is to allow the user to construct, train and test different types of artificial neural networks. By implementing the concepts of templates, inheritance and derived classes from C++ object oriented programming, the necessity for declaring multiple large structures and duplicate attributes is reduced. Utilizing dynamic binding and memory allocation afforded by C++, the user can choose to develop four separate types of neural networks:

- Feedforward Network for control or prediction problems
- ART 1 Network for clustering binary signals
- Kohonen Self-Organizing Map for clustering real valued signals
- Radial Basis Function Networks for control or prediction problems

Once a network is selected, the user has the option of either uploading an existing neural network, or creating a new neural network. In designing each new network, the user can specify topology by selecting the number of layers and nodes per layer that are appropriate. The **Pittnet** program allows attributes of newly constructed networks to be stored for examination and also to be recalled for further training or testing. The networks developed by this program can supplement introductory instruction in the field of artificial neural computing.

### *A.2 Hardware and Software Requirements*

With regard to hardware and software requirements, the **Pittnet** program must be run in the DOS environment only. A 486DX2 66 MHz personal computer (PC) or PC of higher grade is required for successful use of the program. The **Pittnet** program consists of two files:

1. pittnet.exe            executable file of the **Pittnet** program
2. pittnet.cpp            source code file of the **Pittnet** program