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Application of Neural Networks to Seismic Signal Discrimination Research Findings

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13. ABSTRACT *(Maximum 200 words)* Research focused on identification and collection of a suitable database, identification of parametric representation of the time series seismic waveforms, and the training and testing of neural networks for seismic event classification. It was necessary to utilize seismic events that had a high degree of reliability for accurate training of the neural networks. The seismic waveforms were obtained from the Center for Seismic Studies and were organized into smaller databases for training and classification purposes. Unprocessed seismograms were not well suited for presentation to a neural network because of the large number of data points required to represent a seismic event in the time domain. The parametric representation of the seismic events in some cases provided adequate information for accurate event classification, while significantly reducing the minimum size of the neural network. Various networks have achieved classification rates ranging from 88 percent classification of three class problem to 75 percent for the 5 class problem. The results vary dependent on the number of of classes and the method of parametric transformations utilized. Multiple tests were performed in order to statistically average the training and classification rates. Test summaries presented and individual test results are given in the appendix.
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1. INTRODUCTION

This research effort focuses on the viability of using Neural Networks to classify seismic events using only parametric data automatically extracted from the original seismogram along with the official classification as determined by the Center for Seismic Studies. In contrast to existing knowledge-based systems, this method is not based upon seismological expertise. Parametric waveform representation requires that the essential characteristics of a particular event type are adequately represented by the transformations utilized. Prerequisite background information was reviewed in the first technical report of this project [15] and is used as reference throughout this report. A brief investigation using fuzzy logic in lieu of neural networks for seismic event classification was conducted as a related research interest that was indirectly sponsored by this research in terms of database usage and seismic event processing.

The seismological aspects of this research could potentially require extensive background training within the field of seismology. By approaching the seismology problem as a signal classification problem, as opposed to that of a purely seismic problem, familiarity with seismic phase identification, travel times and related considerations can be somewhat over looked. At this point, the classification problem depends more on traditional signal processing algorithms and supervised learning with neural networks. The carefully constructed data base used in this research, allows efforts to concentrate mainly on the application of Neural Networks to the solution of the problem. This data base includes only seismic events that have been analyzed by seismologists and are considered to be correct in terms of parametric data and event classification.

In order to test the usefulness of this system, a data base of waveforms from the Center for Seismic Studies containing time series data as well as parametric data was utilized. The seismic wave forms contained in the data base have been analyzed by seismic experts as to the event classification, magnitude, location and a host of other information. These wave forms are from the GSETT data base and allow for supervised learning of their classification by the different neural networks. The system applies signal preprocessing for translation of time series seismic data into parametric data. This parametric data was then directly applied to the neural networks.

1.1 Database

The Center for Seismic Studies (CSS) is an agency funded by DARPA with the principle objective of providing the research community easy access to data involving treaty monitoring seismology [12]. Wave form and parametric data are available on-line with access to the Central Data Repository via Internet. The data base used in this research is listed by filename, station and Julian date in Appendix A. All of the wave forms listed in these tables are a small subset of the GSETT database base available from CSS [4,5]. These wave forms were produced by the Washington Experimental International Data Center (EIDC) from a 71 day test with data collected from 60 globally distributed stations. This GSETT data was produced for the UN Conference on Disarmament/Group of Scientific Experts Technical Test (1990-1991). The data set includes solutions generated by expert systems, and was reviewed by seismic analyst. The entire GSETT data base was made available on CD-ROM, but the on-line access via Internet was used for actual collection of a test data base. The CSS provides SQL data base management along with special purpose software entitled CenterView developed by CSS.

The GSETT data base contains 1,067 discrete events with 101,364 wave form segments and requires 1.418 GBytes of storage. Two smaller data bases where constructed from GSETT. One set of 75 wave forms (Appendix A) represents 5 event types with 15 different events per type collected from a range of recording stations. The small data set only contains 3 event types from a single recording station. Both data base subsets were carefully checked for reliability of event classification. CSS is actively creating a data base considered to be a Ground Truth Data Base in which the classification and location are verified by a human observer. This data base is set for initial release during the spring of 1993. Discussion with CSS confirms that most of the 75 wave form used in this research are of a high degree of reliability in terms of analytical accuracy with many seismic traces due to be included in the Ground Truth Data Base [37].

1.2 Research Procedure

Three major testing schemes were utilized in this investigation, Individual parametric transformations, such as ARMA coefficients, were generated and used as input to neural networks for training and testing. The transformations that were found to yield classification results better than approximately 40 percent with a backpropagation network were then subjected to a larger series of tests to access the statistical significance of the transformation. A third exploratory scheme combined different transformations into a single training set for application to the neural network.

A literature search suggests many different signal transformations for the reduction of raw seismic waveform data into parametric data. The transformations listed below were experimentally used to generate parametric data for subsequent training and classification with neural networks.

ARMA modeling
Spectrograms
Scalograms
Moment Features
Cumulants
Bispectrum Analysis
Chaotic Model
Waveform Envelope
Signal Duration

Fractal Dimension
Density Functions
Dominate Frequency

Adaptive filters were used with some of the mentioned transforms for the reduction of periodic components in the seismic trace. The adaptively filtered signals would often improve the neural network's classification by 20 percent. Single dimension Kalman filters were tested as a means of pre-whitening the seismic waveform but did not provide any consistent improvement in the neural network's classification.

The comprehensive test series of the database generated from the GSETT data was converted into various parametric test files. Each type of parametric conversion was randomized onto 23 different training and classification schemes. Eleven different parametric conversions were developed yielding 253 different test cases. Each test case was trained on a backpropagation, supervised Kohonen and a Radial Basis neural network. The backpropagation networks were each trained for 10,000 iterations with a fixed learning rate and momentum. Training time averaged 10 - 12 hours on an IBM model 70- 386/20 MHz P.C. The results are summarized in Chapter 3 and detailed results are presented in Appendix B.

The neural network software developed for the research was ported to a DEC VAX and a SUN system. Program run times for the VAX, SUN and a 486/66 MHz P.C. were observed to be within 20 percent for each test run on each platform. Final software development was restricted to a P.C. based platform due to the availability of multiple computers.

1.3 Organization

This introductory chapter, Chapter 1, has offered a somewhat broad description of the seismic discrimination problem. A more detailed description of the seismic problem and associated background information can be found in the first technical report of this project [15]. The first report discusses some of the current research methods for seismic discrimination leading to the incorporation of neural networks for seismic event classification. The various tables listed in Appendix A with seismic waveform names, stations and Julian dates are sufficient references such that anyone accessing the on-line database at the Center for Seismic Studies can retrieve the related seismic waveforms. The related software tools developed in later chapters, were implemented in the ADA language and are detailed in a companion report [16] of on the software developed and parametric transformation routines.

The remainder of this report is divided into three chapters. Chapter 2 provides a brief overview of the parametric transformations considered as well as revisions to methods described in the first scientific report of this project [15].

The detailed testing procedure and test results are given in Chapter 3.

2. Parametric Transformation and Data Reduction

The use of linguistic descriptors and heuristics is prevalent in the field of seismology. First arrival phase, dominate frequency, event magnitude, event type, and duration are a few of the descriptors obtained after an analysis of a seismic trace. All of these descriptors are contingent upon the ability of a seismic expert. Parametric data is extracted directly from the time series seismic waveforms and evaluated with neural networks without a seismic expert in the evaluation process.

Parametric transformations are examined in this chapter. Several of these methods were originally presented in the first scientific report on this project [15], but are included here to reflect changes. The ARMA model is discussed in detail along with a revised development of the fractal dimensions, sonograms, dominate frequency and moment feature maps. Bispectrum analysis was tested along with some preliminary work with fuzzy logic networks. In each case, some of the intermediate test results are presented. More formal testing and results are detailed in Chapter 3.

A investigation of Fuzzy Logic was undertaken in hopes of exploiting some of the heuristic rules. Linguistic rule maps are normally the basis of fuzzy logic inference. These maps are now combined with Fuzzy Associative Memories (FAM) trained with moment feature maps. The combination of both rule maps and FAM's effectively uses heuristics and the extracted features from the seismic trace. The heuristics represent rules that a seismic expert might use as a basis for classification decisions. The FAM's can be trained with information embedded in the seismic trace that is not apparent or easily associated with a meaningful descriptor.

2.1 ARMA Coefficient Modeling

Several of the heuristics stated in the first technical report [15] deal with the dominant frequency of the first arrival wave of a seismic signal. These heuristics offer information on local, regional, and teleseismic events only; no information is provided for man-made events such as marine explosions or quarry blasts.

Many of the given heuristics are limited to natural events, additional information must be provided for further discrimination of man-made events. One method of creating this information is in generating the power spectrum for each seismic event. The power spectrum may be obtained by processing the time series data through a FFT. However, the resulting frequency data is as large as the original time data. As the original time series contains 2400 points, the data size must be reduced since a 2400 point vector is excessively large for neural network training and classification.

One method of retaining the frequency information while significantly reducing the volume of data is in generating the ARMA filter coefficients. The ARMA filter is designed from the time series data and can approximate the original frequency response with a filter of proper order.

As the ARMA model significantly reduces the amount of data, it was decided to include information pertaining to the frequency variation over time which is accomplished by windowing the time series data. The process of widowing divides the data into a specified number of consecutive segments. Each segment or time slice is usually of equal size or duration.

2.1.1 ARMA Model Derivation

The time domain design problem can be stated as follows:

Given a sequence g(n), n = 0, 1, ..., K, design a digital system of prescribed degree such that its impulse response h(n) approximates g(n) as well as possible.

This problem arises as an unusual design task. In many cases, g(n) is the sampled output of a continuous system. When this occurs, the unknown system is to be modeled by a rational transfer function. The modeling of the system is very important. The modeling procedure described here was named for Prony who developed it in 1795 for problems in gas and hydro mechanics.

Let the transfer function H(z) be designed to be

$$H(z) = \frac{\sum_{k=0}^{p} b_k \cdot z^{-k}}{1 + \sum_{k=1}^{p} a_k \cdot z^{-k}} = \sum_{n=0}^{\infty} h(n) \cdot z^{-n} \qquad (2.1.1)$$

where p is an element of the set of natural numbers. Here, the order of the numerator and denominator are assumed to be equal. First, the number of given values g(n) is chosen to be equal to the number of coefficients to be determined. At least one recursive system always exists, the impulse response of which satisfies exactly the condition

$$h(n) = g(n), \quad n = 0, 1, \ldots, K \,. \qquad (2.1.2)$$

Multiplying Eq. (2.1.1) by the denominator, substituting for Eq. (2.1.2), and comparing the terms of equal order, you get the matrix equations shown below.

$$
\begin{bmatrix} b_0 \\ b_1 \\ \vdots \\ b_{(p-1)} \\ b_p \\ \hline 0 \\ \vdots \\ 0 \end{bmatrix}
=
\begin{bmatrix}
g(0) & 0 & & \cdots & & 0 \\
g(1) & g(0) & & & & \vdots \\
\vdots & & & \ddots & & \\
g(p-1) & & g(1) & g(0) & & 0 \\
g(p) & \cdots & g(2) & g(1) & & g(0) \\
\hline
g(p+1) & & & g(2) & & g(1) \\
\vdots & & \ddots & & & \vdots \\
g(2p) & \cdots & & g(p+1) & & g(p)
\end{bmatrix}
*
\begin{bmatrix} 1 \\ a_1 \\ \vdots \\ a_{(p-1)} \\ a_p \end{bmatrix}
\qquad (2.1.3)
$$

The indicated partition in Eq. (2.1.3) leads to the pair of matrix equations

$$
\mathbf{b} = \mathbf{G}_1\mathbf{a} \qquad (2.1.4a)
$$

and

$$
\mathbf{0} = \mathbf{G}_2\mathbf{a} \qquad (2.1.4b)
$$

where $\mathbf{G}_1$ is a (p+1) x (p+1) lower triangular toeplitz matrix, and

$$
\mathbf{G}_2 = [\, \mathbf{g}_1, \mathbf{g}_2, \ldots, \mathbf{g}_{p+1} \,] \qquad (2.1.4c)
$$

is a p x (p+1) rectangular matrix. Equation (2.1.4a) yields the vector $\mathbf{b}$ of the numerator coefficients for any denominator such that the impulse response has the desired values for $n = 0, 1, \ldots, p$.

To calculate the denominator, we write Eq. (2.1.4b) as

$$
\begin{aligned}
\mathbf{0} &= \mathbf{g}_1 + [\, \mathbf{g}_2, \ldots, \mathbf{g}_{p+1} \,] * \mathbf{a}' \\
&= \mathbf{g}_1 + \mathbf{G}_3 * \mathbf{a}'
\end{aligned}
$$

where $\mathbf{a}' = [\, a_1, a_2, \ldots, a_p \,]^T$ is the vector of the unknown coefficients.

If G3 has rank p, we obtain

$$
\mathbf{a}' = -\mathbf{G}_3^{-1} * \mathbf{g}_1 \ . \qquad (2.1.5)
$$

Together with $\mathbf{b}$ from Eq. (2.1.4a) we then have all coefficients of H(z).

2.1.2 ARMA Coefficient Extraction

Once the method for creating the ARMA coefficients has been determined, the next step is to implement the feature extraction. The Prony method as described above handles ARMA modeling through matrix manipulation. At this point, the Matlab™ software package was chosen for feature extraction. Matlab is a software package which was written for the processing of mathematical functions especially in its handling of matrices. Direct implementation of the Prony method can be accomplished using the *prony* command. The command format is

[b , a] = prony(h, nb, na)

where
b = numerator coefficients in descending powers of z
a = denominator coefficients in descending powers of z
h = desired impulse response
nb = numerator order
na = denominator order.

After calculating the filter coefficients, the results are stored with the exception of the constant 1 of the denominator. This constant 1, the a_0 term, was left out of the training data since it would be the same for each signal and provided no significant information to the neural networks for training or classification.

The next step in creating a reduced parametric data set is in determining the number of windows and the filter order required to optimize neural network training and classification. By varying both the number of windows and filter order between 2 and 6, a series of 25 data sets were obtained. Each data set was divided into a 45/30 split, 45 signals for training and 30 signals for classification, then placed into a back-propagation neural network for training and classification. Network training was limited to 1000 epochs before event classification.

Table 1 contains the window size and filter order testing. The data of highest importance is the classification percentage. From Table 1, it can be determined that using four windows and a fourth order ARMA model will provide the best training and discrimination results.

Table 1 Test Data for Determining Window Size and Filter Order

Number of Windows	Filter Order: 2	3	4	5	6
2	57 / 10	80 / 6.7	80 / 10	80 / 15	83 / 16
3	78 / 20	87 / 23	84 / 30	86 / 26	86 / 23
4	96 / 13	93 / 22	93 / 35	94 / 30	90 / 26
5	90 / 12	94 / 18	92 / 20	93 / 22	93 / 22
6	94 / 10	95 / 12	95 / 13	94 / 15	95 / 10

Note: Table format is a / b where a is the training % and b is the classification %.

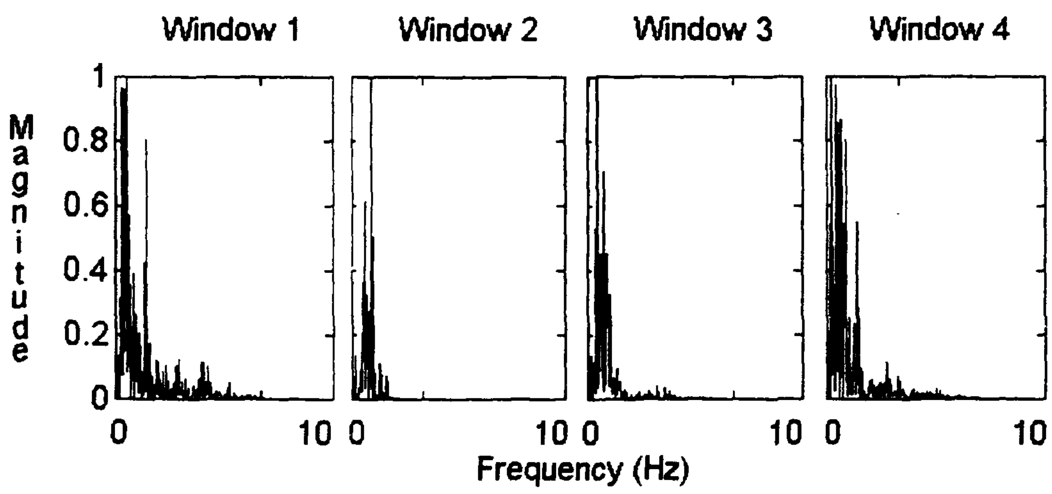

Figure 1 Windowed Frequency Response of Febme16.W

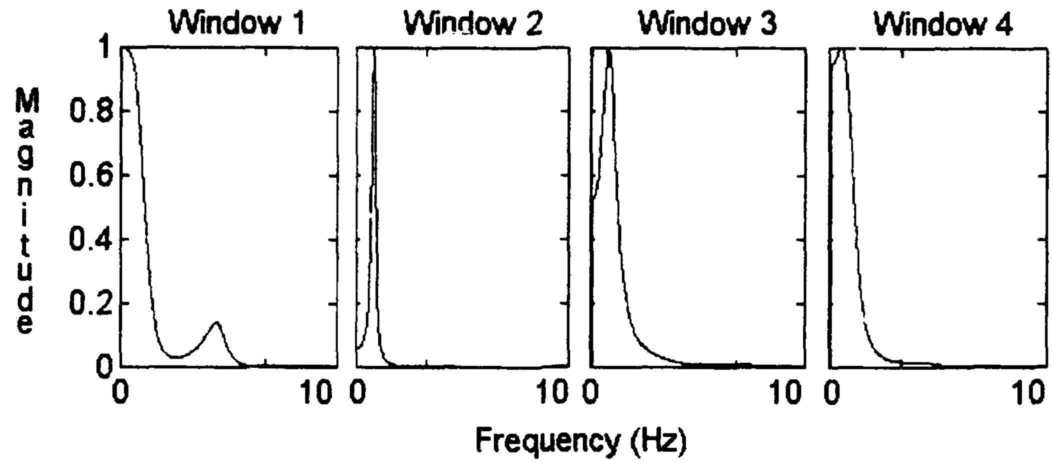

Figure 2 Frequency Response of the ARMA Model

A comparison of the frequency plots of the time series and ARMA model demonstrates the information contained in the reduced parametric data. Figure 1 gives the time series frequency plots for Febme16.W over the chosen four windows. The resulting ARMA filter frequency response plots are contained in Figure 2. A comparison of the respective windows shows the ARMA model to contain the same frequency information as the time series. The resulting ARMA plots are significantly smoother than the time series plots. This is due to the time series plots being created from the actual frequency information contained in the signal while the ARMA plots show the true frequency response curve. The plots shown in Figure 1 and Figure 2 are normalized to a magnitude of one (1) to eliminate any amplitude information. Elimination of amplitude information can be justified as the original project intention was to determine the usefulness of frequency information other than the frequency heuristic of the first arrival wave.

2.2 Fractal Dimension

Examination of various seismic traces suggests a self similarity between successive windowed samples of each trace. Fractal dimension quantifies the self similarity of the graphically presented waveform [64].

While viewed graphically, the waveform occupies a percentage of the two-dimensional graphic space, but does not fill the entire graphic region. A completely filled space (all of the graph colored black on white) would have a dimension of 2. A single line spanning the domain of the graph would have a dimension of 1. The seismic waveform is neither composed of a single line nor does it fill the entire graphic space. The waveform will have a dimension somewhere between 1 and 2 [63].

The generalized case for a graphical object of M parts, each scaled by a ratio of r (where r is the inverse length of the domain space) from the whole, would be

$$M\, r^D = 1 \qquad (2.2.1)$$

where D is defined as the fractal dimension [10].

Solving for D

$$D = \mathrm{Log}\, M \;/\; \mathrm{Log}\, 1/r. \qquad (2.2.2)$$

A single line spanning the domain of a q×q grid of points of a two-dimensional plot would occupy a total of q grid points and the total graph would be scaled by a factor of $r = q$. The fractal dimension for this line is then calculated as

$$D = \mathrm{Log}\, q / \mathrm{Log}\, q = 1$$

which is the expected dimension of a single line.

Now if a waveform is given such that it occupies all grid points (Solid black graph) for a total of q×q points, the fractal dimension would be

$$D = \mathrm{Log}\, q^2 / \mathrm{Log}\, q = 2.$$

A fractal dimension of 2 represents complete coverage of the graph.

The fractal dimension of a seismic trace could be approximately calculated using graphical means by plotting the waveform and counting the number of pixels it occupied in a q×q grid. If M is the number of occupied pixels and q^2 the total number of pixels in the grid, then the fractal dimension is given by

$$D = \mathrm{Log}\, M / \mathrm{Log}\, q. \qquad (2.2.3)$$

For the data sets described in Appendix A, a typical fractal dimension value for seismic waveforms was found to be centered around 1.3.

The graphical method of fractal dimension does not lend itself to processing large amount of data quickly. The graphic process requires plotting of the seismic trace with a second pass through the entire graphic area to sum the number of used pixels. A more direct approach for determining fractal dimension can be implemented based on approximation methods developed for fractal Brownian motion [63]. This method divides a given waveform into N segments and calculates the total length of all the segments. The fractal dimension can then be estimated based on the total waveform length.

Consider a seismic waveform of 2400 data points normalized to a domain of ± 1200 instead of ±1. The waveform is then plotted on a two-dimensional grid of 2400 by

2400 points and can be used for direct calculation of the fractal dimension. The scaling ratio r for N line segments of a seismic waveform with 2400 points becomes

$$r = 1 / (2400\times2400)^{1/2} = 1/2400.$$

The integer distance from one data point to the next data point is summed for a total of the N points (or parts). This is considered the length of a normalized waveform.

$$\text{Total length} = \sum_{k=2}^{N} (1+ (N/2(x_k - x_{k-1}))^2)^{1/2} \qquad (2.2.4)$$

The fractal dimension of the modified grid can be estimated for large N by [63]

$$D = \text{Log (Total length)} / \text{Log (N)}. \qquad (2.2.5)$$

Using the modified grid of 2400×2400 as an example, the fractal dimension is checked with a straight horizontal or vertical line trace of 2400 points. The total line length in this case would be 2400.

$$D = \text{Log } 2400 / \text{Log } 2400 = 1$$

If a completely cluttered waveform is presented such that the total length is equal to the maximum possible length of approximately 2400^2, the fractal dimension would be

$$D = \text{Log } 2400^2 / \text{Log } 2400 = 2.$$

Four variations of the grid dimension method were used for classification. The first variation uses a square window, the number of horizontal and vertical grid elements are equal. The second variation implements a rectangular window where the number of vertical elements is greater than the number of horizontal elements. The third and fourth variations high pass filter the signal before variations one and two are applied.

For each method used, the seismic signal is divided into several time slices, windows, and a fractal dimension calculated for each window. This produced a series of fractal values upon which a neural network was trained and tested for classification.

The neural network has a five neuron output. Each neuron denotes a specific type of event. Since the output neuron values may vary between 0 and 1, the neural network output is processed through a fuzzy rule set to determine final classification. The final results of classification percentages may be seen in Table 2.

Table 2

Fractal Dimension Classification Results

Fractal Dimension Method	**Classification**
Compass dimension	45.30 %
Grid Dimension - No filter	
Square window	4.00 %
Rectangular window	8.00 %
Grid Dimension - High Pass Filter	
Square window	14.67 %
Rectangular window	16.00 %

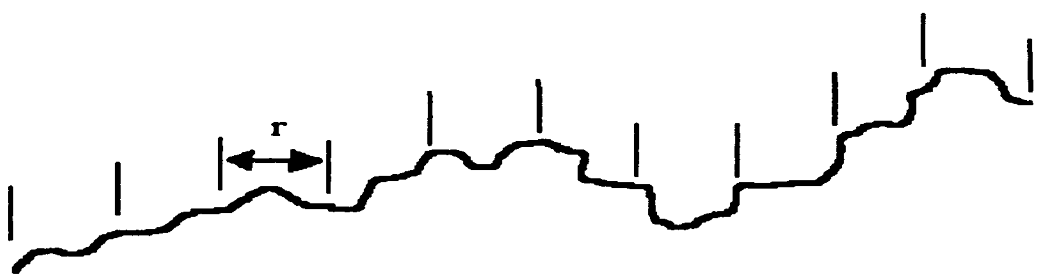

Figure 3 Compass Dimension Method

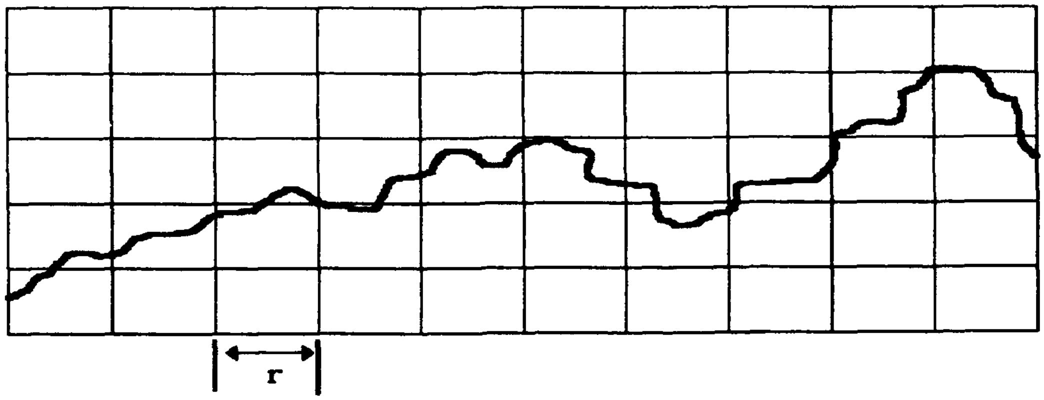

Figure 4 Grid Dimension Method

2.3 Sonograms

The Sonogram is one method of extracting frequency data for presentation to the neural networks for classification of seismic events. The first part of the procedure is to normalize the seismic trace by dividing the entire segment by the largest magnitude in the segment. Then, the seismic trace is "windowed" , divided into equally spaced segments of the original trace size. For example in Subset1, where all waveforms were 2400 samples long, the trace was divided into 32 different segments. This produced 32 segments with 75 samples in each segment. The Fourier transform was taken of each window to created a 3-dimension matrix where the dimension where window, frequency, and magnitude. This array for Wave 1 of Subset 1 can be observed in Figure 5.

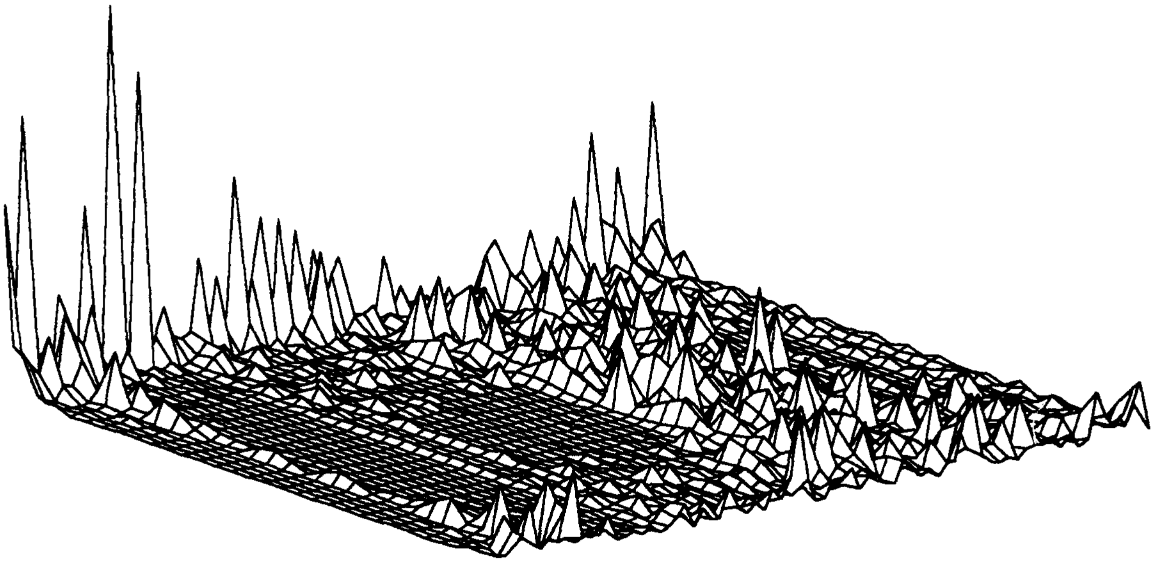

Figure 5 Sonogram of Wavell

The columns of this matrix are transposed and concatenated to form a single vector from the larger matrix. This is performed on a the segment, waveforms, from the database and presented to the network. This created a slight problem since the size of the parametric data was large and cause longer computational time when presented to the network. The routine was extracting too much data.

One method of solving this problem was to have less windows, and another was to choose a method of finding the particular frequency that extract the most information. Using the first method, we found that a 16 windows reduced the size of the data adequately. The second method can be found in the dominant frequency section in this paper.

A backpropagation algorithm was trained on the Subset 1 database with various window sizes. One problem to be noted was that the offset, DC bias, of the waveforms caused some error in the training of the sonogram data. This was due to the magnitude difference of the Fourier transform and the DC offset. Therefore, the waveform mean was subtracted from each segment to remove the offset. This enhance the classification of the data to approximately 87% for the Subset 1 database.

2.4 Dominate Frequency

Heuristics on seismic signals have presented rules which suggest that the dominate frequency of the first arrival phase is an indication of the event type. The specific heuristics are:

1. Cultural noise will have a dominate frequency above 1 Hz.
2. If the dominate frequency of the first arrival is below 2 Hz, then it belongs to a teleseismic event.
3. If the dominate frequency of the first arrival is between 2 - 7 Hz, then it belongs to a regional event.
4. If the dominate frequency is above 7 Hz, the it belongs to a local event.

The training data set from the Center for Seismic Studies has the start of the seismic event aligned 30 seconds (600 samples at 20 Hz sampling rate) from the start of the seismogram. The first arrival phase is generally considered to be within the first 30 seconds of the event wave train and contains the dominate frequency referred in the heuristics listed.

There is no general agreement in the literature surveyed as to the exacting definition of dominate frequency. The heuristics suggest division of the seismic trace into frequency bands of 0 - 2 Hz, 2 - 7 Hz and 7 - 10 Hz. The data base uses a sampling rate of 20 Hz for a span of 120 seconds. The event is aligned by the Center for Seismic Studies data base manager such that the event start time occurs after 30 seconds of pre-event noise. The dominate frequency as described by the heuristics, is only useful during the first 30 seconds after the onset of the first seismic waves. Only sample numbers 600 through 1200 are in the first arrival window that gives the dominate frequency.

The algorithm used to extract the dominate frequency is given by:

1. Filter the seismic trace into 3 banks of signals with pass bands of 0-2 Hz, 2-7 Hz and 7 Hz to 10 Hz.
2. Calculate the net energy in each band and threshold against some minimum value above noise level.
3. Apply a simple comparison rules to generate grade of membership values for the set:
   {noise, low band, mid band, high band, no clear dominate frequency}

Literature suggests that after the first 30 seconds of any given event, the dominate frequency provides no clear indication of the event type. Only the first 30 seconds after the onset of a seismic event contains useful dominated frequency information.

Currently, the two methods of identifying the dominant frequency of a signal are:

1. Band pass filter the signal and evaluate the power in each band, and

2. FFT the signal and sum the energy in each band.

The resulting mesh plots for these methods are shown in Figure 6 and Figure 7 respectively.

The neural network has a five neuron output to present the class type, one neuron for each class. Each neuron ranges between 0 and 1 so, indeterminate levels may be generated. The training results are shown in Table 3.

Table 3

Dominant Frequency Classification Results

Method	Classification
Band Pass Filter	80.0 %
FFT	88.0 %

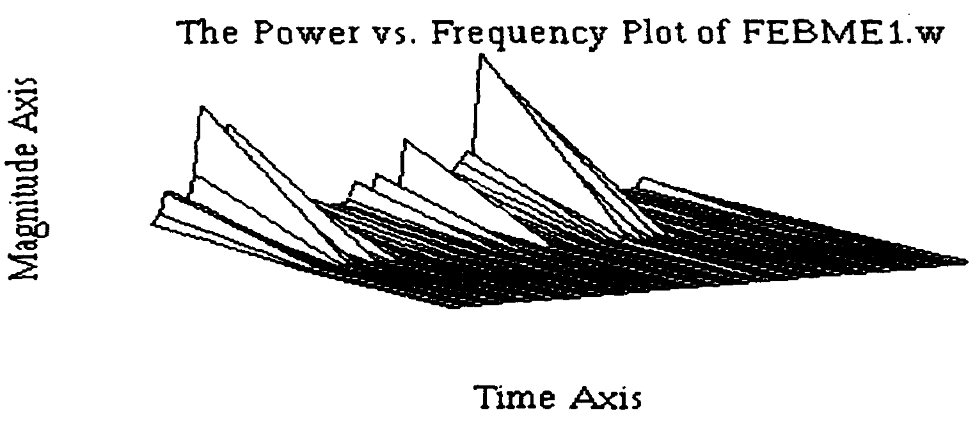

Figure 6 Dominate Frequency Band Pass Filter Fit Vector

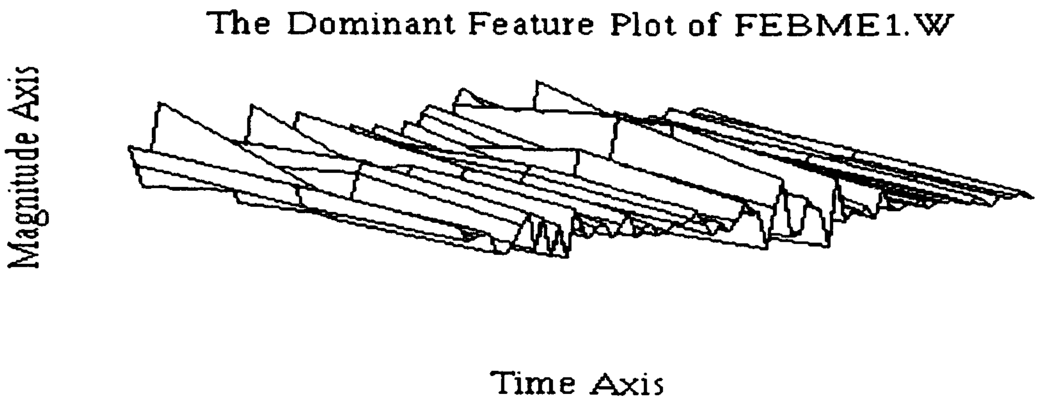

Figure 7 Dominant Frequency FFT Fit Vector

2.5 Moment Feature Maps

One of the rewarding aspects of research is following a wisp of an idea that leads to fruitful results. The calculation of mean and variances are typical signal processing methods used in conjunction with seismology. Bispectrum analysis has been tentatively explored by some researchers and the results *suggest that* the calculation of higher order spectrums and cumulants may yield interesting and potentially useful results in seismic classification. By following the suggested research, it was necessary to calculate higher order central moments as a prelude to cumulant calculations. Mesh plots of these intermediate results (central moments) produced visually different plots of different classes of seismic events. A key rule of thumb employed, but undocumented by neural network researchers is; if you can visually distinguish different patterns graphically, it's is possible to train a neural network to distinguish the same patterns. Through proper normalization, a moment feature map is constructed with a normalized height < 1 for each window.

The general equation for the calculation of moment features is that of central moments [62].

$$M_n = 1/m \sum_k (x_k - \eta_x)^n$$

where n = moment number

k = sample number

Figure 8 illustrates a moment feature plot of the quarry blast FEBQB0.w. The occurrence of a strong high order moment corresponds to the peak energy of the quarry blast. The right hand side of the plot shows the signal settling down to display wide sense stationarity and possibly strict sense stationarity of the seismic activity after passage of the quarry blast. The production code for moment feature generation is detailed in Chapter 5.

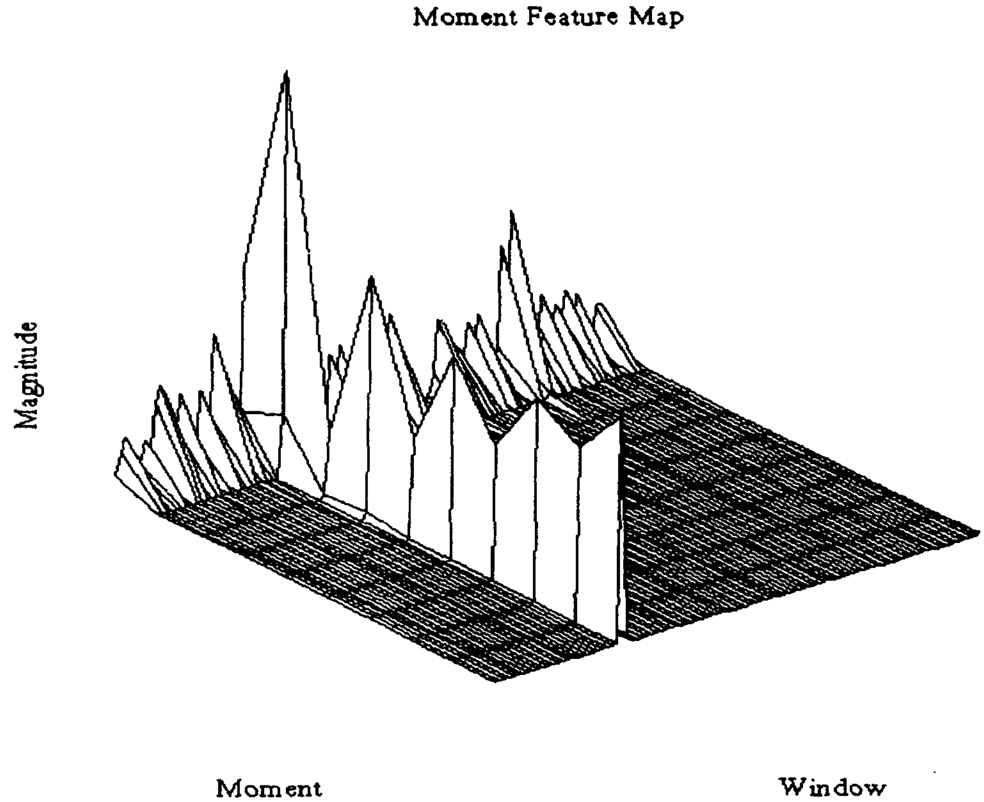

Figure 8 Moment Feature Map of FEBQB0.w

2.6 Bispectrum

This aspect of the neural network investigation is to consider an alternate preprocessing scheme on the raw data. We have taken the original waveform and performed a cumulate operation. This result is then filtered and passed through an FFT. The magnitude of the FFT is plotted and examined for characteristic and/or unusual features.

The purpose behind this scheme is to obtain the bispectrum, which is useful in detecting phase relationships between harmonically related components of random process. We have assumed that such phase relationships may exist in the seismic signals due to the various propagation modes in the earth's crust, mantle, and core. We hope to detect these relationships and use them to discriminate between the sources of these seismic waves (in particular, we want to discriminate between the mechanisms generating the seismic waves).

A first step in this analysis was to generate functions composed of two cosines of different frequencies. The first function had no random phase relation. The second function has a random phase of one cosine with the other by an amount in the range [-0.1, +0.1]. The cumulates of each function were found. Then the corresponding FFT were generated.

The results of this investigation clearly show the degradation of the bispectrum as the amount of random phase is increased. The cosine without the random phase factor still has visible components in the bispectrum.

2.7 Fuzzy Associative Memory

Two different FAM training methods were considered for use in the fuzzy seismic processor. The first method superimposes successive rules on the same FAM. The second generates a bank of FAM rules based on a method developed by Anderson referred to as Brain State in a Box [48]. The superposition of FAMS and the Brain State in the Box (BSB) were tested with results listed in Table 8.

The discussions of code segments in the remainder of this chapter make reference to different variables. Table 4 contains a list variable names, symbols, and dimensions.

Table 4
Variable List

Variable Name	Symbol	Dimension	Comments
Signal	S_w	1×2400	Seismic waveform
Window	W_w	100×24	Time slices
Moment	F_{wk}	1×10	Moment feature vector
M_Shift(k)	M_{wk}	1×10	Fuzzy moment feature
Desired	D_w	1×3	Desired fit vector
Slice_Size	L	1×1	Points /window = 100
Fam_Array	FAM_{wk}	10×3	Array of FAM rules
	$FAMC_k$	10×3	Composite FAM
	B	1×3	Output fit vector
	ΔM	10×3	FAM error
	r	1×1	Learning Rate

w= 1..20 — 20 total seismic waveforms.
k = 1..24 — 24 time slices.

2.7.1 FAM Superposition Method

The listing in Table 5 is a simple training method that superimposes fuzzy rules in the same FAM. Each waveform input to the procedure is in a parametric form. Moment features are used in this particular example as the parametric input. Along with the event class, a fuzzy product between the moment feature and the desired event class is formed for each of the 24 time slices. The product forms a single rule that is then superimposed into the composite FAM. A total of 24 rules, one for each time slice, are generated. Only a single training pass is needed to create the FAM.

The original seismic time series waveform is divided into a windowed time signal.

$$w_w(i,j) = s_w((i-1)*24+j)) \qquad i = 1..24 \qquad j = 1..100 \qquad (2.7.1)$$

Now using the moment feature map for the main parameter for this example with a mean value of zero assumed

$$F_k(n) = (1/L) \sum_{j=1}^{L} (w_k(n,j))^n. \qquad n = 1..10 \qquad (2.7.2)$$

Normalizing the moment feature

$$M_k(n) = F_k(n)/Fmax. \quad n = 1..10 \qquad (2.7.3)$$

where $\qquad Fmax = \max_{n,k} (F_k(n)).$

At this point the parametric data is in proper form for FAM training using the superposition of FAM's method. The fuzzy product of the feature vector transpose M_k^T and the desired fit vector D_k produces FAM_k utilizing correlation minimum encoding scheme. A total of 24 FAM's (one per time slot in this example) are formed for each waveform.

$$FAM_k = M_k^T \circ D_k \qquad (2.7.4)$$

Now all the FAM's are summed on an element by element basis creating 24 composite FAMs, each representing one time slice..

$$FAMC_k(i,j) = \sum_{w=1}^{20} FAM_{wk}(i,j) \quad i = 1..10 \qquad j = 1..3 \qquad (2.7.5)$$

Implementation of this training scheme is shown in Table 5.. The code segment begins by clearing out the FAM array. The array size is 24 windows by 10 moment features by 1 fit vector per moment feature. Each seismic waveform is loaded into the program sequentially along with the desired class and is presented to the Find_Moment procedure. The Find_Moment procedure divides each seismic waveform into 24 windows of 100 points. The mean value and central moments 2 through 10 are calculated for each waveform and stored in a temporary matrix. The moments are then normalized and passed to the Generate_Fuzzy_Moment procedure. The Generate_Fuzzy_Moment procedure takes each normalized moment and generates a fuzzy grade of membership for the entire moment matrix. At this point, the FAM can be formed with the fuzzy moment feature matrix and the desired class vector.

The training scheme in Table 5 is based on the superposition of rules from each waveform in the training set in the FAM. Each window of the moment feature matrix and the desired classification form a rule. The outer most loop of the procedure Teach_FAM, loop j, loads one waveform in at a time. The waveform is converted into 24 fuzzy moment feature segments. Each segment forms the basis of a single fuzzy rule by taking the fuzzy product of moment feature m_shift and the classification vector Desired. The rules are added to Fam_Array and the process continues to loop through the remaining seismic waveforms. The training set of waveforms are only presented to the composite FAM once.

This superposition method has worked well on an experimental basis for small training subsets. When the number of training signals was less than 15 and the total number of event classes equal to 3, the moment feature data was sufficient to give 100 percent classification of the remaining signals. As the number of training signals grew beyond 15, all elements of the FAM were observed to approach a midpoint value of 0.5 and in some cases with more than 30 signals, elements of the FAM saturated with grade of membership values of 0 or 1.

Classification of seismic events using the trained FAM described is achieved with the Classify procedure listed in Table 6. The data set to be classified is loaded in one at a time and converted into parametric fit vectors. The fit vectors are then presented to the trained FAM bank of 24 windows. The output of the rules are combined with unity weighting factor, then defuzzified for the final classification.

Table 5

FAM Training Code Segment

```
PROCEDURE Teach_Fam IS
--****************************************
BEGIN

 FOR k IN 1..24  LOOP
  Clear(Fam_Array(k));
 END LOOP;--k

 --Loop thru N waveforms
 FOR j IN 1..20 LOOP
    load_signal(j);
    Find_Moment;
    Generate_Fuzzy_Moment;
    -- Get the desired fit vector


    Get_Desired(j);
    -- FAM Filter

--   Now superimpose  all the FAM's
--   Recall that m_shift has the Parametric data
    FOR k IN 1..24 LOOP
        Fam_Array(k):=Fam_Array(k) +
               transpose(m_shift(k))*Desired;
    END LOOP;--k

 END LOOP; -- j  all waves 1..N
END Teach_Fam;
--*****************************************************
```

Classification with the trained FAM is straight forward. The fuzzy composition of the parametric data M_k from each time slice and the trained FAMC form the intermediate output vector B_k.

$$B_k = M_k \circ FAMC \tag{2.7.6}$$

All the time slices are passed through the FAMC and a composite output vector B is formed by summing the individual output vector together.

$$B = \sum_{k=1}^{24} B_k \qquad (2.7.8)$$

The composite output vector B is then defuzzified to obtain an output classification using

$$\text{class} = \text{position}\,(\max(B)). \qquad (2.7.9)$$

Table 6
FAM Classification Code Segment

```
PROCEDURE Classify IS
--****************************************
BEGIN
    load_signal(j);
    Find_Moments;
    Generate_Fuzzy_Moment;
    Clear(B);      -- B is the FAM filtered output

    -- FAM Filter
    FOR k IN 1..Num_Time_Slices LOOP
        B:=B+moments(k)*Fam_Array(k);
    END LOOP; --k

    -- Output results
    B:=B*(1.0/Cardinality(B)); -- scale B
   pos:=max_fit(B);
   Get_Desired(j);
   IF Desired(pos)>0.5 THEN PUT("Correct ");
       ELSE PUT("In-correct ");
   END IF;
   PUT(class);
END Classify;
--****************************************************
```

2.7.2 Brain State in a Box FAM Method

The Brain State in a Box is a second type of FAM that an be formed with supervised training using the Widrow-Hoff training method for each FAM [3,49]. An array of FAM's is created for each event class with 24 time slices representing the members of each array. Supervised training is achieved by iterating through the entire training set for a total of N epochs. The input vector is applied to the composite FAM and forms a tentative output vector. The difference between this vector and the desired vector is calculated forming an error vector. The FAM is then updated with the fuzzy produce of the error, input and the learning rate.

The training signal are presented to the main processing loop in a class random order. This random ordering tends to increase the rate of learning. The FAM to be trained is then formed by modifying the previous FAM values by adding ΔM.

$$FAM_k(new)= FAM_k(old) + \Delta M \qquad (2.7.10)$$

The ΔM is calculated by taking a learning rate times the transpose of the difference between the desired response and the current response all combined .through the composition operator along with the current input.

$$\Delta M = r\circ(D_k - M_k \circ FAM_k)^T\circ M_k \qquad (2.7.11)$$

This procedure is continued in an iterative manner until the ΔM is reduced below some prescribed limit or a specified number of epochs in training. In the testing for this research, a 20 epochs was used for the termination of training criteria.

The procedure Classify in Table 6 takes the seismic waveform training set and preprocesses it in a similar manner as the training procedure. The resulting fuzzy moment feature matrix is presented to each of the 24 rules contained in the FAM by taking the fuzzy product of the input variable moments and Fam_Array. The output of each rule is combined into a composite output vector B. This vector B is then scaled by the reciprocal of its cardinality then defuzzified using a maximum of the mean method.

Table 7

Supervised Training using Widrow-Hoff Rule

```
FOR i IN 1.. 20 LOOP
  Clear(FAM);
  Clear(FAM_T)
   r:= grade_of_membership(0.0);
  q:= grade_of_membership(1.0);
  B(1):=r;                              -- Grade of membership = 0
  FOR j IN 1..Number_Signals LOOP
   Desired(1):=q;                       -- Set all classes to the same
   Desired(2):=q;                       -- grade of membership
   Desired(3):=q;
   Desired(Signal_Class(j)):=r;                 -- reset correct class to 1
   Tentative:=Signal(j)*FAM;
   FAM_T:=rate*Signal(j)*transpose((Desired-Tentative));
   FAM:=FAM +FAM_T;
  END LOOP; --j

END LOOP ; -- i
```

Referring to the code segment in Table 7, the outer most loop , loop i, allows for a total number of epoch training passes set by the variable number_iterations. Each seismic signal is assumed to be preprocessed and stored in the variable Signal upon entry into this procedure. The desired classification vector is formed and a tentative output vector is calculated with Fam_Array and Signal. This tentative output vector is then subtracted from the desired class vector forming an error vector. The fuzzy product of the error vector, the current input signal, and the learning rate are stored in Fam_T. This holding variable, Fam_T, is correction matrix that is combined with the main FAM variable. Termination of the training procedure is determined in Table 7 by the number of iteration epochs. An alternate termination method could be implemented by calculating average error between the desired and the tentative output vectors.

3 Comprehensive Testing

The comprehensive test series utilized a database generated from the GSETT database. The test subset of 75 events are randomized in three different fashions, then transformed into parametric data comprised of moment features, sonograms, fractal dimension, ARMA models, and different combinations of parametric data. The parametric data is then used to train backpropagation neural networks, supervised Kohonen, and Radial Basis neural networks. Other type of neural networks were tested, such as the recurrent neural network and supervised Kohonen, but not used in the final analysis due to poor performance during network training. Training of the three neural network types used typically yielded 100 percent training.

After the preliminary research was completed as to the type of parametric transformations to further investigate, a general processing procedure was developed to conduct systematic testing of the various schemes.

The general procedure follows:

Obtain data base
- Search master database at CSS and generate 75 test signals
- Download raw waveform data to PC computer via Internet
- Create input seismic signal master list

Transform raw seismic waveforms into parametric data
- Read stored wave form from disk drive
- Collect some statistics as signal is input
- Normalize Data
- Optional filtering if desired
- Apply transformation
- Form composite parametric data file

Create randomized data files for training and testing

Generate three random groupi^gs of all 75 waveforms for training
Generate 10 random files with 30 training and 45 testing signals
Generate 10 random files with 45 training and 30 testing signals

Apply parametric data to neural network

Report results
Tabulate individual training and testing results
Compile statistical averages

3.1 Definition of Parametric Data Types

All data files (*.dat) were obtained from the master database and contain a total of seventy five (75) seismic signals. Each signal consist of 2400 data points sampled at twenty (20) Hertz. Each *.dat file is randomized twenty three different ways using a MatLab M file named reorder.m. The source listing of M files are found in the project software report [15]. The first three files of each set are named RG(1-3)??.prm. All 75 signals are used as training data. The next ten files are named SP(1-10)???.prm. The files are split into 30 training signals and 45 test signals. The last ten files are named SP(11-20)???.prm. These file were created by using the last forty five signals as training data and testing on the first 30.

	Data Points	Classes	*.prm file names
ARMA.DAT	144	5	???A1.prm
ARMAS.DAT	144	3	???A2.prm
COMBO1.DAT	21	5	???K1.prm
FRAC1.DAT	40	5	???F3.prm
MOMENT1.DAT	240	5	???M5.prm
MOMENT2.DAT	120	5	???M2.prm
SGX.DAT (sonogram)	114	5	???S1.prm

A1 - Auto Regressive Moving Average (ARMA). Data was separated into 28 rectangular time windows. A1 contains five output classes, local, regional, teleseismic, marine explosion, and quarry blast.

A2 - Same algorithm as A1 but with only three output classes. These consist of marine explosions, quarry blast, and natural events.

CO1 - Type 1 events (quarry blast) were discriminated against all other events. The CO1 files were created by regrouping the classes in Combo1.dat. Combo1.dat is a derivation of Kludge1.dat.

CO2 - Type 2 events (local) were discriminated against all other events. CO2 files were created in the same manner as CO1.

K1 - Kludge number 1. A combination of other parametric types according to known heuristics. Details of parametric content were described earlier.

K1* K1 data run on a backpropagation network with two hidden layers. The network architecture is 21-12-10-5 as opposed to the K1 runs which used 21-10-5.

M2 Moment feature extraction 2. Data contains five output classes.

M5- Moment feature extraction 5. Data is divided into 24 time windows with 10 features each. Data contains five output classes.

S1- Sonogram 1. This routine performs a 32 point fast Fourier transform on each of 38 windows. Data contains five output classes.

3.2 Combination Experiments

A combination of ARMA coefficients, signal duration, fractal dimension and moment features were used to form a composite data set. Many different combination were tested but only two variations provided reasonable results. The K1 and K11 series were extensively tested to provide a statistical basis with the results reported in the test summary. The general procedure for generating the K1 test set is outlined below. The source code listing is found in the companion software documentation.

Four non-overlapping intervals divide the 2400 sample signals (20 Hz sampling rate) into 30 second windows. Based on several heuristics suggested by the literature search and experimentation, the different transforms were formed according to the following algorithm. Note that the raw seismic waveform data is stored in the array 'data'.

First form the four non-overlapping windows from the raw seismic waveform.

```
win0=data(1:600)          first 30 seconds - no seismic event present
win1=data(601:1200)       second 30 seconds, assumed to be the P wave
win2=data(1201:1800)      third 30 seconds
win3=data(1801:2400);     last 30 seconds
```

Now calculate a second order ARMA model based on the first 30 seconds of data. This corresponds to win1 since each seismic waveform contains 30 seconds (win0) of pre-event samples.

Calculate ARMA coefficients of the expected P Phase that should occur in win1.

```
[AN,AD]=prony(win1,2,2)          Prony method is used for ARMA.
```

Now estimate the duration of the seismic event by comparing the squared sum of each window to a threshold set to 150% of the first window (win0).

```
Threshold=1.5*sum(win0.*win0);
win1sq=sum(win1.*win1);
win2sq=sum(win2.*win2);
win3sq=sum(win3.*win3);
Duration=0;
-- Compare the windows to the threshold
if win1sq > Threshold          then Duration = Duration + 1;
  else if win2sq > Threshold   then Duration = Duration + 1;
  else if win3sq > Threshold   then Duration = Duration + 1;
end;
```

Now find the fractal dimension, the frac2 procedure is the estimated method discussed earilier in this report.

```
fd  = frac2(win0);
fd1 = frac2(win1) - fd;
fd2 = frac2(win2) - fd;
fd3 = frac2(win3) - fd;
```

The first five central moments of each windows 1 through 3 are now computed.

```
momen(1,:) = abs(moment(win1,5));
momen(2,:) = abs(moment(win2,5));
momen(3,:) = abs(moment(win3,5));
-- Renormalize the moment data.
momen = momen/(max(max(momen)));
```

Finally the parameter array is formed with the calculated values

```
data_out(current_file,:) =    [AN AD(2:3) Duration fd1 fd2 fd3 ...
                               momen(1,2:5) momen(2,2:5) ...
                               momen(3,2:5)];
```

Note that the denominator of the ARMA coefficients is normalized such that the first coefficient has a value of 1.0. This coefficient adds no information to the neural network and is discarded by specifying two of the three ARMA denominator coefficients.

The windowing of signals generally will incorporate a given amount of overlap between successive windows. A 50 percent overlap is not uncommon. For the combination described above, as well as most of the other methods used in this research, the amount of successive window overlap did not significantly change the level of neural network training and subsequent testing. Significance being defined as a 5 percent or less difference in neural network training.

A variation of the K1 training set was created that redefined the output classes.

Various ways of reclassifying the seismic signals were attempted on a trail basis from the K1 data set.

3.3 Combination Experiment Summary

The K1 combination data initially trained at the 100 percent level and classified new data at an average of 40 percent over the 20 random variations. Additional training and testing was performed to determine the sensitivity of the neural network to the different classes of input data. Several variations of the K1 data were tested. The results of are listed below.

Backpropagation Neural Network Setup

Number of data records	75
Training Records	30
Classification records	45
Input Layer	21 neurons
First hidden layer	12 neurons
Second hidden layer	10 neurons
Learning rate	0.2
Momentum	0.05

Class	Type
1	Marine Explosion
2	Local
3	Regional
4	Teleseismic
5	Quarry Blast

Test Summary

Variation	Classes	Percent Training	Percent Classification
SP1N2 (Class 3 removed)			
	Natural	100.00%	88.24%
	Man_Made	91.67%	33.33%
SP1N3 (Class 3 removed)			
	Class 1	83.33%	33.33%
	Class 2	75.00%	27.27%
	Class 4	100.00%	50.00%
	Class 5	100.00%	44.44%
SP1TC (Class 3 removed)			
	Class 1	83.33%	55.56%
	Class 2 & 4	100.00%	88.24%
	Class 5	100.00%	22.22%
SP1E1 (Classes 2,3 & 4 removed)			
	Class 1	100.00%	55.56 %
	Class 5	100.00%	88.89%
SP1DD	Class 3 removed		
	Class 4 & 5	100.00%	46.67%
	Class 1&2	100.00%	50.00%
SP13C2 (Class 3 verses all others)			
	Class 1,2,4,5	100.00%	88.00%
	Class 3	90.00%	100.00%

3.4 BiSpectrum Experimental Results

The next aspect of the investigation was to look at the BiSpectrum of the seismic waveforms . Here it turned out that the major contribution to the bispectrum of each waveform was the DC or near DC components (even though the means are subtracted from the waveforms before the cumulates are found). The bispectra came in arrays of 121 x 121. It was decided to concentrate on the 10 x 10 grid area for the lowest frequencies. To attain greater resolution, the cumulates were found on a 201 x 201 grid. The BiSpectrum source code can be found in the software documentation [16].

A backpropagation neural network was used to test the BiSpectrums of all 75 seismic signals. Forty five signals were used for training purposes and 30 signals used for testing. The network summary is given below.

Network: Back Propagation Run Date: 8/02/1993

Input Data

Waveform File Name.	SP1BS2.PRM
Number of Data Records	75
Number of Training Records	45
Number of Testing Records	30
Number of Training Epochs	38044
Number of Network Layers	3
Number of Neurons Per Layer	55 20 5
Learning Rate Delta	0.2000
Momentum	0.1000
Termination Error	0.000E+00
Saving Weight in	SP1BS2.BWT
Computer	20 MHz IBM PS2 Model 70

Training Summary

Training Threshold	0.7000
Training Threshold Difference.	0.2000
Average Time Per Epoch.(sec)	5.16
Ave. Error	3.324E-02
Max. Error	3.076E-01
Min. Error	2.216E-08
Percent Correct	39/45 = 86.67

		Output Class						Percent
		0	1	2	3	4	5	Correct
	1	2/7	5/7	0/7	0/7	0/7	0/7	71.43
Input	2	0/9	0/9	9/9	0/9	0/9	0/9	100.00
	3	0/9	0/9	0/9	9/9	0/9	0/9	100.00
	4	3/10	0/10	0/10	0/10	7/10	0/10	70.00
	5	1/10	0/10	0/10	0/10	0/10	9/10	90.00

Classification Summary

Classification Threshold	0.7000
Classification Threshold Difference	0.2000
Percent Correct	5/30 = 16.67

		Output Class						Percent
		0	1	2	3	4	5	Correct
	1	4/8	1/8	0/8	0/8	1/8	2/8	12.50
Input	2	3/6	0/6	1/6	1/6	1/6	0/6	16.67
	3	2/6	0/6	1/6	1/6	2/6	0/6	16.67
	4	1/5	0/5	0/5	0/5	1/5	2/5	20.00
	5	2/5	0/5	0/5	0/5	2/5	1/5	20.00

Although some of the classes trained at the 100 percent level, the classification of the test set exhibited results comparable to random guessing. Variations on this basic scheme failed to yield any improvement.

3.5 Fuzzy Logic Experimental Results

Two different seismic test sets were used to train and classify the fuzzy seismic processor. The first data set was comprised of 20 signals from the KAF station located in Kangasniemi, Finland. This data set contained 20 signals with three event types including quarry blast, local and regional events. A second data set with a diversity of recording stations was constructed with 75 discrete events, 15 events of type local, regional, teleseismic, quarry blast, and marine explosion. Both data sets are listed in Appendix A. Each data set was tested using the superposition of FAM rules as well as the Brain State in the Box scheme. Table 8 summarizes the results.

The data set formed from events recorded at the single station KAF was applied with all 20 signals used for training. Both FAM methods achieved 100 percent correct results. The data set was next split into 12 training signals and 8 classification signals. Once again, 100% training was achieved with 100 percent correct classification. Additional testing not reported in Table 8, shows that for this set of signals, only the moment feature need be used as the sole parametric data input to the system for 100 percent classification. These perfect results are not to be generalized; they were obtained only due to the small size of the test data set.

The multiple station test used a total of 75 test signals with 5 different event types. When all 75 signals were used for training the superimposed FAM scheme, the element values of the FAM approached a midpoint value of 0.5. No learning was possible with this larger data set, the superposition FAM was not an effective strategy. After splitting the multiple station data set into 40 training signals and 35 classification signals, a small amount of learning with the superimposed FAM occurred but remained below the level of random guessing (< 33 percent). Only 5 percent of the signals classified as correct using the superimposed FAM scheme. Examination of the values internal to the FAM's showed that each element was approaching a midpoint value of 0.5.

The multiple station 40/35 split data set was applied to the FAM event bank using FAM'S formed with the Brain State in the Box. Training of this data set was at a 100 percent correct level while classification performed at a slightly lower level with 67 percent correct classification. The training rate of the multiple station data set with the 75 signals, was at the 53 percent correct level. These results were obtained after considerable "tweeking" of the fuzzy logic parameters.

Table 8

Training and Classification Results

Database	Superposition of Time Slices		Brain State in Box	
	Training	Classification	Training	Classification
Single Station 12/8 split	100%	100%	100%	100%
Single Station 20 signals train	100%	n/a	100%	n/a
Multiple Stations 40/35 split	11%	5%	100%	53%
Multiple Stations 75 signals train	n/a	n/a	63%	n/a

The high percentage of learning rates presented in Table 8 seems to indicate extremely good results. Indeed, for the two databases tested the results were good. It should be noted that seismic classification with neural networks often approaches 95 percent to 100 percent . Studies by Dowla [27] and Dysart [28] indicate results in this range. The results typically reported in neural network studies are for bivalent cases. The results presented here are for 3 class (20 signal set) and 5 class (75 signal set) cases. Direct comparison to results obtained with neural network techniques are not practical due to the extensive amount of learning parameter adjustment within the fuzzy logic scheme. Again it should be noted that the fuzzy logic method was fine tuned to yield good results. Additional investigation is required for development of a system that does not require tuning.

3.6 Test Series Results

Table 9, 10, and 11 give the compiled results of each parametric data file. The percentages are the average of twenty different randomization's. Individual test results are listed in Appendix C.

Table 9 Back Propagation

Parametric Data	Trained (%)	Tested (%)	Average (%)
A1	96.2	14.15	55.35
A2	99.5	41.34	70.42
CO1	99.3	79.33	89.33
CO2	99.73	69.6	84.67
F3	84.39	34.39	59.39
K1	95.95	40.61	68.28
K1*	97.39	42.06	69.73
K11	96.17	38.78	67.48
M2	94.72	15.06	54.89
M5	99.17	19.11	59.14
S1	99.45	15.28	57.36

Table 10 Kohonen Test Results

Parametric Data	Trained (%)	Tested (%)	Average (%)
A1	99.67	39.56	69.61
A2	99.39	61.22	80.31
CO1	92.06	78.94	85.50
CO2	90.22	74.11	82.11
F3	88.11	41.17	66.14
K1	92.61	44.50	68.56
K11	91.00	43.62	67.31
M2	99.34	26.28	62.81
M5	99.67	24.11	61.89
S1	94.28	29.45	61.86

Table 11 Radial Basis Test Results

Parametric Data	Trained (%)	Tested (%)	Average (%)
A1	100.00	31.33	65.67
A2	100.00	58.11	79.06
CO1	100.00	75.5	87.75
CO2	100.00	75.39	87.69
F3	100.00	40.18	70.09
K1	100.00	38.11	69.06
K11	100.00	40.28	70.14
M2	100.00	26.83	63.42
M5	100.00	25.61	62.81
S1	100.00	23.5	61.75

3.7 Training Times

Several PC class machine were used to train and test the various parametric transformations. Records of the training time per epoch verses the type of computer was part of the summary data from the SeisNet software. The training times of each neural network and the number of features are noted below.

Table 12 Backpropagation Networks Training Times
(sec/epoch)

Input Features	Training Records	486-50 Mhz	486-66 Mhz	386-20 Mhz
240	75	24.52	22.08	
	30	8.00	7.19	
	45	14.59	13.28	
144	75	10.77	7.78	76.24
	30	4.23		28.10
	45	7.43	5.55	41.24
120	75	5.16	5.47	
	30		1.58	16.85
	45	3.82		24.79
114	75	6.40		
	30	2.53		19.40
	45	3.82		29.29
40	75	0.91	0.73	
	30	0.42		2.52
	45	0.63	0.52	3.79
21	30	0.19		0.93
	45	0.29		1.49

Table 13 Kohonen Network Training Times
(sec/epoch)

Input Features	Training Records	486-50 Mhz	486-66 Mhz	386-20 Mhz
240	75	10.62		
	30			28.06
	45			42.25
144	75	6.18		
	30	2.37		17.31
	45	3.49	2.62	26.53
120	75	6.71	4.87	
	30		1.95	18.59
	45	3.73		25.50
114	75	5.03		
	30	1.81		15.00
	45	3.18		22.71
40	75	0.83		
	30	0.37		2.31
	45	0.49	0.39	3.49
21	75	0.31		
	30	0.13		0.87
	45	0.26		1.29

Note: All computers were not used for all test series.

Table 14 Radial Basis Network Training Times
(sec/epoch)

Input Features	Training Records	486-50 Mhz
240	75	3.44
	30	0.56
	45	1.23
144	75	1.86
	30	0.37
	45	0.74
120	75	1.63
	30	0.34
	45	0.67
114	75	1.35
	30	0.29
	45	0.55
40	75	0.78
	30	0.20
	45	0.35
21	75	0.40
	30	0.15
	45	0.20

Note: All computers were not used for all test series.

4. Summary

The research focused on identification and collection of a suitable database, identification of parametric representation of the time series seismic waveforms, and the training and testing of neural networks for seismic event classification. It was necessary to utilize seismic events that had a high degree of reliability for accurate training of the neural networks. The seismic waveforms were obtained from the Center for Seismic Studies and were organized into smaller databases for training and classification purposes. Unprocessed seismograms were not well suited for presentation to a neural network because of the large number of data points required to represent a seismic event in the time domain. The parametric representation of the seismic events in some cases provided adequate information for accurate event classification, while significantly reducing the minimum size of the neural network. Various networks have achieved classification rates ranging from 88% classification of a three class problem to 75% for the 5 class problem. The results vary dependent on the number of classes and the method of parametric transformations utilized. Multiple tests were performed in order to statistically average the training and classification rates. Test summaries were presented in Chapter 3 and individual test results are given in Appendix B.

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APPENDIX A Data Base Wave Form Files from CSS

FNAME	STA	CHAN	JDATE
Febme1.w	ARU	bz	1991119
Febme16.w	ESLA	sz	1991114
Febme17.w	ESLA	sz	1991114
Febme18.w	ESLA	sz	1991135
Febme19.w	ESLA	sz	1991135
Febme43.w	GAR	bz	1990051
Febme45.w	GAR	bz	1991124
Febme47.w	GAR	bz	1991139
Febme48.w	GAR	bz	1991141
Febme49.w	GAR	bz	1991146
Febme55.w	KIV	bz	1991133
Febme56.w	KIV	bz	1991146
Febme65.w	OBN	bz	1991139
Febme66.w	OBN	bz	1991144
Febme67.w	OBN	bz	1991146
Febr0.w	GRA1	bz	1990331
Febr9.w	GRA1	bz	1991117
Febr15.w	GRA1	bz	1991127
Febr21.w	GRA1	bz	1991136
Febr46.w	WRA	sz	1990331
Febr52.w	WRA	cb	1991114
Febr58.w	WRA	cb	1991119
Febr66.w	WRA	cb	1991121
Febr72.w	WRA	cb	1991129
Febr86.w	WRA	cb	1991141
Febr99.w	WRA	cb	1991143
Febr103.w	WRA	cb	1991147
Febr109.w	WRA	cb	1991151
Febr112.w	WRA	cb	1991152
Febr115.w	WRA	cb	1991153

NOTE: All signals are 2400 samples at 20.00 samples per second.

APPENDIX A Data Base Wave Form Files from CSS

FNAME	STA	CHAN	JDATE
Febta25.w	GRA1	bz	1991132
Febta52.w	WRA	sz	1990123
Febta69.w	WRA	sz	1990334
Febta78.w	WRA	sz	1990335
Febta81.w	WRA	sz	1990335
Febta86.w	WRA	sz	1990051
Febta97.w	WRA	sz	1990065
Febta150.w	WRA	cb	1991114
Febta177.w	WRA	cb	1991118
Febta229.w	WRA	cb	1991121
Febta309.w	WRA	cb	1991125
Febta317.w	WRA	cb	1991125
Febta408.w	WRA	cb	1991133
Febta513.w	WRA	cb	1991137
Febta542.w	WRA	cb	1991138
Febla0.w	BJT	sz	1991147
Febla5.w	GAR	bz	1991115
Febla7.w	GAR	bz	1991117
Febla8.w	GAR	bz	1991119
Febla9.w	GAR	bz	1991145
Febla11.w	GRA1	bz	1991112
Febla13.w	GRA1	bz	1991116
Febla16.w	GRA1	bz	1991122
Febla19.w	GRA1	bz	1991149
Febla20.w	HFS	sz	1991135
Febla26.w	HFS	cb	1991135
Febla73.w	WRA	cb	1991137
Febla75.w	WRA	cb	1991143
Febla76.w	WRA	cb	1991143
Febla82.w	WRA	cb	1991146

NOTE: All signals are 2400 samples at 20.00 samples per second.

APPENDIX A Data Base Wave Form Files from CSS

FNAME	STA	CHAN	JDATE
Febqb0.w	ASAR	cb	1991123
Febqb12.w	CTA	bz	1991123
Febqb20.w	CTA	bz	1991141
Febqb33.w	KAF	sz	1990331
Febqb45.w	KAF	sz	1991114
Febqb93.w	KAF	sz	1991133
Febqb100.w	KAF	sz	1991135
Febqb114.w	KAF	sz	1991140
Febqb117.w	KAF	sz	1991140
Febqb118.w	KAF	sz	1991140
Febqb122.w	KAF	sz	1991142
Febqb147.w	KAF	sz	1991150
Febqb154.w	KAF	sz	1991154
Febqb158.w	STK	bz	1991121
Febqb180.w	WRA	cb	1991141

NOTE: All signals are 2400 samples at 20.00 samples per second.

APPENDIX A GSETT-Subset1 Station Names and Locations

STA	STATION NAME	LATITUDE	LONGITUDE
ARU	ARTI - SVERDLOVSK, OBLAST	56.4000	58.6000
ASAR	ALICE SPRINGS ARRAY - NORTH TERRITORY, AUSTRALIA	23.7040	133.9620
BJT	BAIJIATUAN - BAIJIATUAN, CHINA	40.0403	116.1750
CTA	CHARTERS TOWERS - QUEENSLAND, AUSTRALIA	20.0880	146.2540
ESLA	SONSECA ARRAY STATION - SPAIN	39.6700	-3.9600
GAR	GARM - GARM, USSR	39.0000	70.3000
GRA1	GRAFENBERG ARRAY - BOYERN, GERMANY	49.6920	11.2220
HFS	HAGFORS ARRAY - SWEDEN	60.1335	13.6836
KAF	KANGASNIEMI - FINLAND	62.1127	26.3062
KIV	KISLOVODSK - WESTERN CAUCASUS USSR	43.9500	42.6833
OBN	OBNINSK - OBNINSK, USSR	55.1167	36.5667
STK	STEPHENS CREEK - NEW SOUTH WALES, AUSTRALIA	31.8820	141.5920
WRA	WARRAMUNGA ARRAY - NORTH TERRITORY, AUSTRALIA	-19.7657	134.3891

APPENDIX B Detailed Test Results

Back propagation Neural Network Training Data
CO1

	Input Class	Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP1	1	0	5	1	0	0	0	6	83.33%
	2	0	0	24	0	0	0	24	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP2	1	0	3	0	0	0	0	3	100.00%
	2	0	0	27	0	0	0	27	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP3	1	0	6	0	0	0	0	6	100.00%
	2	0	0	24	0	0	0	24	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP4	1	0	5	0	0	0	0	5	100.00%
	2	0	0	25	0	0	0	25	100.00%
	3	2	0	0	2	0	0	4	50.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP5	1	0	4	0	0	0	0	4	100.00%
	2	0	0	26	0	0	0	26	100.00%
	3	1	0	0	6	0	0	7	85.71%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP6	1	0	4	1	0	0	0	5	80.00%
	2	0	0	25	0	0	0	25	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP7	1	0	4	0	0	0	0	4	100.00%
	2	0	0	26	0	0	0	26	100.00%
	3	1	0	0	2	0	0	3	66.67%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP8	1	0	3	0	0	0	0	3	100.00%
	2	0	0	27	0	0	0	27	100.00%
	3	1	0	0	5	0	0	6	83.33%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP9	1	0	5	0	0	0	0	5	100.00%
	2	0	0	25	0	0	0	25	100.00%
	3	2	0	0	3	0	0	5	60.00%
	4	1	0	0	0	4	0	5	80.00%
	5	0	0	0	0	0	8	8	100.00%
SP10	1	0	8	0	0	0	0	8	100.00%
	2	0	0	22	0	0	0	22	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	3	3	100.00%

Back propagation Neural Network Testing Data
CO1

	Input Class	Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP1	1	1	5	3	0	1	0	9	55.56%
	2	1	2	33	0	3	2	36	91.67%
	3	5	1	0	2	2	0	10	20.00%
	4	4	0	1	0	1	0	6	16.67%
	5	3	1	3	0	2	0	9	0.00%
SP2	1	3	3	6	2	5	0	12	25.00%
	2	0	2	31	3	1	0	33	93.94%
	3	4	0	0	5	0	0	9	55.56%
	4	4	1	2	1	0	0	8	0.00%
	5	0	0	1	0	0	0	7	0.00%
SP3	1	0	3	6	0	1	0	9	33.33%
	2	0	2	34	0	2	1	36	94.44%
	3	6	0	0	2	2	0	10	20.00%
	4	7	0	0	0	2	2	11	18.18%
	5	4	0	0	0	0	2	6	33.33%
SP4	1	1	4	5	1	2	1	10	40.00%
	2	0	0	35	0	0	4	35	100.00%
	3	5	0	2	3	1	0	11	27.27%
	4	5	1	2	0	0	0	8	0.00%
	5	3	1	0	0	0	4	8	50.00%
SP5	1	2	2	7	1	3	1	11	18.18%
	2	1	2	31	0	0	1	34	91.18%
	3	5	0	0	3	0	0	8	37.50%
	4	6	0	2	2	1	0	11	9.09%
	5	3	0	2	0	1	2	8	25.00%
SP6	1	1	1	8	1	4	1	10	10.00%
	2	0	2	33	1	0	1	35	94.29%
	3	4	0	2	3	0	0	9	33.33%
	4	3	0	2	2	0	2	9	0.00%
	5	2	0	2	0	1	3	8	37.50%
SP7	1	0	3	8	0	0	3	11	27.27%
	2	2	4	28	0	1	1	34	82.35%
	3	8	0	2	1	0	1	12	8.33%
	4	2	0	3	0	1	1	7	14.29%
	5	4	0	3	0	0	1	8	12.50%
SP8	1	0	6	6	1	2	1	12	50.00%
	2	2	1	30	3	1	0	33	90.91%
	3	3	0	1	5	0	0	9	55.56%
	4	7	0	1	0	1	0	9	11.11%
	5	3	0	4	0	0	0	7	0.00%
SP9	1	2	5	3	0	1	1	10	50.00%
	2	0	1	34	0	0	1	35	97.14%
	3	6	0	3	1	0	0	10	10.00%
	4	6	0	4	0	0	0	10	0.00%
	5	5	0	1	0	0	1	7	14.29%
SP10	1	1	3	3	0	3	0	7	42.86%
	2	2	3	33	1	1	0	38	86.84%

Back propagation Neural Network Training Data
CO1

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	9	0	0	0	0	9	100.00%
	2	0	0	36	0	0	0	36	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP12	1	0	10	2	0	0	0	12	83.33%
	2	0	0	33	0	0	0	33	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP13	1	0	8	1	0	0	0	9	88.89%
	2	0	0	36	0	0	0	36	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP14	1	0	10	0	0	0	0	10	100.00%
	2	0	0	35	0	0	0	35	100.00%
	3	2	0	0	2	0	0	4	50.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP15	1	0	11	0	0	0	0	11	100.00%
	2	0	0	34	0	0	0	34	100.00%
	3	1	0	0	6	0	0	7	85.71%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP16	1	0	10	0	0	0	0	10	100.00%
	2	0	0	35	0	0	0	35	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP17	1	0	11	0	0	0	0	11	100.00%
	2	0	0	34	0	0	0	34	100.00%
	3	1	0	0	2	0	0	3	66.67%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP18	1	0	12	0	0	0	0	12	100.00%
	2	0	0	33	0	0	0	33	100.00%
	3	1	0	0	5	0	0	6	83.33%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP19	1	0	10	0	0	0	0	10	100.00%
	2	0	0	35	0	0	0	35	100.00%
	3	2	0	0	3	0	0	5	60.00%
	4	1	0	0	0	4	0	5	80.00%
	5	0	0	0	0	0	8	8	100.00%
SP20	1	0	7	0	0	0	0	7	100.00%
	2	0	0	38	0	0	0	38	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	3	3	100.00%

Back propagation Neural Network Testing Data
CO1

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	4	2	0	1	0	6	66.67%
	2	1	1	22	0	3	2	24	91.67%
	3	5	1	0	2	2	0	10	20.00%
	4	4	0	1	0	1	0	6	16.67%
	5	3	1	3	0	2	0	9	0.00%
SP12	1	0	1	2	2	5	0	3	33.33%
	2	1	3	23	3	1	0	27	85.19%
	3	4	0	0	5	0	0	9	55.56%
	4	4	1	2	1	0	0	8	0.00%
	5	0	0	1	0	0	0	7	0.00%
SP13	1	3	2	1	0	1	0	6	33.33%
	2	1	0	23	0	2	1	24	95.83%
	3	6	0	0	2	2	0	10	20.00%
	4	7	0	0	0	2	2	11	18.18%
	5	4	0	0	0	0	2	6	33.33%
SP14	1	0	4	1	1	2	1	5	80.00%
	2	2	5	18	0	0	4	25	72.00%
	3	5	0	2	3	1	0	11	27.27%
	4	5	1	2	0	0	0	8	0.00%
	5	3	1	0	0	0	4	8	50.00%
SP15	1	0	2	2	1	3	1	4	50.00%
	2	2	1	23	0	0	1	26	88.46%
	3	5	0	0	3	0	0	8	37.50%
	4	6	0	2	2	1	0	11	9.09%
	5	3	0	2	0	1	2	8	25.00%
SP16	1	0	4	1	1	4	1	5	80.00%
	2	3	1	21	1	0	1	25	84.00%
	3	4	0	2	3	0	0	9	33.33%
	4	3	0	2	2	0	2	9	0.00%
	5	2	0	2	0	1	3	8	37.50%
SP17	1	0	1	3	0	0	3	4	25.00%
	2	2	3	21	0	1	1	26	80.77%
	3	8	0	2	1	0	1	12	8.33%
	4	2	0	3	0	1	1	7	14.29%
	5	4	0	3	0	0	1	8	12.50%
SP18	1	0	2	1	1	2	1	3	66.67%
	2	0	5	22	3	1	0	27	81.48%
	3	3	0	1	5	0	0	9	55.56%
	4	7	0	1	0	1	0	9	11.11%
	5	3	0	4	0	0	0	7	0.00%
SP19	1	1	3	1	0	1	1	5	60.00%
	2	0	7	18	0	0	1	25	72.00%
	3	6	0	3	1	0	0	10	10.00%
	4	6	0	4	0	0	0	10	0.00%
	5	5	0	1	0	0	1	7	14.29%
SP20	1	1	5	2	0	3	0	8	62.50%
	2	2	1	19	1	1	0	22	86.36%

Back propagation Neural Network Training Data
CO_2

Input Class		Output Class							
		0	1	2	3	4	5	TOTAL	% CORR
SP1	1	0	3	1	0	0	0	4	75.00%
	2	0	0	26	0	0	0	26	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP2	1	0	6	0	0	0	0	6	100.00%
	2	0	0	24	0	0	0	24	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP3	1	0	6	0	0	0	0	6	100.00%
	2	0	0	24	0	0	0	24	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP4	1	0	7	0	0	0	0	7	100.00%
	2	0	0	23	0	0	0	23	100.00%
	3	2	0	0	2	0	0	4	50.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP5	1	0	8	0	0	0	0	8	100.00%
	2	0	0	22	0	0	0	22	100.00%
	3	1	0	0	6	0	0	7	85.71%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP6	1	0	6	0	0	0	0	6	100.00%
	2	0	0	24	0	0	0	24	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP7	1	0	8	0	0	0	0	8	100.00%
	2	0	0	22	0	0	0	22	100.00%
	3	1	0	0	2	0	0	3	66.67%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP8	1	0	7	0	0	0	0	7	100.00%
	2	0	0	23	0	0	0	23	100.00%
	3	1	0	0	5	0	0	6	83.33%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP9	1	0	7	0	0	0	0	7	100.00%
	2	0	0	23	0	0	0	23	100.00%
	3	2	0	0	3	0	0	5	60.00%
	4	1	0	0	0	4	0	5	80.00%
	5	0	0	0	0	0	8	8	100.00%
SP10	1	0	5	0	0	0	0	5	100.00%
	2	0	0	25	0	0	0	25	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	3	3	100.00%

Back propagation Neural Network Testing Data
CO_2

Input Class		Output Class							
		0	1	2	3	4	5	TOTAL	% CORR
SP1	1	1	4	6	0	1	0	11	36.36%
	2	1	6	27	0	3	2	34	79.41%
	3	5	1	0	2	2	0	10	20.00%
	4	4	0	1	0	1	0	6	16.67%
	5	3	1	3	0	2	0	9	0.00%
SP2	1	0	1	8	2	5	0	9	11.11%
	2	2	7	27	3	1	0	36	75.00%
	3	4	0	0	5	0	0	9	55.56%
	4	4	1	2	1	0	0	8	0.00%
	5	0	0	1	0	0	0	7	0.00%
SP3	1	1	4	4	0	1	0	9	44.44%
	2	3	6	27	0	2	1	36	75.00%
	3	6	0	0	2	2	0	10	20.00%
	4	7	0	0	0	2	2	11	18.18%
	5	4	0	0	0	0	2	6	33.33%
SP4	1	0	0	8	1	2	1	8	0.00%
	2	4	5	28	0	0	4	37	75.68%
	3	5	0	2	3	1	0	11	27.27%
	4	5	1	2	0	0	0	8	0.00%
	5	3	1	0	0	0	4	8	50.00%
SP5	1	2	2	3	1	3	1	7	28.57%
	2	2	11	25	0	0	1	38	65.79%
	3	5	0	0	3	0	0	8	37.50%
	4	6	0	2	2	1	0	11	9.09%
	5	3	0	2	0	1	2	8	25.00%
SP6	1	2	1	6	1	4	1	9	11.11%
	2	2	4	30	1	0	1	36	83.33%
	3	4	0	2	3	0	0	9	33.33%
	4	3	0	2	2	0	2	9	0.00%
	5	2	0	2	0	1	3	8	37.50%
SP7	1	1	1	5	0	0	3	7	14.29%
	2	3	3	32	0	1	1	38	84.21%
	3	8	0	2	1	0	1	12	8.33%
	4	2	0	3	0	1	1	7	14.29%
	5	4	0	3	0	0	1	8	12.50%
SP8	1	2	3	3	1	2	1	8	37.50%
	2	3	4	30	3	1	0	37	81.08%
	3	3	0	1	5	0	0	9	55.56%
	4	7	0	1	0	1	0	9	11.11%
	5	3	0	4	0	0	0	7	0.00%
SP9	1	1	2	5	0	1	1	8	25.00%
	2	2	6	29	0	0	1	37	78.38%
	3	6	0	3	1	0	0	10	10.00%
	4	6	0	4	0	0	0	10	0.00%
	5	5	0	1	0	0	1	7	14.29%
SP10	1	0	2	8	0	3	0	10	20.00%
	2	3	1	31	1	1	0	35	88.57%

Back propagation Neural Network Training Data
CO_2

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	11	0	0	0	0	11	100.00%
	2	0	0	34	0	0	0	34	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP12	1	0	9	0	0	0	0	9	100.00%
	2	0	0	36	0	0	0	36	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP13	1	0	9	0	0	0	0	9	100.00%
	2	0	0	36	0	0	0	36	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP14	1	0	8	0	0	0	0	8	100.00%
	2	0	0	37	0	0	0	37	100.00%
	3	2	0	0	2	0	0	4	50.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP15	1	0	7	0	0	0	0	7	100.00%
	2	0	0	38	0	0	0	38	100.00%
	3	1	0	0	6	0	0	7	85.71%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP16	1	0	9	0	0	0	0	9	100.00%
	2	0	0	36	0	0	0	36	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP17	1	0	6	1	0	0	0	7	85.71%
	2	0	0	38	0	0	0	38	100.00%
	3	1	0	0	2	0	0	3	66.67%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP18	1	0	8	0	0	0	0	8	100.00%
	2	0	0	37	0	0	0	37	100.00%
	3	1	0	0	5	0	0	6	83.33%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP19	1	0	8	0	0	0	0	8	100.00%
	2	0	0	37	0	0	0	37	100.00%
	3	2	0	0	3	0	0	5	60.00%
	4	1	0	0	0	4	0	5	80.00%
	5	0	0	0	0	0	8	8	100.00%
SP20	1	0	10	0	0	0	0	10	100.00%
	2	0	0	35	0	0	0	35	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	3	3	100.00%

Back propagation Neural Network Testing Data
CO_2

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP11	1	1	1	2	0	1	0	4	25.00%
	2	0	2	24	0	3	2	26	92.31%
	3	5	1	0	2	2	0	5	40.00%
	4	4	0	1	0	1	3	9	11.11%
	5	3	1	3	0	2	0	6	0.00%
SP12	1	1	1	4	2	5	0	6	16.67%
	2	2	2	20	3	1	0	24	83.33%
	3	4	0	0	5	0	0	6	83.33%
	4	4	1	2	1	0	0	7	0.00%
	5	0	0	1	0	0	0	8	0.00%
SP13	1	0	2	4	0	1	0	6	33.33%
	2	1	1	22	0	2	1	24	91.67%
	3	6	0	0	2	2	0	5	40.00%
	4	7	0	0	0	2	2	4	50.00%
	5	4	0	0	0	0	2	9	22.22%
SP14	1	1	1	5	1	2	1	7	14.29%
	2	0	2	21	0	0	4	23	91.30%
	3	5	0	2	3	1	0	4	75.00%
	4	5	1	2	0	0	0	7	0.00%
	5	3	1	0	0	0	4	7	57.14%
SP15	1	1	2	5	1	3	1	8	25.00%
	2	0	3	19	0	0	1	22	86.36%
	3	5	0	0	3	0	0	7	42.86%
	4	6	0	2	2	1	0	4	25.00%
	5	3	0	2	0	1	2	7	28.57%
SP16	1	0	3	3	1	4	1	6	50.00%
	2	1	4	19	1	0	1	24	79.17%
	3	4	0	2	3	0	0	6	50.00%
	4	3	0	2	2	0	2	6	0.00%
	5	2	0	2	0	1	3	7	42.86%
SP17	1	1	1	6	0	0	3	8	12.50%
	2	0	2	20	0	1	1	22	90.91%
	3	8	0	2	1	0	1	3	33.33%
	4	2	0	3	0	1	1	8	12.50%
	5	4	0	3	0	0	1	7	14.29%
SP18	1	0	1	6	1	2	1	7	14.29%
	2	1	3	19	3	1	0	23	82.61%
	3	3	0	1	5	0	0	8	62.50%
	4	7	0	1	0	1	0	37	2.70%
	5	3	0	4	0	0	0	6	0.00%
SP19	1	0	4	3	0	1	1	7	57.14%
	2	5	4	14	0	0	1	23	60.87%
	3	6	0	3	1	0	0	8	12.50%
	4	6	0	4	0	0	0	37	0.00%
	5	5	0	1	0	0	1	5	20.00%
SP20	1	0	2	3	0	3	0	5	40.00%
	2	2	3	20	1	1	0	25	80.00%

Back propagation Neural Network Training Data
M2

Input Class		0	1	2	3	4	5	TOTAL	% CORR
SP1	1	0	6	0	0	0	0	6	100.00%
	2	0	0	4	0	0	0	4	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP2	1	0	3	0	0	0	0	3	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	1	0	0	0	6	0	7	85.71%
	5	0	0	0	0	0	8	8	100.00%
SP3	1	0	6	0	0	0	0	6	100.00%
	2	1	0	5	0	0	0	6	83.33%
	3	0	0	0	5	0	0	5	100.00%
	4	1	0	0	0	3	0	4	75.00%
	5	1	0	0	0	0	8	9	88.89%
SP4	1	1	4	0	0	0	0	5	80.00%
	2	1	0	6	0	0	0	7	85.71%
	3	1	0	0	3	0	0	4	75.00%
	4	1	0	0	0	6	0	7	85.71%
	5	0	0	0	0	0	7	7	100.00%
SP5	1	0	4	0	0	0	0	4	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP6	1	0	5	0	0	0	0	5	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP7	1	0	4	0	0	0	0	4	100.00%
	2	1	0	7	0	0	0	8	87.50%
	3	1	0	0	2	0	0	3	66.67%
	4	1	0	0	0	7	0	8	87.50%
	5	1	0	0	0	0	6	7	85.71%
SP8	1	0	3	0	0	0	0	3	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP9	1	1	4	0	0	0	0	5	80.00%
	2	1	0	6	0	0	0	7	85.71%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	5	0	5	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP10	1	0	8	0	0	0	0	8	100.00%
	2	1	0	4	0	0	0	5	80.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	3	3	100.00%

Back propagation Neural Network Testing Data
M2

Input Class		0	1	2	3	4	5	TOTAL	% CORR
SP1	1	4	2	0	0	0	3	9	22.22%
	2	9	1	2	0	2	1	11	18.18%
	3	3	4	1	1	4	0	10	10.00%
	4	2	0	0	2	2	0	6	33.33%
	5	6	1	0	0	1	1	9	11.11%
SP2	1	7	1	1	1	0	2	12	8.33%
	2	5	0	0	0	2	2	9	0.00%
	3	6	0	1	0	1	1	9	0.00%
	4	2	0	1	2	1	2	8	12.50%
	5	3	0	2	0	0	2	7	28.57%
SP3	1	6	1	0	1	1	0	9	11.11%
	2	6	1	0	1	1	0	9	0.00%
	3	6	0	1	2	1	0	10	20.00%
	4	6	0	0	2	2	1	11	18.18%
	5	2	1	0	0	2	1	6	16.67%
SP4	1	5	3	0	1	1	0	10	30.00%
	2	4	1	2	0	0	1	8	25.00%
	3	6	0	2	0	3	0	11	0.00%
	4	6	1	0	0	1	0	8	12.50%
	5	5	0	0	0	1	2	8	25.00%
SP5	1	8	0	1	2	0	0	11	0.00%
	2	5	0	1	1	0	0	7	14.29%
	3	3	0	3	2	0	0	8	25.00%
	4	7	0	2	0	2	0	11	18.18%
	5	3	0	2	0	2	1	8	12.50%
SP6	1	5	1	1	0	0	3	10	10.00%
	2	3	0	0	1	3	2	9	0.00%
	3	4	2	2	1	0	0	9	11.11%
	4	6	1	0	1	0	1	9	0.00%
	5	5	0	2	0	0	1	8	12.50%
SP7	1	4	1	0	0	6	0	11	9.09%
	2	5	0	0	0	2	0	7	0.00%
	3	4	0	0	0	5	0	12	0.00%
	4	3	0	1	0	2	1	7	28.57%
	5	4	1	1	0	1	1	8	12.50%
SP8	1	5	0	1	1	1	4	12	0.00%
	2	3	0	1	3	1	0	8	12.50%
	3	3	0	2	4	0	0	9	44.44%
	4	2	0	1	1	4	1	9	44.44%
	5	7	0	0	0	0	0	7	0.00%
SP9	1	8	1	0	0	0	1	10	10.00%
	2	6	0	0	0	1	1	8	0.00%
	3	7	0	1	1	1	0	10	10.00%
	4	9	0	0	0	0	1	10	0.00%
	5	4	0	0	0	0	3	7	42.86%
SP10	1	3	1	0	2	0	1	7	14.29%
	2	4	2	0	2	2	0	10	0.00%
	3	3	1	0	3	1	0	8	37.50%
	4	3	1	0	1	2	1	8	25.00%
	5	7	2	0	0	3	0	12	0.00%

Back propagation Neural Network Training Data
M2

Input Class		Output Class							
		0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	9	0	0	0	0	9	100.00%
	2	1	0	10	0	0	0	11	90.91%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP12	1	0	12	0	0	0	0	12	100.00%
	2	1	0	8	0	0	0	9	88.89%
	3	0	0	0	9	0	0	9	100.00%
	4	1	0	0	0	7	0	8	87.50%
	5	0	0	0	0	0	7	7	100.00%
SP13	1	1	8	0	0	0	0	9	88.89%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	11	0	11	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP14	1	1	9	0	0	0	0	10	90.00%
	2	1	0	7	0	0	0	8	87.50%
	3	0	0	0	11	0	0	11	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	1	0	0	0	0	7	8	87.50%
SP15	1	0	11	0	0	0	0	11	100.00%
	2	1	0	6	0	0	0	7	85.71%
	3	0	0	0	8	0	0	8	100.00%
	4	2	0	0	0	9	0	11	81.82%
	5	1	0	0	0	0	7	8	87.50%
SP16	1	0	10	0	0	0	0	10	100.00%
	2	1	0	8	0	0	0	9	88.89%
	3	0	0	0	9	0	0	9	100.00%
	4	1	0	0	0	8	0	9	88.89%
	5	1	0	0	0	0	7	8	87.50%
SP17	1	1	10	0	0	0	0	11	90.91%
	2	1	0	6	0	0	0	7	85.71%
	3	0	0	0	12	0	0	12	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP18	1	1	11	0	0	0	0	12	91.67%
	2	1	0	7	0	0	0	8	87.50%
	3	0	0	0	9	0	0	9	100.00%
	4	1	0	0	0	8	0	9	88.89%
	5	1	0	0	0	0	6	7	85.71%
SP19	1	1	9	0	0	0	0	10	90.00%
	2	1	0	7	0	0	0	8	87.50%
	3	0	0	0	10	0	0	10	100.00%
	4	3	0	0	0	7	0	10	70.00%
	5	0	0	0	0	0	7	7	100.00%
SP20	1	0	7	0	0	0	0	7	100.00%
	2	0	0	10	0	0	0	10	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	12	12	100.00%

Back propagation Neural Network Testing Data
M2

Input Class		Output Class							
		0	1	2	3	4	5	TOTAL	% CORR
SP11	1	3	1	0	1	0	1	6	16.67%
	2	0	0	0	2	0	2	4	0.00%
	3	1	0	2	2	0	0	5	40.00%
	4	2	0	1	3	1	2	9	11.11%
	5	5	0	0	0	0	1	6	16.67%
SP12	1	2	1	0	0	0	0	3	33.33%
	2	3	0	1	2	0	0	6	16.67%
	3	2	2	1	1	0	0	6	16.67%
	4	3	0	0	2	2	0	7	28.57%
	5	6	0	0	0	1	1	8	12.50%
SP13	1	3	1	0	2	0	0	6	16.67%
	2	3	0	0	2	1	0	6	0.00%
	3	2	0	0	3	0	0	5	60.00%
	4	2	0	0	1	1	0	4	25.00%
	5	5	0	1	0	2	1	9	11.11%
SP14	1	2	3	0	0	0	0	5	60.00%
	2	3	1	0	1	2	0	7	0.00%
	3	1	0	1	2	0	0	4	50.00%
	4	4	0	0	1	1	1	7	14.29%
	5	5	0	2	0	0	0	7	0.00%
SP15	1	2	1	1	0	0	0	4	25.00%
	2	6	0	0	1	0	1	8	0.00%
	3	4	2	0	1	0	0	7	14.29%
	4	2	0	0	1	0	1	4	0.00%
	5	3	1	0	0	3	0	7	0.00%
SP16	1	2	1	0	2	0	0	5	20.00%
	2	3	0	1	1	0	1	6	16.67%
	3	4	0	0	2	0	0	6	33.33%
	4	2	0	0	2	2	0	6	33.33%
	5	2	0	0	1	3	1	7	14.29%
SP17	1	2	0	1	0	0	1	4	0.00%
	2	3	0	0	1	0	4	8	0.00%
	3	2	0	0	1	0	0	3	33.33%
	4	2	1	0	1	3	1	8	37.50%
	5	3	0	0	1	1	2	7	28.57%
SP18	1	2	0	0	1	0	0	3	0.00%
	2	4	0	0	0	0	3	7	0.00%
	3	2	0	1	1	0	2	6	16.67%
	4	3	0	0	1	1	1	6	16.67%
	5	5	0	0	0	2	1	8	12.50%
SP19	1	4	1	0	0	0	0	5	20.00%
	2	3	2	0	1	0	1	7	0.00%
	3	4	0	0	1	0	0	5	20.00%
	4	3	0	0	1	1	0	5	20.00%
	5	5	0	0	0	1	2	8	25.00%
SP20	1	6	1	0	1	0	0	8	12.50%
	2	3	0	1	1	0	0	5	20.00%
	3	5	0	0	2	0	0	7	28.57%
	4	4	0	0	2	1	0	7	14.29%
	5	1	0	0	2	0	0	3	0.00%

Back propagation Neural Network Training Data
K1

Input Class		Output Class						
	0	1	2	3	4	5	TOTAL	% CORR
SP1 1	1	5	0	0	0	0	6	83.33%
2	1	0	3	0	0	0	4	75.00%
3	0	0	0	5	0	0	5	100.00%
4	0	0	0	0	9	0	9	100.00%
5	1	0	0	0	0	5	6	83.33%
SP2 1	0	3	0	0	0	0	3	100.00%
2	0	0	6	0	0	0	6	100.00%
3	0	0	0	6	0	0	6	100.00%
4	0	0	0	0	7	0	7	100.00%
5	0	0	0	0	0	8	8	100.00%
SP3 1	0	6	0	0	0	0	6	100.00%
2	1	0	5	0	0	0	6	83.33%
3	0	0	0	5	0	0	5	100.00%
4	0	0	0	0	4	0	4	100.00%
5	0	0	0	0	0	9	9	100.00%
SP4 1	0	5	0	0	0	0	5	100.00%
2	0	0	7	0	0	0	7	100.00%
3	0	0	0	4	0	0	4	100.00%
4	0	0	0	0	7	0	7	100.00%
5	0	0	0	0	0	7	7	100.00%
SP5 1	0	4	0	0	0	0	4	100.00%
2	1	0	7	0	0	0	8	87.50%
3	0	0	0	7	0	0	7	100.00%
4	0	0	0	0	4	0	4	100.00%
5	0	0	0	0	0	7	7	100.00%
SP6 1	1	4	0	0	0	0	5	80.00%
2	2	0	4	0	0	0	6	66.67%
3	0	0	0	6	0	0	6	100.00%
4	0	0	0	0	6	0	6	100.00%
5	0	0	0	0	0	7	7	100.00%
SP7 1	1	3	0	0	0	0	4	75.00%
2	0	0	8	0	0	0	8	100.00%
3	0	0	0	3	0	0	3	100.00%
4	0	0	0	0	8	0	8	100.00%
5	0	0	0	0	0	7	7	100.00%
SP8 1	0	3	0	0	0	0	3	100.00%
2	0	0	7	0	0	0	7	100.00%
3	1	0	0	5	0	0	6	83.33%
4	0	0	0	0	6	0	6	100.00%
5	0	0	0	0	0	8	8	100.00%
SP9 1	1	4	0	0	0	0	5	80.00%
2	0	0	7	0	0	0	7	100.00%
3	0	0	0	5	0	0	5	100.00%
4	0	0	0	0	5	0	5	100.00%
5	0	0	0	0	0	8	8	100.00%
SP10 1	0	8	0	0	0	0	8	100.00%
2	0	0	5	0	0	0	5	100.00%
3	0	0	0	7	0	0	7	100.00%
4	0	0	0	0	7	0	7	100.00%
5	0	0	0	0	0	3	3	100.00%

Back propagation Neural Network Testing Data
K1

Input Class		Output Class						
	0	1	2	3	4	5	TOTAL	% CORR
SP1 1	0	5	1	0	2	1	9	55.56%
2	4	0	4	2	1	0	11	36.36%
3	0	0	1	8	0	1	10	80.00%
4	0	2	1	0	3	0	6	50.00%
5	4	0	3	0	1	1	9	11.11%
SP2 1	8	1	1	1	1	0	12	8.33%
2	4	0	1	1	2	1	9	11.11%
3	2	0	2	5	0	0	9	55.56%
4	1	0	0	0	2	5	8	25.00%
5	2	0	1	0	1	3	7	42.86%
SP3 1	5	2	1	0	1	0	9	22.22%
2	2	1	3	0	1	2	9	33.33%
3	1	1	0	6	1	1	10	60.00%
4	4	1	1	0	5	0	11	45.45%
5	2	0	0	0	1	3	6	50.00%
SP4 1	5	4	0	0	0	1	10	40.00%
2	2	0	0	0	4	2	8	0.00%
3	1	0	1	8	1	0	11	72.73%
4	2	0	1	0	2	3	8	25.00%
5	2	0	3	0	1	2	8	25.00%
SP5 1	5	2	0	2	0	2	11	18.18%
2	2	0	1	1	2	1	7	14.29%
3	1	0	1	6	0	0	8	75.00%
4	2	0	2	0	2	5	11	18.18%
5	1	0	2	0	0	5	8	62.50%
SP6 1	5	1	0	0	2	2	10	10.00%
2	2	0	2	0	2	3	9	22.22%
3	0	0	1	6	0	2	9	66.67%
4	0	1	1	0	3	4	9	33.33%
5	2	0	0	0	0	6	8	75.00%
SP7 1	5	2	1	0	2	1	11	18.18%
2	1	0	0	0	2	4	7	0.00%
3	1	0	2	7	1	1	12	58.33%
4	1	0	1	0	5	0	7	71.43%
5	3	0	0	0	0	5	8	62.50%
SP8 1	2	3	2	0	5	0	12	25.00%
2	3	0	2	2	1	0	8	25.00%
3	2	1	0	6	0	0	9	66.67%
4	3	0	1	0	2	3	9	22.22%
5	0	0	1	0	1	5	7	71.43%
SP9 1	2	2	3	0	2	1	10	20.00%
2	2	0	3	1	0	2	8	37.50%
3	2	1	0	6	0	1	10	60.00%
4	2	0	2	0	1	5	10	10.00%
5	3	0	0	0	0	4	7	57.14%
SP10 1	2	4	0	0	0	1	7	57.14%
2	4	0	2	0	2	2	10	20.00%
3	1	0	0	4	1	2	8	50.00%
4	1	0	1	0	3	3	8	37.50%
5	1	1	2	0	1	7	12	58.33%

Back propagation Neural Network Training Data
K1

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	9	0	0	0	0	9	100.00%
	2	0	0	11	0	0	0	11	100.00%
	3	2	0	0	8	0	0	10	80.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP12	1	1	11	0	0	0	0	12	91.67%
	2	1	0	8	0	0	0	9	88.89%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP13	1	3	6	0	0	0	0	9	66.67%
	2	0	0	9	0	0	0	9	100.00%
	3	1	0	0	9	0	0	10	90.00%
	4	1	0	0	0	10	0	11	90.91%
	5	0	0	0	0	0	6	6	100.00%
SP14	1	0	10	0	0	0	0	10	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	11	0	0	11	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP15	1	1	10	0	0	0	0	11	90.91%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	0	11	0	11	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP16	1	2	8	0	0	0	0	10	80.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP17	1	1	10	0	0	0	0	11	90.91%
	2	2	0	5	0	0	0	7	71.43%
	3	1	0	0	11	0	0	12	91.67%
	4	0	0	0	0	7	0	7	100.00%
SSP18	1	0	12	0	0	0	0	12	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	1	0	0	0	8	0	9	88.89%
	5	0	0	0	0	0	7	7	100.00%
SP19	1	0	10	0	0	0	0	10	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	10	0	10	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP20	1	2	5	0	0	0	0	7	71.43%
	2	0	0	10	0	0	0	10	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	1	0	0	0	7	0	8	87.50%
	5	0	0	0	0	0	12	12	100.00%

Back propagation Neural Network Testing Data
K1

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SSP11	1	1	4	1	0	0	0	6	66.67%
	2	2	0	1	0	1	0	4	25.00%
	3	2	0	1	2	0	0	5	40.00%
	4	3	0	2	0	2	2	9	22.22%
	5	0	1	0	0	2	3	6	50.00%
SP12	1	3	0	0	0	0	0	3	0.00%
	2	1	0	0	2	2	1	6	0.00%
	3	0	1	0	4	0	1	6	66.67%
	4	1	1	1	1	3	0	7	42.86%
	5	2	0	0	0	1	5	8	62.50%
SP13	1	2	3	0	0	1	0	6	50.00%
	2	3	0	2	0	0	1	6	33.33%
	3	1	0	0	4	0	0	5	80.00%
	4	0	0	0	1	1	2	4	25.00%
	5	4	0	0	0	0	5	9	55.56%
SP14	1	0	4	0	0	1	0	5	80.00%
	2	1	1	1	0	3	1	7	14.29%
	3	1	0	0	2	0	1	4	50.00%
	4	1	1	1	0	4	0	7	57.14%
	5	3	2	0	0	0	2	7	28.57%
SP15	1	1	2	1	0	0	0	4	50.00%
	2	4	0	2	0	2	0	8	25.00%
	3	0	1	0	4	0	2	7	57.14%
	4	1	0	1	0	2	0	4	50.00%
	5	2	0	0	0	0	5	7	71.43%
SP16	1	2	1	0	0	2	0	5	20.00%
	2	2	0	1	1	1	1	6	16.67%
	3	1	0	0	5	0	0	6	83.33%
	4	0	0	1	0	3	2	6	50.00%
	5	1	0	0	0	2	4	7	57.14%
SP17	1	2	2	0	0	0	0	4	50.00%
	2	3	1	0	2	2	0	8	0.00%
	3	0	0	0	3	0	0	3	100.00%
	4	1	1	0	0	3	3	8	37.50%
	5	2	1	2	0	0	2	7	28.57%
SP18	1	1	2	0	0	0	0	3	66.67
	2	5	1	0	0	0	1	7	0.00%
	3	0	0	0	5	0	1	6	83.33%
	4	1	1	1	0	2	1	6	33.33%
	5	0	2	1	0	2	3	8	37.50%
SSP19	1	4	1	0	0	0	0	5	20.00%
	2	6	0	1	0	0	0	7	14.29%
	3	1	0	0	4	0	0	5	80.00%
	4	0	5	0	0	0	0	5	0.00%
	5	4	0	0	0	1	3	8	37.50%
SP20	1	4	3	1	0	0	0	8	37.50%
	2	2	0	1	1	0	1	5	20.00%
	3	1	0	0	6	0	0	7	85.71%
	4	1	0	1	0	3	2	7	42.86%
	5	0	1	0	0	0	2	3	66.67%

Back propagation Neural Network Training Data
M5

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP1	1	0	6	0	0	0	0	6	100.00%
	2	0	0	4	0	0	0	4	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	1	0	0	0	0	5	6	83.33%
SP2	1	0	3	0	0	0	0	3	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP3	1	0	6	0	0	0	0	6	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP4	1	0	5	0	0	0	0	5	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	4	0	0	4	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP5	1	0	4	0	0	0	0	4	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP6	1	0	5	0	0	0	0	5	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP7	1	0	4	0	0	0	0	4	100.00%
	2	1	0	7	0	0	0	8	87.50%
	3	0	0	0	3	0	0	3	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	1	0	0	0	0	6	7	85.71%
SP8	1	0	3	0	0	0	0	3	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP9	1	0	5	0	0	0	0	5	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	5	0	5	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP10	1	0	8	0	0	0	0	8	100.00%
	2	0	0	5	0	0	0	5	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	3	3	100.00%

Back propagation Neural Network Testing Data
M5

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP1	1	3	2	0	0	1	3	9	22.22%
	2	7	0	1	0	3	0	11	9.09%
	3	5	1	1	0	3	0	10	0.00%
	4	1	0	0	2	3	0	6	50.00%
	5	4	1	0	0	2	2	9	22.22%
SP2	1	6	0	1	3	0	2	12	0.00%
	2	0	0	1	2	4	2	9	11.11%
	3	8	0	0	0	1	0	9	0.00%
	4	5	0	1	0	2	0	8	25.00%
	5	3	0	3	0	1	0	7	0.00%
SP3	1	7	0	1	0	0	1	9	0.00%
	2	4	1	0	2	0	2	9	0.00%
	3	5	0	1	2	2	0	10	20.00%
	4	9	0	0	1	0	1	11	0.00%
	5	0	1	0	0	0	5	6	83.33%
SP4	1	4	3	0	1	1	1	10	30.00%
	2	4	1	1	0	1	1	8	12.50%
	3	6	0	1	1	3	0	11	9.09%
	4	4	1	0	0	3	0	8	37.50%
	5	5	0	0	0	0	3	8	37.50%
SP5	1	6	0	1	4	0	0	11	0.00%
	2	3	0	0	3	1	0	7	0.00%
	3	5	0	2	1	0	0	8	12.50%
	4	4	0	2	3	1	1	11	9.09%
	5	1	2	3	1	0	1	8	12.50%
SP6	1	3	1	2	1	0	3	10	10.00%
	2	4	0	0	1	2	2	9	0.00%
	3	4	1	1	2	1	0	9	22.22%
	4	5	0	2	1	1	0	9	11.11%
	5	3	0	2	1	0	2	8	25.00%
SP7	1	4	2	1	0	3	1	11	18.18%
	2	5	0	0	0	2	0	7	0.00%
	3	6	0	2	1	3	0	12	8.33%
	4	2	0	2	0	3	0	7	42.86%
	5	3	0	3	0	0	2	8	25.00%
SP8	1	7	0	3	1	0	1	12	0.00%
	2	2	0	2	3	1	0	8	25.00%
	3	4	0	1	4	0	0	9	44.44%
	4	5	0	0	1	3	0	9	33.33%
	5	5	0	0	0	1	1	7	14.29%
SP9	1	5	1	1	1	0	2	10	10.00%
	2	6	0	1	0	0	1	8	12.50%
	3	6	0	0	3	1	0	10	30.00%
	4	6	0	0	2	1	1	10	10.00%
	5	4	0	0	0	0	3	7	42.86%
SP10	1	4	0	0	2	0	1	7	0.00%
	2	2	2	0	3	2	1	10	0.00%
	3	4	0	0	2	2	0	8	25.00%
	4	2	1	0	1	3	1	8	37.50%
	5	9	0	1	0	2	0	12	0.00%

Back propagation Neural Network Training Data
M5

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	9	0	0	0	0	9	100.00%
	2	0	0	11	0	0	0	11	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP12	1	0	12	0	0	0	0	12	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP13	1	0	9	0	0	0	0	9	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	11	0	11	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP14	1	0	10	0	0	0	0	10	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	11	0	0	11	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	1	0	0	0	0	7	8	87.50%
SP15	1	0	11	0	0	0	0	11	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	0	11	0	11	100.00%
	5	1	0	0	0	0	7	8	87.50%
SP16	1	0	10	0	0	0	0	10	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	1	0	0	0	0	7	8	87.50%
SP17	1	0	11	0	0	0	0	11	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	12	0	0	12	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP18	1	0	12	0	0	0	0	12	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP19	1	0	10	0	0	0	0	10	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	10	0	10	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP20	1	0	7	0	0	0	0	7	100.00%
	2	0	0	10	0	0	0	10	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	12	12	100.00%

Back propagation Neural Network Testing Data
M5

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP11	1	2	0	0	3	0	1	6	0.00%
	2	1	0	0	1	0	2	4	0.00%
	3	2	0	1	2	0	0	5	40.00%
	4	3	0	0	3	2	1	9	22.22%
	5	2	0	1	0	1	2	6	33.33%
SP12	1	0	1	1	0	1	0	3	33.33%
	2	4	0	0	2	0	0	6	0.00%
	3	1	2	0	3	0	0	6	50.00%
	4	2	0	0	2	3	0	7	42.86%
	5	3	1	2	0	1	1	8	12.50%
SP13	1	1	1	0	2	0	2	6	16.67%
	2	3	0	0	2	0	1	6	0.00%
	3	0	1	0	3	0	1	5	60.00%
	4	1	0	0	1	2	0	4	50.00%
	5	3	0	1	0	3	2	9	22.22%
SP14	1	2	0	0	3	0	0	5	0.00%
	2	2	0	1	2	2	0	7	14.29%
	3	1	1	0	2	0	0	4	50.00%
	4	2	0	1	2	2	0	7	28.57%
	5	4	0	3	0	0	0	7	0.00%
SP15	1	0	2	0	0	1	1	4	50.00%
	2	1	1	1	2	1	1	8	12.50%
	3	2	2	0	2	21	0	7	28.57%
	4	4	0	0	0	0	0	4	0.00%
	5	4	0	1	0	1	1	7	14.29%
SP16	1	3	0	0	2	0	0	5	0.00%
	2	4	0	0	2	0	0	6	0.00%
	3	1	0	0	4	1	0	6	66.67%
	4	3	0	0	1	2	0	6	33.33%
	5	2	0	1	0	0	4	7	57.14%
SP17	1	3	1	0	0	0	0	4	25.00%
	2	5	0	0	2	0	1	8	0.00%
	3	1	0	0	2	0	0	3	66.67%
	4	1	1	1	1	4	0	8	50.00%
	5	2	0	0	0	2	3	7	42.86%
SP18	1	1	0	0	0	0	2	3	0.00%
	2	4	0	0	0	1	2	7	0.00%
	3	1	0	1	2	1	1	6	33.33%
	4	3	0	0	1	1	1	6	16.67%
	5	4	1	0	0	1	2	8	25.00%
SP19	1	2	0	2	0	0	1	5	0.00%
	2	4	0	0	2	1	0	7	0.00%
	3	2	0	0	1	2	0	5	20.00%
	4	4	0	0	0	1	0	5	20.00%
	5	2	1	1	0	2	2	8	25.00%
SP20	1	5	0	0	2	1	0	8	0.00%
	2	3	0	1	1	0	0	5	20.00%
	3	1	0	1	5	0	0	7	71.43%
	4	3	0	0	4	0	0	7	0.00%
	5	1	0	0	2	0	0	3	0.00%

Neural Network Training Data
F3

Input Class	0	1	2	3	4	5	TOTAL	% CORR
SP1 1	1	5	0	0	0	0	6	83.33%
2	1	0	3	0	0	0	4	75.00%
3	1	0	0	4	0	0	5	80.00%
4	0	0	0	0	9	0	9	100.00%
5	0	0	0	0	0	6	6	100.00%
SP2 1	0	3	0	0	0	0	3	100.00%
2	0	0	6	0	0	0	6	100.00%
3	0	0	0	6	0	0	6	100.00%
4	0	0	0	0	7	0	7	100.00%
5	0	0	0	0	0	8	8	100.00%
SP3 1	0	6	0	0	0	0	6	100.00%
2	0	0	5	0	0	1	6	83.33%
3	0	0	0	4	0	1	5	80.00%
4	0	0	0	0	4	0	4	100.00%
5	0	0	0	0	0	9	9	100.00%
SP4 1	0	5	0	0	0	0	5	100.00%
2	0	0	6	1	0	0	7	85.71%
3	0	0	0	4	0	0	4	100.00%
4	2	0	0	0	5	0	7	71.43%
5	5	0	0	0	0	2	7	28.57%
SP5 1	1	3	0	0	0	0	4	75.00%
2	2	0	6	0	0	0	8	75.00%
3	0	0	0	7	0	0	7	100.00%
4	0	0	0	0	4	0	4	100.00%
5	2	0	0	0	0	5	7	71.43%
SP6 1	1	4	0	0	0	0	5	80.00%
2	1	0	5	0	0	0	6	83.33%
3	4	0	0	2	0	0	6	33.33%
4	1	0	0	0	5	0	6	83.33%
5	0	0	0	0	0	7	7	100.00%
SP7 1	0	4	0	0	0	0	4	100.00%
2	2	0	6	0	0	0	8	75.00%
3	0	0	0	3	0	0	3	100.00%
4	0	0	0	0	8	0	8	100.00%
5	4	0	0	0	0	3	7	42.86%
SP8 1	0	3	0	0	0	0	3	100.00%
2	0	0	6	0	0	1	7	85.71%
3	0	0	0	6	0	0	6	100.00%
4	0	0	0	0	6	0	6	100.00%
5	1	0	0	0	0	7	8	87.50%
SP9 1	0	5	0	0	0	0	5	100.00%
2	4	0	2	0	0	1	7	28.57%
3	2	0	0	5	0	0	5	100.00%
4	1	0	0	0	5	0	5	100.00%
5	0	0	0	0	0	8	8	100.00%
SP10 1	0	8	0	0	0	0	8	100.00%
2	1	0	4	0	0	0	5	80.00%
3	0	0	0	7	0	0	7	100.00%
4	0	0	0	0	7	0	7	100.00%
5	0	0	0	0	0	3	3	100.00%

Neural Network Testing Data
F3

Input Class	0	1	2	3	4	5	TOTAL	% CORR
SP1 1	5	2	0	0	1	1	9	22.22%
2	5	0	0	0	4	2	11	0.00%
3	1	0	0	6	0	3	10	60.00%
4	1	0	1	0	3	1	6	50.00%
5	4	0	1	0	1	3	9	33.33%
SP2 1	3	4	1	1	0	3	12	33.33%
2	2	0	2	1	0	4	9	22.22%
3	0	0	0	7	0	2	9	77.78%
4	3	0	0	1	2	0	8	25.00%
5	2	0	1	0	0	4	7	57.14%
SP3 1	1	3	2	1	0	2	9	33.33%
2	2	0	3	0	1	3	9	33.33%
3	4	1	1	1	0	3	10	10.00%
4	3	0	1	1	4	2	11	36.36%
5	1	0	0	0	0	5	6	83.33%
SP4 1	2	5	1	1	0	1	10	50.00%
2	4	0	3	0	0	1	8	37.50%
3	4	0	0	7	0	0	11	63.64%
4	1	0	2	0	3	2	8	37.50%
5	6	0	1	1	0	0	8	0.00%
SP5 1	1	5	1	1	2	1	11	45.45%
2	4	0	2	0	1	0	7	28.57%
3	1	0	0	7	0	0	8	87.50%
4	3	0	1	1	5	1	11	45.45%
5	6	0	0	0	1	1	8	12.50%
SP6 1	4	2	0	0	2	2	10	20.00%
2	3	0	0	0	1	5	9	0.00%
3	6	1	0	1	0	1	9	11.11%
4	3	0	0	0	6	0	9	66.67%
5	0	0	1	0	0	7	8	87.50%
SP7 1	7	0	1	1	0	2	11	0.00%
2	2	0	1	2	1	1	7	14.29%
3	5	0	0	6	0	1	12	50.00%
4	5	0	0	0	2	0	7	28.57%
5	5	0	0	0	1	2	8	25.00%
SP8 1	3	4	2	2	0	1	12	33.33%
2	0	0	5	0	1	2	8	62.50%
3	1	0	1	1	0	6	9	11.11%
4	3	0	3	0	2	1	9	22.22%
5	0	0	2	0	1	4	7	57.14%
SP9 1	1	4	1	2	0	2	10	40.00%
2	2	0	1	0	0	5	8	12.50%
3	1	0	1	3	0	5	10	30.00%
4	5	0	0	0	3	2	10	30.00%
5	1	0	2	0	0	4	7	57.14%
SP10 1	4	3	0	0	0	0	7	42.86%
2	5	0	4	0	1	0	10	40.00%
3	1	0	0	6	0	1	8	75.00%
4	3	0	1	1	3	0	8	37.50%
5	9	0	1	0	2	0	12	0.00%

Neural Network Training Data
F3

Input Class		0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	9	0	0	0	0	9	100.00%
	2	1	0	10	0	0	0	11	90.91%
	3	1	0	0	9	0	0	10	90.00%
	4	1	0	0	0	5	0	6	83.33%
	5	1	0	0	0	0	8	9	88.89%
SP12	1	2	10	0	0	0	0	12	83.33%
	2	9	0	0	0	0	0	9	0.00%
	3	2	0	0	7	0	0	9	77.78%
	4	1	0	0	0	7	0	8	87.50%
	5	1	0	0	0	0	6	7	85.71%
SP13	1	0	9	0	0	0	0	9	100.00%
	2	2	0	7	0	0	0	9	77.78%
	3	1	0	0	9	0	0	10	90.00%
	4	2	0	0	0	9	0	11	81.82%
	5	0	0	0	0	0	6	6	100.00%
SP14	1	1	9	0	0	0	0	10	90.00%
	2	1	0	6	0	0	1	8	75.00%
	3	0	0	0	11	0	0	11	100.00%
	4	1	0	0	0	7	0	8	87.50%
	5	0	0	0	0	0	8	8	100.00%
SP15	1	0	11	0	0	0	0	11	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	1	0	0	7	0	0	8	87.50%
	4	2	0	0	0	9	0	11	81.82%
	5	3	0	0	0	0	5	8	62.50%
SP16	1	0	10	0	0	0	0	10	100.00%
	2	0	0	6	0	0	3	9	66.67%
	3	0	0	0	9	0	0	9	100.00%
	4	2	0	0	0	7	0	9	77.78%
	5	1	0	0	0	0	7	8	87.50%
SP17	1	0	11	0	0	0	0	11	100.00%
	2	2	0	5	0	0	0	7	71.43%
	3	0	0	0	11	1	0	12	91.67%
	4	0	0	0	0	7	0	7	100.00%
	5	6	0	0	0	0	2	8	25.00%
SP18	1	1	11	0	0	0	0	12	91.67%
	2	1	0	7	0	0	0	8	87.50%
	3	1	0	0	8	0	0	9	88.89%
	4	3	0	0	0	6	0	9	66.67%
	5	2	0	0	2	0	3	7	42.86%
SP19	1	1	9	0	0	0	0	10	90.00%
	2	1	0	7	0	0	0	8	87.50%
	3	0	0	0	10	0	0	10	100.00%
	4	3	0	0	0	7	0	10	70.00%
	5	4	0	0	0	0	3	7	42.86%
SP20	1	0	7	0	0	0	0	7	100.00%
	2	1	0	9	0	0	0	10	90.00%
	3	3	0	0	5	0	0	8	62.50%
	4	0	1	1	0	6	0	8	75.00%
	5	8	0	0	0	0	4	12	33.33%

Neural Network Testing Data
F3

Input Class		0	1	2	3	4	5	TOTAL	% CORR
SP11	1	1	2	1	2	0	0	6	33.33%
	2	1	0	0	0	0	3	4	0.00%
	3	2	0	1	2	0	0	5	40.00%
	4	4	0	3	0	2	0	9	22.22%
	5	3	0	0	1	0	2	6	33.33%
SP12	1	0	2	0	0	1	0	3	66.67%
	2	4	0	0	0	1	1	6	0.00%
	3	6	0	0	0	0	0	6	0.00%
	4	3	0	0	0	3	1	7	42.86%
	5	6	0	0	0	0	2	8	25.00%
SP13	1	2	2	0	1	1	0	6	33.33%
	2	3	2	0	0	0	1	6	0.00%
	3	0	0	0	5	0	0	5	100.00%
	4	1	0	0	0	3	0	4	75.00%
	5	8	0	1	0	0	0	9	0.00%
SP14	1	0	4	0	1	0	0	5	80.00%
	2	1	0	2	0	1	3	7	28.57%
	3	1	0	0	2	0	1	4	50.00%
	4	0	1	0	0	4	2	7	57.14%
	5	1	0	1	0	0	5	7	71.43%
SP15	1	1	1	1	0	1	0	4	25.00%
	2	3	0	1	1	1	2	8	12.50%
	3	3	0	0	3	0	1	7	42.86%
	4	1	0	0	0	2	1	4	50.00%
	5	4	0	1	0	0	2	7	28.57%
SP16	1	0	2	1	2	0	0	5	40.00%
	2	1	0	4	1	0	0	6	66.67%
	3	4	0	0	2	0	0	6	33.33%
	4	5	0	0	1	0	0	6	0.00%
	5	1	0	3	1	0	2	7	28.57%
SP17	1	0	1	1	0	1	1	4	25.00%
	2	3	0	1	1	3	0	8	12.50%
	3	0	0	0	3	0	0	3	100.00%
	4	2	1	1	1	3	0	8	37.50%
	5	3	0	0	2	2	0	7	0.00%
SP18	1	1	1	0	1	0	0	3	33.33%
	2	4	0	1	1	1	0	7	14.29%
	3	1	0	0	5	0	0	6	83.33%
	4	1	2	0	0	3	0	6	50.00%
	5	5	0	0	3	0	0	8	0.00%
SP19	1	1	2	0	0	1	1	5	40.00%
	2	3	0	1	0	1	2	7	14.29%
	3	1	0	0	4	0	0	5	80.00%
	4	2	0	0	0	3	0	5	60.00%
	5	6	0	0	0	1	1	8	12.50%
SP20	1	3	3	0	1	1	0	8	37.50%
	2	1	1	2	0	0	1	5	40.00%
	3	4	0	0	3	0	0	7	42.86%
	4	2	1	2	0	1	1	7	14.29%
	5	2	0	1	0	0	0	3	0.00%

Suprervised Kohonen TRAINING A1

Class		0	1	2	3	4	5	TOT	% CORR
SP1	1	0	6	0	0	0	0	6	100.00%
	2	0	0	4	0	0	0	4	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP2	1	0	3	0	0	0	0	3	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	3	100.00%
SP3	1	0	6	0	0	0	0	6	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP4	1	0	5	0	0	0	0	5	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	4	0	0	4	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP5	1	0	4	0	0	0	0	4	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP6	1	0	5	0	0	0	0	5	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP7	1	0	4	0	0	0	0	4	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	3	0	0	3	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP8	1	0	3	0	0	0	0	3	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP9	1	0	5	0	0	0	0	5	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	5	0	5	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP10	1	0	7	0	0	0	0	7	100.00%
	2	0	0	5	0	0	0	5	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	3	3	100.00%

TESTING

Class		0	1	2	3	4	5	TOT	% CORR
SP1	1	0	8	0	0	1	0	9	88.89%
	2	0	7	1	0	1	2	11	9.09%
	3	0	7	0	1	2	0	10	10.00%
	4	0	4	1	0	0	1	6	0.00%
	5	0	2	4	0	2	1	9	11.11%
SP2	1	0	7	0	1	3	1	12	58.33%
	2	0	0	0	1	4	4	9	0.00%
	3	0	0	0	6	3	0	9	66.67%
	4	0	0	1	0	6	1	8	75.00%
	5	0	1	0	0	2	4	7	57.14%
SP3	1	0	5	3	0	0	1	9	55.56%
	2	0	4	3	2	0	0	9	33.33%
	3	0	1	2	3	4	0	10	30.00%
	4	0	0	4	1	1	5	11	9.09%
	5	0	2	3	0	0	1	6	16.67%
SP4	1	0	7	0	1	2	0	10	70.00%
	2	0	0	2	1	0	5	8	25.00%
	3	0	0	3	8	0	0	11	72.73%
	4	0	0	2	1	5	0	8	62.50%
	5	0	1	0	0	3	4	8	50.00%
SP5	1	0	2	3	1	1	4	11	18.18%
	2	0	0	3	2	1	1	7	42.86%
	3	0	0	3	5	0	0	8	62.50%
	4	0	0	6	0	0	5	11	0.00%
	5	0	0	3	0	0	5	8	62.50%
SP6	1	0	6	0	0	2	2	10	60.00%
	2	0	2	1	1	2	3	9	11.11%
	3	0	2	0	5	1	1	9	55.56%
	4	0	0	1	0	2	6	9	22.22%
	5	0	1	1	0	1	5	8	62.50%
SP7	1	0	4	4	0	2	1	11	36.36%
	2	0	0	4	0	1	2	7	57.14%
	3	0	0	9	1	2	0	12	8.33%
	4	0	0	2	0	4	1	7	57.14%
	5	0	1	2	0	1	4	8	50.00%
SP8	1	0	3	2	1	3	3	12	25.00%
	2	0	0	0	4	2	2	8	0.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	1	4	4	9	44.44%
	5	0	0	1	0	1	5	7	71.43%
SP9	1	0	5	1	0	0	4	10	50.00%
	2	0	0	4	0	0	4	8	50.00%
	3	0	0	8	2	0	0	10	20.00%
	4	0	0	1	1	0	8	10	0.00%
	5	0	1	0	0	0	6	7	85.71%
SP10	1	0	5	0	0	2	0	7	71.43%
	2	0	1	3	1	5	0	10	30.00%
	3	0	0	2	4	2	0	8	50.00%
	4	0	0	0	0	8	0	8	100.00
	5	0	2	3	0	4	3	12	25.00%

Suprervised Kohonen TRAINING A1

Class		0	1	2	3	4	5	TOT	% CORR
SP11	1	0	9	0	0	0	0	9	100.00%
	2	0	0	11	0	0	0	11	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP12	1	0	12	0	0	0	0	12	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP13	1	0	9	0	0	0	0	9	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	11	0	11	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP14	1	0	10	0	0	0	0	10	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	11	0	0	11	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP15	1	0	10	0	0	1	0	11	90.91%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	0	11	0	11	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP16	1	0	10	0	0	0	0	10	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP17	1	0	10	0	0	1	0	11	90.91%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	12	0	0	12	100.00%
	4	0	0	1	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP18	1	0	12	0	0	0	0	12	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP19	1	0	10	0	0	0	0	10	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	9	1	0	10	90.00%
	4	0	0	0	0	10	0	10	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP20	1	0	7	0	0	0	0	7	100.00%
	2	0	0	10	0	0	0	10	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	12	12	100.00%

TESTING

Class		0	1	2	3	4	5	TOT	% CORR
SP11	1	0	3	0	1	1	1	6	50.00%
	2	0	0	0	1	1	2	4	0.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	5	0	4	0	9	44.44%
	5	0	0	4	0	0	2	6	33.33%
SP12	1	0	1	0	0	1	1	3	33.33%
	2	0	1	1	3	0	1	6	16.67%
	3	0	0	2	4	0	0	6	66.67%
	4	0	2	4	1	0	0	7	0.00%
	5	0	1	3	0	1	3	8	37.50%
SP13	1	0	5	0	0	1	0	6	83.33%
	2	0	0	1	1	3	1	6	16.67%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	2	2	0	4	50.00%
	5	0	1	1	0	7	0	9	0.00%
SP14	1	0	3	1	0	1	0	5	60.00%
	2	0	0	3	3	1	0	7	42.86%
	3	0	0	1	3	0	0	4	75.00%
	4	0	1	4	0	2	0	7	28.57%
	5	0	0	7	0	0	0	7	0.00%
SP15	1	0	2	0	1	1	0	4	50.00%
	2	0	3	5	0	0	0	8	62.50%
	3	0	2	3	2	0	0	7	28.57%
	4	0	2	2	0	0	0	4	0.00%
	5	0	3	1	0	0	3	7	42.86%
SP16	1	0	4	0	1	0	0	5	80.00%
	2	0	0	0	4	0	2	6	0.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	2	4	0	6	66.67%
	5	0	0	0	1	4	2	7	28.57%
SP17	1	0	2	1	0	1	0	4	50.00%
	2	0	2	2	2	0	2	8	25.00%
	3	0	0	0	3	0	0	3	100.00%
	4	0	1	5	1	0	1	8	0.00%
	5	0	3	1	0	1	2	7	28.57%
SP18	1	0	2	1	0	0	0	3	66.67%
	2	0	3	1	0	0	3	7	14.29%
	3	0	1	4	1	0	0	6	16.67%
	4	0	2	4	0	0	0	6	0.00%
	5	0	5	1	0	0	2	8	25.00%
SP19	1	0	2	1	0	0	1	5	40.00%
	2	0	1	5	1	0	0	7	71.43%
	3	0	0	3	1	1	0	5	20.00%
	4	0	1	3	0	1	0	5	20.00%
	5	0	2	3	0	2	1	8	12.50%
SP20	1	0	5	0	1	1	1	8	62.50%
	2	0	0	1	2	0	2	5	20.00%
	3	0	0	2	5	0	0	7	71.43%
	4	0	1	2	2	1	1	7	14.29%
	5	0	0	1	0	0	2	3	66.67%

Suprervised Kohonen TRAINING A2

Class		0	1	2	3	TOTAL	% CORR
SP1	1	0	5	0	1	6	83.33%
	2	0	0	6	0	6	100.00%
	3	0	0	0	18	18	100.00%
SP2	1	0	3	0	0	3	100.00%
	2	0	0	8	0	8	100.00%
	3	0	0	0	19	19	100.00%
SP3	1	0	6	0	0	6	100.00%
	2	0	0	9	0	9	100.00%
	3	0	0	0	15	15	100.00%
SP4	1	0	5	0	0	5	100.00%
	2	0	0	7	0	7	100.00%
	3	0	0	0	18	18	100.00%
SP5	1	0	4	0	0	4	100.00%
	2	0	0	7	0	7	100.00%
	3	0	0	0	19	19	100.00%
SP6	1	0	5	0	0	5	100.00%
	2	0	0	7	0	7	100.00%
	3	0	0	0	18	18	100.00%
SP7	1	0	4	0	0	4	100.00%
	2	0	0	7	0	7	100.00%
	3	0	0	0	19	19	100.00%
SP8	1	0	3	0	0	3	100.00%
	2	0	0	8	0	8	100.00%
	3	0	0	0	19	19	100.00%
SP9	1	0	5	0	0	5	100.00%
	2	0	0	8	0	8	100.00%
	3	0	0	0	17	17	100.00%
SP10	1	0	8	0	0	8	100.00%
	2	0	0	3	0	3	100.00%
	3	0	0	0	19	19	100.00%

TESTING

Class		0	1	2	3	TOTAL	% CORR
SP1	1	0	8	0	1	9	88.89%
	2	0	4	2	3	9	22.22%
	3	0	22	1	4	27	14.81%
SP2	1	0	6	1	5	12	50.00%
	2	0	1	3	3	7	42.86%
	3	0	0	5	21	26	80.77%
SP3	1	0	5	1	3	9	55.56%
	2	0	2	1	3	6	16.67%
	3	0	2	6	22	30	73.33%
SP4	1	0	6	1	3	10	60.00%
	2	0	1	5	2	8	62.50%
	3	0	0	5	22	27	81.48%
SP5	1	0	2	3	6	11	18.18%
	2	0	0	5	3	8	62.50%
	3	0	0	8	18	26	69.23%
SP6	1	0	6	3	1	10	60.00%
	2	0	2	6	0	8	75.00%
	3	0	1	12	14	27	51.85%
SP7	1	0	4	2	5	11	36.36%
	2	0	1	2	5	8	25.00%
	3	0	0	2	24	26	92.31%
SP8	1	0	4	2	6	12	33.33%
	2	0	0	3	4	7	42.86%
	3	0	0	3	23	26	88.46%
SP9	1	0	5	3	2	10	50.00%
	2	0	1	6	0	7	85.71%
	3	0	0	11	17	28	60.71%
SP10	1	0	5	0	2	7	71.43%
	2	0	1	2	9	12	16.67%
	3	0	1	1	24	26	92.31%

Suprervised Kohonen TRAINING A2

Class		0	1	2	3	TOTAL	% CORR
SP11	1	0	9	0	0	9	100.00%
	2	0	0	9	0	9	100.00%
	3	0	0	0	27	7	100.00%
SP12	1	0	11	0	1	12	91.67%
	2	0	0	7	0	7	100.00%
	3	0	0	0	26	26	100.00%
SP13	1	0	9	0	0	9	100.00%
	2	0	0	6	0	6	100.00%
	3	0	0	0	30	30	100.00%
SP14	1	0	9	0	1	10	90.00%
	2	0	0	8	0	8	100.00%
	3	0	0	0	27	27	100.00%
SP15	1	0	10	0	1	11	)0.91%
	0	0	8	0		8	100.00%
	3	0	0	0	26	26	100.00%
SP16	1	0	10	0	0	10	100.00%
	2	0	0	8	0	8	100.00%
	3	0	0	0	27	27	100.00%
SP17	1	0	11	0	0	11	100.00%
	2	0	0	8	0	8	100.00%
	3	0	0	0	26	26	100.00%
SP18	1	0	12	0	0	12	100.00%
	2	0	0	7	0	7	100.00%
	3	0	0	0	26	26	100.00%
SP19	1	0	9	0	1	10	90.00%
	2	0	0	7	0	7	100.00%
	3	0	0	0	28	28	100.00%
SP20	1	0	7	0	0	7	100.00%
	2	0	0	12	0	12	100.00%
	3	0	0	0	26	26	100.00%

TESTING

Class		0	1	2	3	TOTAL	% CORR
SP11	1	0	3	1	2	6	50.00%
	2	0	0	2	4	6	33.33%
	3	0	0	2	16	18	88.89%
SP12	1	0	2	1	0	3	66.67%
	2	0	1	3	4	8	37.50%
	3	0	2	1	16	19	84.21%
SP13	1	0	5	0	1	6	83.33%
	2	0	1	1	7	9	11.11%
	3	0	0	1	14	15	93.33%
SP14	1	0	3	1	1	5	60.00%
	2	0	1	1	5	7	14.29%
	3	0	1	1	16	18	88.89%
SP15	1	0	2	0	2	4	50.00%
	2	0	3	3	1	7	42.86%
	3	0	9	0	10	19	52.63%
SP16	1	0	4	0	1	5	80.00%
	2	0	0	2	5	7	28.57%
	3	0	0	2	16	18	88.89%
SP17	1	0	2	0	2	4	50.00%
	2	0	3	2	2	7	28.57%
	3	0	4	4	11	19	57.89%
SP18	1	0	2	0	1	3	66.67%
	2	0	5	2	1	8	25.00%
	3	0	8	4	7	19	36.84%
SP19	1	0	2	1	2	5	40.00%
	2	0	2	1	5	8	12.50%
	3	0	2	1	!14	17	82.35%
SP20	1	0	5	1	2	8	62.50%
	2	0	0	2	i	3	66.67%
	3	0	1	3	15	19	78.95%

Suprervised Kohonen TRAINING CO1

Class		0	1	2	TOT	% CORR
SP1	1	0	4	2	6	66.67%
	2	0	0	24	24	100.00%
	3	0	0	0	5	100.00%
	4	0	0	0	9	100.00%
	5	0	0	0	6	100.00%
SP2	1	0	2	1	3	66.67%
	2	0	0	27	27	100.00%
	3	0	0	0	6	100.00%
	4	0	0	0	7	100.00%
	5	0	0	0	8	100.00%
SP3	1	0	5	1	6	83.33%
	2	0	0	24	24	100.00%
	3	0	0	0	5	100.00%
	4	0	0	0	4	100.00%
	5	0	0	0	9	100.00%
SP4	1	0	3	2	5	60.00%
	2	0	0	25	25	100.00%
	3	2	0	0	4	50.00%
	4	0	0	0	7	100.00%
	5	0	0	0	7	100.00%
SP5	1	0	11	0	11	10.00%
	2	0	0	26	26	100.00%
	3	1	0	0	7	85.71%
	4	0	0	0	4	100.00%
	5	0	0	0	7	100.00%
SP6	1	0	3	2	5	60.00%
	2	0	0	25	25	100.00%
	3	0	0	0	6	100.00%
	4	0	0	0	6	100.00%
	5	0	0	0	7	100.00%
SP7	1	0	3	1	4	75.00%
	2	0	0	26	26	100.00%
	3	1	0	0	3	66.67%
	4	0	0	0	8	100.00%
	5	0	0	0	7	100.00%
SP8	1	0	2	1	3	66.67%
	2	0	0	27	27	100.00%
	3	1	0	0	6	83.33%
	4	0	0	0	6	100.00%
	5	0	0	0	8	100.00%
SP9	1	0	3	2	5	60.00%
	2	0	0	25	25	100.00%
	3	2	0	0	5	60.00%
	4	1	0	0	5	80.00%
	5	0	0	0	8	100.00%
SP10	1	0	7	1	8	87.50%
	2	0	0	22	22	100.00%
	3	0	0	0	7	100.00%
	4	0	0	0	7	100.00%
	5	0	0	0	3	100.00%

TESTING

Class		0	1	2	TOT	% CORR
SP1	1	0	2	7	9	22.22%
	2	0	1	35	36	97.22%
	3	5	1	0	10	20.00%
	4	4	0	1	6	16.67%
	5	3	1	3	9	0.00%
SP2	1	0	1	11	12	8.33%
	2	0	0	33	33	100.00%
	3	4	0	0	9	55.56%
	4	4	1	2	8	0.00%
	5	0	0	1	7	0.00%
SP3	1	0	3	6	9	33.33%
	2	0	5	31	36	86.11%
	3	6	0	0	10	20.00%
	4	7	0	0	11	18.18%
			0	0	6	33.33%
SP4	1	0	2	8	10	20.00%
	2	0	1	34	35	97.14%
	3	5	0	2	11	27.27%
	4	5	1	2	8	0.00%
	5	3	1	0	8	50.00%
SP5	1	0	0	11	11	0.00%
	2	0	0	34	34	100.00%
	3	5	0	0	8	37.50%
	4	6	0	2	11	9.09%
	5	3	0	2	8	25.00%
SP6	1	0	0	10	10	0.00%
	2	0	1	34	35	97.14%
	3	4	0	2	9	33.33%
	4	3	0	2	9	0.00%
	5	2	0	2	8	37.50%
SP7	1	0	1	10	11	9.09%
	2	0	0	34	34	100.00%
	3	8	0	2	12	8.33%
	4	2	0	3	7	14.29%
	5	4	0	3	8	12.50%
SP8	1	0	4	8	12	33.33%
	2	0	3	30	33	90.91%
	3	3	0	1	9	55.56%
	4	7	0	1	9	11.11%
	5	3	0	4	7	0.00%
SP9	1	0	4	6	10	40.00%
	2	0	1	34	35	97.14%
	3	6	0	3	10	10.00%
	4	6	0	4	10	0.00%
	5	5	0	1	7	14.29%
SP10	1	0	3	4	7	42.86%
	2	0	5	33	38	86.84%
	3	1	1	0	8	62.50%
	4	4	2	0	8	12.50%
	5	6	1	1	12	8.33%

Suprervised Kohonen TRAINING CO1

	0	1	2		TOTAL	% CORR
SP11	1	0	2	7	9	22.22%
	2	0	0	36	36	100.00%
	3	0	0	0	5	100.00%
	4	0	0	0	9	100.00%
	5	0	0	0	6	100.00%
SP12	1	0	8	4	12	66.67%
	2	0	1	32	33	96.97%
	3	0	0	0	6	100.00%
	4	0	0	0	7	100.00%
	5	0	0	0	8	100.00%
SP13	1	0	3	6	9	33.33%
	2	0	0	36	36	100.00%
	3	0	0	0	5	100.00%
	4	0	0	0	4	100.00%
	5	0	0	0	9	100.00%
SP14	1	0	6	4	10	60.00%
	2	0	0	35	35	100.00%
	3	2	0	0	4	50.00%
	4	0	0	0	7	100.00%
	5	0	0	0	7	100.00%
SP15	1	0	7	4	11	63.64%
	2	0	0	34	34	100.00%
	3	1	0	0	7	85.71%
	4	0	0	0	4	100.00%
	5	0	0	0	7	100.00%
SP16	1	0	5	5	10	50.00%
	2	0	0	35	35	100.00%
	3	0	0	0	6	100.00%
	4	0	0	0	6	100.00%
	5	0	0	0	7	100.00%
SP17	1	0	9	2	11	81.82%
	2	0	0	34	34	100.00%
	3	1	0	0	3	66.67%
	4	0	0	0	8	100.00%
	5	0	0	0	7	100.00%
SP18	1	0	10	2	12	83.33%
	2	0	1	32	33	96.97%
	3	1	0	0	6	83.33%
	4	0	0	0	6	100.00%
	5	0	0	0	8	100.00%
SP19	1	0	6	4	10	60.00%
	2	0	1	34	35	97.14%
	3	2	0	0	5	60.00%
	4	1	0	0	5	80.00%
	5	0	0	0	8	100.00%
SP20	1	0	2	5	7	28.57%
	2	0	0	38	38	100.00%
	3	0	0	0	7	100.00%
	4	0	0	0	7	100.00%
	5	0	0	0	3	100.00%

TESTING

	0	1	2		TOTAL	% CORR
SP11	1	0	1	5	6	16.67%
	2	0	2	22	24	91.67%
	3	5	1	0	10	20.00%
	4	4	0	1	6	16.67%
	5	3	1	3	9	0.00%
SP12	1	0	1	2	3	33.33%
	2	0	1	26	27	96.30%
	3	4	0	0	9	55.56%
	4	4	1	2	8	0.00%
	5	0	0	1	7	0.00%
SP13	1	0	2	4	6	33.33%
	2	0	0	24	24	100.00%
	3	6	0	0	10	20.00%
	4	7	0	0	11	18.18%
	5	4	0	0	6	33.33%
SP14	1	0	2	3	5	40.00%
	2	0	2	23	25	92.00%
	3	5	0	2	11	27.27%
	4	5	1	2	8	0.00%
	5	3	1	0	8	50.00%
SP15	1	0	0	4	4	0.00%
	2	0	1	25	26	96.15%
	3	5	0	0	8	37.50%
	4	6	0	2	11	9.09%
	5	3	0	2	8	25.00%
SP16	1	0	0	5	5	0.00%
	2	0	0	25	25	100.00%
	3	4	0	2	9	33.33%
	4	3	0	2	9	0.00%
	5	2	0	2	8	37.50%
SP17	1	0	2	2	4	50.00%
	2	0	4	22	26	84.62%
	3	8	0	2	12	8.33%
	4	2	0	3	7	14.29%
	5	4	0	3	8	12.50%
SP18	1	0	1	2	3	33.33%
	2	0	5	22	27	81.48%
	3	3	0	1	9	55.56%
	4	7	0	1	9	11.11%
	5	3	0	4	7	0.00%
SP19	1	0	2	3	5	40.00%
	2	0	9	16	25	64.00%
	3	6	0	3	10	10.00%
	4	6	0	4	10	0.00%
	5	5	0	1	7	14.29%
SP20	1	0	1	7	8	12.50%
	2	0	0	22	22	100.00%
	3	1	1	0	8	62.50%
	4	4	2	0	8	12.50%
	5	6	1	1	12	8.33%

Suprervised Kohonen TRAINING CO1 TESTING

Class		0	1	2	TOTAL	% CORR	Class		0	1	2	TOTAL	% CORR
SP1	1	0	1	3	4	25.00%	SP1	1	0	1	10	11	9.09%
	2	0	0	26	26	100.00%		2	0	6	28	34	82.35%
	3	0	0	0	5	100.00%		3	5	1	0	10	20.00%
	4	0	0	0	9	100.00%		4	4	0	1	6	16.67%
	5	0	0	0	6	100.00%		5	3	1	3	9	0.00%
SP2	1	0	3	3	6	50.00%	SP2	1	0	0	9	9	0.00%
	2	0	0	24	24	100.00%		2	0	2	34	36	94.44%
	3	0	0	0	6	100.00%		3	4	0	0	9	55.56%
	4	0	0	0	7	100.00%		4	4	1	2	8	0.00%
	5	0	0	0	8	100.00%		5	0	0	1	7	0.00%
SP3	1	0	4	2	6	66.67%	SP3	1	0	3	6	9	33.33%
	2	0	1	23	24	95.83%		2	0	12	24	36	66.67%
	3	0	0	0	5	100.00%		3	6	0	0	10	20.00%
	4	0	0	0	4	100.00%		4	7	0	0	11	18.18%
	5	0	0	0	9	100.00%		5	4	0	0	6	33.33%
SP4	1	0	4	3	7	57.14%	SP4	1	0	1	7	8	12.50%
	2	0	0	23	23	100.00%		2	0	0	37	37	100.00%
	3	2	0	0	4	50.00%		3	5	0	2	11	27.27%
	4	0	0	0	7	100.00%		4	5	1	2	8	0.00%
	5	0	0	0	7	100.00%		5	3	1	0	8	50.00%
SP5	1	0	8	0	8	100.00%	SP5	1	0	2	5	7	28.57%
	2	0	0	22	22	100.00%		2	0	7	31	38	81.58%
	3	1	0	0	7	85.71%		3	5	0	0	8	37.50%
	4	0	0	0	4	100.00%		4	6	0	2	11	9.09%
	5	0	0	0	7	100.00%		5	3	0	2	8	25.00%
SP6	1	0	5	1	6	83.33%	SP6	1	0	1	8	9	11.11%
	2	0	0	24	24	100.00%		2	0	5	31	36	86.11%
	3	0	0	0	6	100.00%		3	4	0	2	9	33.33%
	4	0	0	0	6	100.00%		4	3	0	2	9	0.00%
	5	0	0	0	7	100.00%		5	2	0	2	8	37.50%
SP7	1	0	7	1	8	87.50%	SP7	1	0	1	6	7	14.29%
	2	0	0	22	22	100.00%		2	0	5	33	38	86.84%
	3	1	0	0	3	66.67%		3	8	0	2	12	8.33%
	4	0	0	0	8	100.00%		4	2	0	3	7	14.29%
	5	0	0	0	7	100.00%		5	4	0	3	8	12.50%
SP8	1	0	7	0	7	100.00%	SP8	1	0	3	5	8	37.50%
	2	0	1	22	23	95.65%		2	0	6	31	37	83.78%
	3	1	0	0	6	83.33%		3	3	0	1	9	55.56%
	4	0	0	0	6	100.00%		4	7	0	1	9	11.11%
	5	0	0	0	8	100.00%		5	3	0	4	7	0.00%
SP9	1	0	4	3	7	57.14%	SP9	1	0	2	6	8	25.00%
	2	0	0	23	23	100.00%		2	0	2	35	37	94.59%
	3	2	0	0	5	60.00%		3	6	0	3	10	10.00%
	4	1	0	0	5	80.00%		4	6	0	4	10	0.00%
	5	0	0	0	8	100.00%		5	5	0	1	7	14.29%
SP10	1	0	3	2	5	60.00%	SP10	1	0	0	10	10	0.00%
	2	0	0	25	25	100.00%		2	0	0	35	35	100.00%
	3	0	0	0	7	100.00%		3	1	1	0	8	62.50%
	4	0	0	0	7	100.00%		4	4	2	0	8	12.50%
	5	0	0	0	3	100.00%		5	6	1	1	12	8.33%

Suprervised Kohonen TRAINING A1

	Class	0	1	2	TOT	% CORR
SP11	1	0	7	4	11	63.64%
	2	0	2	32	34	94.12%
	3	0	0	0	5	100.00%
	4	0	0	0	9	100.00%
	5	0	0	0	6	100.00%
SP12	1	0	6	3	9	66.67%
	2	0	0	36	36	100.00%
	3	0	0	0	6	100.00%
	4	0	0	0	7	100.00%
	5	0	0	0	8	100.00%
SP13	1	0	2	7	9	22.22%
	2	0	0	36	36	100.00%
	3	0	0	0	5	100.00%
	4	0	0	0	4	100.00%
	5	0	0	0	9	100.00%
SP14	1	0	6	2	8	75.00%
	2	0	1	36	37	97.30%
	3	2	0	0	4	50.00%
	4	0	0	0	7	100.00%
	5	0	0	0	7	100.00%
SP15	1	0	3	4	7	42.86%
	2	0	0	38	38	100.00%
	3	1	0	0	7	85.71%
	4	0	0	0	4	100.00%
	5	0	0	0	7	100.00%
SP16	1	0	7	2	9	77.78%
	2	0	2	34	36	94.44%
	3	0	0	0	6	100.00%
	4	0	0	0	6	100.00%
	5	0	0	0	7	100.00%
SP17	1	0	2	5	7	28.57%
	2	0	1	37	38	97.37%
	3	1	0	0	3	66.67%
	4	0	0	0	8	100.00%
	5	0	0	0	7	100.00%
SP18	1	0	4	4	8	50.00%
	2	0	2	35	37	94.59%
	3	1	0	0	6	83.33%
	4	0	0	0	6	100.00%
	5	0	0	0	8	100.00%
SP19	1	0	3	5	8	37.50%
	2	0	4	33	37	89.19%
	3	2	0	0	5	60.00%
	4	1	0	0	5	80.00%
	5	0	0	0	8	100.00%
SP20	1	0	1	9	10	10.00%
	2	0	1	34	35	97.14%
	3	0	0	0	7	100.00%
	4	0	0	0	7	100.00%
	5	0	0	0	3	100.00%

TESTING

	Class	0	1	2	TOT	% CORR
SP11	1	0	2	2	4	50.00%
	2	0	7	19	26	73.08%
	3	5	1	0	5	40.00%
	4	4	0	1	9	11.11%
	5	3	1	3	6	0.00%
SP12	1	0	0	6	6	0.00%
	2	0	1	23	24	95.83%
	3	4	0	0	6	83.33%
	4	4	1	2	7	0.00%
	5	0	0	1	8	0.00%
SP13	1	0	1	5	6	16.67%
	2	0	0	24	24	100.00%
	3	6	0	0	5	40.00%
	4	7	0	0	4	50.00%
	5	4	0	0	9	22.22%
SP14	1	0	1	6	7	14.29%
	2	0	2	21	23	91.30%
	3	5	0	2	4	75.00%
	4	5	1	2	7	0.00%
	5	3	1	0	7	57.14%
SP15	1	0	0	8	8	0.00%
	2	0	1	21	22	95.45%
	3	5	0	0	7	42.86%
	4	6	0	2	4	25.00%
	5	3	0	2	7	28.57%
SP16	1	0	1	5	6	16.67%
	2	0	2	22	24	91.67%
	3	4	0	2	6	50.00%
	4	3	0	2	6	0.00%
	5	2	0	2	7	42.86%
SP17	1	0	3	5	8	37.50%
	2	0	3	19	22	86.36%
	3	8	0	2	3	33.33%
	4	2	0	3	8	12.50%
	5	4	0	3	7	14.29%
SP18	1	0	1	6	7	14.29%
	2	0	3	20	23	86.96%
	3	3	0	1	8	62.50%
	4	7	0	1	37	2.70%
	5	3	0	4	6	0.00%
SP19	1	0	2	5	7	28.57%
	2	0	6	17	23	73.91%
	3	6	0	3	8	12.50%
	4	6	0	4	37	0.00%
	5	5	0	1	5	20.00%
SP20	1	0	1	4	5	20.00%
	2	0	1	24	25	96.00%
	3	1	1	0	10	50.00%
	4	4	2	0	35	2.86%
	5	6	1	1	12	8.33%

Suprervised Kohonen TRAINING F3

Class		0	1	2	3	4	5	TOT	% CORR
SP1	1	0	5	0	0	1	0	6	83.33%
	2	0	0	2	0	0	2	4	50.00%
	3	0	0	1	4	0	0	5	80.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	1	0	0	5	6	83.33%
SP2	1	0	2	0	0	0	1	3	66.67%
	2	0	0	4	0	2	0	6	66.67%
	3	0	0	0	5	0	1	6	83.33%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP3	1	0	6	0	0	0	0	6	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	1	0	4	0	0	5	80.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP4	1	0	4	0	0	0	1	5	80.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	4	0	0	4	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP5	1	0	1	2	0	0	1	4	25.00%
	2	0	0	6	1	0	1	8	75.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	3	1	4	75.00%
	5	0	0	0	1	1	5	7	71.43%
SP6	1	0	4	1	0	0	0	5	80.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	1	0	6	7	85.71%
SP7	1	0	4	0	0	0	0	4	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	3	0	0	3	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	1	0	0	6	7	85.71%
SP8	1	0	2	0	0	1	0	3	66.67%
	2	0	0	6	0	0	1	7	85.71%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	1	0	0	7	8	87.50%
SP9	1	0	5	0	0	0	0	5	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	5	0	5	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP10	1	0	6	0	0	2	0	8	75.00%
	2	0	1	4	0	0	0	5	80.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	1	0	6	0	7	85.71%
	5	0	0	0	1	0	2	3	66.67%

TESTING

Class		0	1	2	3	4	5	TOT	% CORR
SP1	1	0	3	4	0	1	1	9	33.33%
	2	0	0	2	3	4	2	11	18.18%
	3	0	0	0	7	0	3	10	70.00%
	4	0	0	0	1	5	0	6	83.33%
	5	0	0	4	1	0	4	9	44.44%
SP2	1	0	1	2	1	4	4	12	8.33%
	2	0	0	2	1	1	5	9	22.22%
	3	0	0	0	7	1	1	9	77.78%
	4	0	1	0	1	5	1	8	62.50%
	5	0	0	2	1	0	4	7	57.14%
SP3	1	0	4	1	1	2	1	9	44.44%
	2	0	2	2	1	1	3	9	22.22%
	3	0	1	2	7	0	0	10	70.00%
	4	0	1	1	1	6	2	11	54.55%
	5	0	1	1	1	0	3	6	50.00%
SP4	1	0	5	0	0	1	4	10	50.00%
	2	0	0	3	1	0	4	8	37.50%
	3	0	1	2	7	1	0	11	63.64%
	4	0	0	2	1	5	0	8	62.50%
	5	0	1	2	1	0	4	8	50.00%
SP5	1	0	2	2	2	3	2	11	18.18%
	2	0	0	3	1	0	3	7	42.86%
	3	0	0	0	8	0	0	8	100.00%
	4	0	2	1	1	7	0	11	63.64%
	5	0	0	3	2	0	3	8	37.50%
SP6	1	0	5	0	0	1	4	10	50.00%
	2	0	2	2	1	1	3	9	22.22%
	3	0	0	1	8	0	0	9	88.89%
	4	0	1	1	1	5	1	9	55.56%
	5	0	1	1	1	0	5	8	62.50%
SP7	1	0	0	5	0	6	0	11	0.00%
	2	0	0	2	0	2	3	7	28.57%
	3	0	1	1	7	3	0	12	58.33%
	4	0	0	0	1	6	0	7	85.71%
	5	0	0	1	2	1	4	8	50.00%
SP8	1	0	0	7	0	4	1	12	0.00%
	2	0	0	2	2	1	3	8	25.00%
	3	0	0	1	8	0	0	9	88.89%
	4	0	0	2	1	5	1	9	55.56%
	5	0	0	3	2	0	2	7	28.57%
SP9	1	0	4	3	1	1	1	10	40.00%
	2	0	0	2	1	2	3	8	25.00%
	3	0	0	3	5	0	2	10	50.00%
	4	0	1	2	0	4	3	10	40.00%
	5	0	0	2	1	0	4	7	57.14%
SP10	1	0	4	0	1	0	2	7	57.14%
	2	0	0	3	3	2	2	10	30.00%
	3	0	0	0	7	1	0	8	87.50%
	4	0	2	1	1	4	0	8	50.00%
	5	0	0	7	5	0	0	12	0.00%

Suprervised Kohonen TRAINING F3

Class		0	1	2	3	4	5	TOT	% CORR
SP11	1	0	9	0	0	0	0	9	100.00%
	2	0	0	11	0	0	0	11	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	1	0	5	0	6	83.33%
	5	0	0	0	1	0	8	9	88.89%
SP12	1	0	12	0	0	0	0	12	100.00%
	2	0	1	8	0	0	0	9	88.89%
	3	0	1	0	8	0	0	9	88.89%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	1	0	6	7	85.71%
SP13	1	0	8	0	1	0	0	9	88.89%
	2	0	0	7	1	1	0	9	77.78%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	2	0	9	0	11	81.82%
	5	0	0	1	3	0	2	6	33.33%
SP14	1	0	9	0	1	0	0	10	90.00%
	2	0	0	5	1	2	0	8	62.50%
	3	0	0	0	11	0	0	11	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	1	0	0	0	7	8	87.50%
SP15	1	0	9	1	0	0	1	11	81.82%
	2	0	0	4	0	2	1	7	57.14%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	2	9	0	11	81.82%
	5	0	0	0	1	0	7	8	87.50%
SP16	1	0	9	0	0	0	1	10	90.00%
	2	0	1	7	0	0	1	9	77.78%
	3	0	0	0	8	0	1	9	88.89%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP17	1	0	10	1	0	0	0	11	90.91%
	2	0	0	6	1	0	0	7	85.71%
	3	0	2	0	10	0	0	12	83.33%
	4	0	0	0	0	6	1	7	85.71%
	5	0	1	1	1	0	5	8	62.50%
SP18	1	0	10	1	0	1	0	12	83.33%
	2	0	0	5	1	2	0	8	62.50%
	3	0	1	0	8	0	0	9	88.89%
	4	0	0	1	0	7	1	9	77.78%
	5	0	0	0	2	0	5	7	71.43%
SP19	1	0	9	1	0	0	0	10	90.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	1	0	8	1	10	80.00%
	5	0	0	0	2	0	5	7	71.43%
SP20	1	0	7	0	0	0	0	7	100.00%
	2	0	2	6	0	0	2	10	60.00%
	3	0	0	1	7	0	0	8	87.50%
	4	0	0	0	0	7	1	8	87.50%
	5	0	1	0	1	0	10	12	83.33%

TESTING

Class		0	1	2	3	4	5	TOT	% CORR
SP11	1	0	3	2	1	0	0	6	50.00%
	2	0	1	0	0	1	2	4	0.00%
	3	0	0	1	4	0	0	5	80.00%
	4	0	2	4	0	1	2	9	11.11%
	5	0	0	1	2	0	3	6	50.00%
SP12	1	0	1	1	0	1	0	3	33.33%
	2	0	2	0	0	0	4	6	0.00%
	3	0	1	0	5	0	0	6	83.33%
	4	0	2	1	1	3	0	7	42.86%
	5	0	2	0	0	0	6	8	75.00%
SP13	1	0	1	1	3	1	0	6	16.67%
	2	0	0	2	1	1	2	6	33.33%
	3	0	0	1	4	0	0	5	80.00%
	4	0	1	1	0	2	0	4	50.00%
	5	0	0	7	2	0	0	9	0.00%
SP14	1	0	3	1	1	0	0	5	60.00%
	2	0	0	3	2	2	0	7	42.86%
	3	0	0	0	3	0	1	4	75.00%
	4	0	0	1	0	4	2	7	57.14%
	5	0	0	5	2	0	0	7	0.00%
SP15	1	0	2	1	0	0	1	4	50.00%
	2	0	2	0	1	2	3	8	0.00%
	3	0	1	0	6	0	0	7	85.71%
	4	0	0	0	0	3	1	4	75.00%
	5	0	0	1	2	0	4	7	57.14%
SP16	1	0	2	1	1	0	1	5	40.00%
	2	0	0	2	0	0	4	6	33.33%
	3	0	0	0	4	0	2	6	66.67%
	4	0	2	1	0	1	2	6	16.67%
	5	0	0	3	2	0	2	7	28.57%
SP17	1	0	1	0	0	1	2	4	25.00%
	2	0	1	0	1	3	3	8	0.00%
	3	0	0	0	3	0	0	3	100.00%
	4	0	1	2	1	4	0	8	50.00%
	5	0	1	1	1	0	4	7	57.14%
SP18	1	0	1	0	1	0	1	3	33.33%
	2	0	1	1	1	2	2	7	14.29%
	3	0	1	0	5	0	0	6	83.33%
	4	0	2	0	0	4	0	6	66.67%
	5		1	2	2	0	3	8	37.50%
SP19	1	0	3	0	0	1	1	5	60.00%
	2	0	2	2	0	0	3	7	28.57%
	3	0	0	1	4	0	0	5	80.00%
	4	0	2	0	0	3	0	5	60.00%
	5	0	0	4	2	0	2	8	25.00%
SP20	1	0	3	1	1	2	1	8	37.50%
	2	0	0	0	0	2	3	5	0.00%
	3	0	2	0	5	0	0	7	71.43%
	4	0	0	1	0	4	2	7	57.14%
	5	0	1	1	0	0	1	3	33.33%

Suprervised Kohonen TRAINING K11

Class		0	1	2	3	4	5	TOT	% CORR
SP11	1	0	8	0	1	0	0	9	88.89%
	2	0	0	9	0	0	2	11	81.82%
	3	0	0	0	9	0	1	10	90.00%
	4	0	0	2	0	3	1	6	50.00%
	5	0	0	0	0	0	9	9	100.00%
SP12	1	0	11	1	0	0	0	12	91.67%
	2	0	1	8	0	0	0	9	88.89%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	1	0	0	0	6	7	85.71%
SP13	1	0	5	2	1	0	1	9	55.56%
	2	0	1	7	1	0	0	9	77.78%
	3	0	1	1	8	0	0	10	80.00%
	4	0	0	0	0	10	1	11	90.91%
	5	0	0	0	0	0	6	6	100.00%
SP14	1	0	8	1	1	0	0	10	80.00%
	2	0	0	7	0	1	0	8	87.50%
	3	0	0	0	11	0	0	11	100.00%
	4	0	0	0	0	6	2	8	75.00%
	5	0	0	0	0	0	8	8	100.00%
SP15	1	0	10	0	0	1	0	11	90.91%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	1	0	10	0	11	90.91%
	5	0	1	0	0	0	7	8	87.50%
SP16	1	0	9	0	0	1	0	10	90.00%
	2	0	0	8	1	0	0	9	88.89%
	3	0	0	1	8	0	0	9	88.89%
	4	0	0	1	0	7	1	9	77.78%
	5	0	0	0	0	1	7	8	87.50%
SP17	1	0	10	1	0	0	0	11	90.91%
	2	0	0	5	1	0	1	7	71.43%
	3	0	0	0	11	0	1	12	91.67%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP18	1	0	10	0	0	1	1	12	83.33%
	2	0	0	6	1	1	0	8	75.00%
	3	0	0	0	8	0	1	9	88.89%
	4	0	0	0	1	8	0	9	88.89%
	5	0	0	0	0	1	6	7	85.71%
SP19	1	0	9	0	0	1	0	10	90.00%
	2	0	0	7	0	1	0	8	87.50%
	3	0	0	1	9	0	0	10	90.00%
	4	0	0	0	1	9	0	10	90.00%
	5	0	0	0	0	0	7	7	100.00%
SP20	1	0	5	0	0	1	1	7	71.43%
	2	0	1	9	0	0	0	10	90.00%
	3	0	0	1	7	0	0	8	87.50%
	4	0	0	1	0	6	1	8	75.00%
	5	0	0	0	0	0	12	12	100.00%

TESTING

Class		0	1	2	3	4	5	TOT	% CORR
SP11	1	0	3	1	1	0	1	6	50.00%
	2	0	1	2	1	0	0	4	50.00%
	3	0	0	2	3	0	0	5	60.00%
	4	0	0	3	0	1	5	9	11.11%
	5	0	0	1	0	0	5	6	83.33%
SP12	1	0	1	0	1	1	0	3	33.33%
	2	0	0	2	3	0	1	6	33.33%
	3	0	1	1	4	0	0	6	66.67%
	4	0	0	3	2	2	0	7	28.57%
	5	0	0	2	0	4	2	8	25.00%
SP13	1	0	2	1	2	1	0	6	33.33%
	2	0	0	5	0	0	1	6	83.33%
	3	0	0	0	5	0	0	5	100.00%
	4	0	1	2	0	0	1	4	0.00%
	5	0	1	1	1	1	5	9	55.56%
SP14	1	0	4	0	0	1	0	5	80.00%
	2	0	1	2	1	1	2	7	28.57%
	3	0	0	2	2	0	0	4	50.00%
	4	0	0	2	0	4	1	7	57.14%
	5	0	1	1	0	2	3	7	42.86%
SP15	1	0	1	0	0	2	1	4	25.00%
	2	0	1	3	0	3	1	8	37.50%
	3	0	3	0	4	0	0	7	57.14%
	4	0	0	2	0	2	0	4	50.00%
	5	0	1	1	0	1	4	7	57.14%
SP16	1	0	2	1	0	1	1	5	40.00%
	2	0	1	1	0	2	2	6	16.67%
	3	0	1	1	4	0	0	6	66.67%
	4	0	1	1	0	4	0	6	66.67%
	5	0	0	0	0	5	2	7	28.57%
SP17	1	0	1	0	2	1	0	4	25.00%
	2	0	1	1	1	3	2	8	12.50%
	3	0	0	0	2	0	1	3	66.67%
	4	0	0	0	0	4	4	8	50.00%
	5	0	0	1	0	0	6	7	85.71%
SP18	1	0	2	0	1	0	0	3	66.67%
	2	0	3	1	1	1	1	7	14.29%
	3	0	1	1	4	0	0	6	66.67%
	4	0	3	0	0	2	1	6	33.33%
	5	0	0	0	0	2	6	8	75.00%
SP19	1	0	3	0	1	1	0	5	60.00%
	2	0	0	3	0	2	2	7	42.86%
	3	0	0	1	4	0	0	5	80.00%
	4	0	1	1	0	2	1	5	40.00%
	5	0	1	1	0	2	4	8	50.00%
SP20	1	0	3	0	1	2	2	8	37.50%
	2	0	1	1	0	0	3	5	20.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	2	2	0	1	2	7	14.29%
	5	0	0	0	0	1	2	3	66.67%

Suprervised Kohonen TRAINING K11

		0	1	2	3	4	5	TOTAL	% CORR
SP1	1	0	6	0	0	0	0	6	100.00%
	2	0	0	4	0	0	0	4	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP2	1	0	2	0	0	0	1	3	66.67%
	2	0	0	5	0	1	0	6	83.33%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP3	1	0	5	1	0	0	0	6	83.33%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	1	0	2	1	4	50.00%
	5	0	0	0	0	0	9	9	100.00%
SP4	1	0	5	0	0	0	0	5	100.00%
	2	0	1	6	0	0	0	7	85.71%
	3	0	0	0	4	0	0	4	100.00%
	4	0	0	1	0	6	0	7	85.71%
	5	0	0	0	0	0	7	7	100.00%
SP5	1	0	3	0	0	0	1	4	75.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	6	0	1	7	85.71%
	4	0	1	0	0	3	0	4	75.00%
	5	0	0	0	0	0	7	7	100.00%
SP6	1	0	5	0	0	0	0	5	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP7	1	0	4	0	0	0	0	4	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	3	0	0	3	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP8	1	0	2	0	1	0	0	3	66.67%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	1	5	0	0	6	83.33%
	4	0	0	1	0	4	1	6	66.67%
	5	0	0	1	0	0	7	8	87.50%
SP9	1	0	4	1	0	0	0	5	80.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	5	0	5	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP10	1	0	7	0	0	1	0	8	87.50%
	2	0	0	5	0	0	0	5	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	1	0	0	2	3	66.67%

TESTING

		0	1	2	3	4	5	TOTAL	% CORR
SP1	1	0	4	3	1	1	0	9	44.44%
	2	0	2	3	1	4	1	11	27.27%
	3	0	1	2	7	0	0	10	70.00%
	4	0	1	1	0	3	1	6	50.00%
	5	0	0	2	0	5	2	9	22.22%
SP2	1	0	3	0	2	3	4	12	25.00%
	2	0	0	0	2	3	4	9	0.00%
	3	0	1	0	5	2	1	9	55.56%
	4	0	2	0	0	3	3	8	37.50%
	5	0	0	1	0	2	4	7	57.14%
SP3	1	0	2	1	1	2	3	9	22.22%
	2	0	2	3	1	0	3	9	33.33%
	3	0	2	0	5	0	3	10	50.00%
	4	0	3	5	0	0	3	11	0.00%
	5	0	0	1	0	2	3	6	50.00%
SP4	1	0	5	1	2	1	1	10	50.00%
	2	0	0	4	3	0	1	8	50.00%
	3	0	2	2	6	1	0	11	54.55%
	4	0	2	1	0	2	3	8	25.00%
	5	0	0	2	0	2	4	8	50.00%
SP5	1	0	4	2	4	0	1	11	36.36%
	2	0	0	4	1	2	0	7	57.14%
	3	0	0	3	5	0	0	8	62.50%
	4	0	3	4	0	3	1	11	27.27%
	5	0	4	1	0	1	2	8	25.00%
SP6	1	0	1	3	2	0	4	10	10.00%
	2	0	2	4	2	1	0	9	44.44%
	3	0	1	1	6	0	1	9	66.67%
	4	0	0	5	0	1	3	9	11.11%
	5	0	1	2	0	1	4	8	50.00%
SP7	1	0	2	5	1	3	0	11	18.18%
	2	0	1	2	0	2	2	7	28.57%
	3	0	2	1	8	1	0	12	66.67%
	4	0	0	3	0	4	0	7	57.14%
	5	0	1	1	0	2	4	8	50.00%
SP8	1	0	1	3	3	4	1	12	8.33%
	2	0	0	6	1	0	1	8	75.00%
	3	0	1	2	6	0	0	9	66.67%
	4	0	0	7	0	1	1	9	11.11%
	5	0	0	4	0	1	2	7	28.57%
SP9	1	0	6	3	0	0	1	10	60.00%
	2	0	1	4	1	1	1	8	50.00%
	3	0	3	2	5	0	0	10	50.00%
	4	0	2	5	0	1	2	10	10.00%
	5	0	0	3	0	0	4	7	57.14%
SP10	1	0	4	0	2	0	1	7	57.14%
	2	0	1	6	1	1	1	10	60.00%
	3	0	1	1	5	1	0	8	62.50%
	4	0	1	6	0	1	0	8	12.50%
	5	0	0	7	0	1	4	12	33.33%

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TRAINING

	0	1	2	3	4	5	TOTAL		% CORR
SP1	1	0	6	0	0	0	0	6	100.00%
	2	0	0	4	0	0	0	4	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP2	1	0	3	0	0	0	0	3	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP3	1	0	6	0	0	0	0	6	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	1	0	3	0	4	75.00%
	5	0	0	0	0	0	9	9	100.00%
SP4	1	0	5	0	0	0	0	5	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	4	0	0	4	100.00%
	4	0	0	1	0	6	0	7	85.71%
	5	0	0	0	0	0	7	7	100.00%
SP5	1	0	3	0	0	1	0	4	75.00%
	2	0	0	7	0	1	0	8	87.50%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP6	1	0	4	1	0	0	0	5	80.00%
	2	0	0	5	0	0	1	6	83.33%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP7	1	0	4	0	0	0	0	4	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	3	0	0	3	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP8	1	0	3	0	0	0	0	3	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	5	0	1	6	83.33%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP9	1	0	5	0	0	0	0	5	100.00%
	2	0	0	6	0	1	0	7	85.71%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	5	0	5	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP10	1	0	7	1	0	0	0	8	87.50%
	2	0	0	5	0	0	0	5	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	3	3	100.00%

TESTING

	0	1	2	3	4	5	TOTAL		% CORR
SP1	1	0	3	1	0	3	2	9	33.33%
	2	0	1	4	1	4	1	11	36.36%
	3	0	1	2	6	0	1	10	60.00%
	4	0	1	1	0	3	1	6	50.00%
	5	0	0	5	0	2	2	9	22.22%
SP2	1	0	2	1	5	3	1	12	16.67%
	2	0	0	1	2	2	4	9	11.11%
	3	0	0	1	5	2	1	9	55.56%
	4	0	0	0	0	3	5	8	37.50%
	5	0	0	1	0	2	4	7	57.14%
SP3	1	0	4	2	0	0	3	9	44.44%
	2	0	1	4	1	0	3	9	44.44%
	3	0	0	1	6	0	3	10	60.00%
	4	0	4	4	0	2	1	11	18.18%
	5	0	0	2	0	1	3	6	50.00%
SP4	1	0	4	1	1	2	2	10	40.00%
	2	0	0	3	2	1	2	8	37.50%
	3	0	1	2	8	0	0	11	72.73%
	4	0	2	2	0	1	3	8	12.50%
	5	0	0	3	2	1	2	8	25.00%
SP5	1	0	6	2	1	1	1	11	54.55%
	2	0	0	3	1	3	0	7	42.86%
	3	0	1	1	6	0	0	8	75.00%
	4	0	0	4	0	2	5	11	18.18%
	5	0	0	2	2	1	3	8	37.50%
SP6	1	0	0	0	2	1	7	10	0.00%
	2	0	0	2	1	2	4	9	22.22%
	3	0	0	1	7	0	1	9	77.78%
	4	0	1	1	1	2	4	9	22.22%
	5	0	0	1	0	0	7	8	87.50%
SP7	1	0	1	0	0	6	4	11	9.09%
	2	0	0	0	0	2	5	7	0.00%
	3	0	0	2	6	2	2	12	50.00%
	4	0	0	3	0	4	0	7	57.14%
	5	0	1	1	0	2	4	8	50.00%
SP8	1	0	5	2	0	3	2	12	41.67%
	2	0	1	3	1	2	1	8	37.50%
	3	0	1	1	7	0	0	9	77.78%
	4	0	0	1	0	6	2	9	66.67%
	5	0	0	4	0	1	2	7	28.57%
SP9	1	0	6	0	0	1	3	10	60.00%
	2	0	1	3	0	2	2	8	37.50%
	3	0	2	2	5	0	1	10	50.00%
	4	0	0	2	0	2	6	10	20.00%
	5	0	0	4	0	1	2	7	28.57%
SP10	1	0	3	2	1	0	1	7	42.86%
	2	0	2	1	0	3	4	10	10.00%
	3	0	2	0	5	0	1	8	62.50%
	4	0	1	1	0	5	1	8	62.50%
	5	0	1	2	0	4	5	12	41.67%

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TRAINING

	0	1	2	3	4	5	TOTAL		%CORR
SP11	1	0	9	0	0	0	0	9	100.00%
	2	0	0	8	0	0	3	11	72.73%
	3	0	0	0	9	0	1	10	90.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP12	1	0	9	2	0	1	0	12	75.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	1	0	0	6	7	85.71%
SP13	1	0	6	1	0	2	0	9	66.67%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	9	0	1	10	90.00%
	4	0	0	0	0	11	0	11	100.00%
	5	0	0	0	0	1	5	6	83.33%
SP14	1	0	7	2	0	1	0	10	70.00%
	2	0	0	7	0	1	0	8	87.50%
	3	0	0	0	10	0	1	11	90.91%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	1	7	8	87.50%
SP15	1	0	11	0	0	0	0	11	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	3	0	8	0	11	72.73%
	5	0	0	0	0	0	8	8	100.00%
SP16	1	0	10	0	0	0	0	10	100.00%
	2	0	0	8	0	1	0	9	88.89%
	3	0	0	2	7	0	0	9	77.78%
	4	0	0	0	1	8	0	9	88.89%
	5	0	0	1	0	1	6	8	75.00%
SP17	1	0	10	1	0	0	0	11	90.91%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	11	0	1	12	91.67%
	4	0	0	1	0	6	0	7	85.71%
	5	0	0	0	0	1	7	8	87.50%
SP18	1	0	10	1	0	1	0	12	83.33%
	2	0	0	7	0	0	1	8	87.50%
	3	0	0	1	8	0	0	9	88.89%
	4	0	0	1	0	8	0	9	88.89%
	5	0	0	1	0	0	6	7	85.71%
SP19	1	0	8	2	0	0	0	10	80.00%
	2	0	0	6	1	0	1	8	75.00%
	3	0	0	2	8	0	0	10	80.00%
	4	0	0	1	0	9	0	10	90.00%
	5	0	1	0	0	1	5	7	71.43%
SP20	1	0	5	0	1	0	1	7	71.43%
	2	0	0	9	1	0	0	10	90.00%
	3	0	0	1	6	0	1	8	75.00%
	4	0	0	1	0	7	0	8	87.50%
	5	0	0	0	0	0	12	12	100.00%

TESTING

	0	1	2	3	4	5	TOTAL		%CORR
SP11	1	0	2	1	0	3	0	6	33.33%
	2	0	2	0	0	1	1	4	0.00%
	3	0	0	2	3	0	0	5	60.00%
	4	0	1	1	0	6	1	9	66.67%
	5	0	0	2	0	2	2	6	33.33%
SP12	1	0	1	0	0	1	1	3	33.33%
	2	0	0	2	1	2	1	6	33.33%
	3	0	0	2	4	0	0	6	66.67%
	4	0	1	1	1	4	0	7	57.14%
	5	0	0	0	0	3	5	8	62.50%
SP13	1	0	2	1	0	3	0	6	33.33%
	2	0	0	3	0	2	1	6	50.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	1	0	2	1	4	50.00%
	5	0	1	1	0	1	6	9	66.67%
SP14	1	0	3	0	0	2	0	5	60.00%
	2	0	1	1	0	2	3	7	14.29%
	3	0	0	1	2	0	1	4	50.00%
	4	0	1	2	0	4	0	7	57.14%
	5	0	2	1	0	2	2	7	28.57%
SP15	1	0	3	1	0	0	0	4	75.00%
	2	0	0	4	0	1	3	8	50.00%
	3	0	1	0	4	0	2	7	57.14%
	4	0	0	1	0	3	0	4	75.00%
	5	0	1	1	0	1	4	7	57.14%
SP16	1	0	2	1	0	1	1	5	40.00%
	2	0	0	3	2	0	1	6	50.00%
	3	0	1	1	4	0	0	6	66.67%
	4	0	0	1	0	3	2	6	50.00%
	5	0	1	3	0	2	1	7	14.29%
SP17	1	0	2	0	1	0	1	4	50.00%
	2	0	1	2	2	3	0	8	25.00%
	3	0	0	0	3	0	0	3	100.00%
	4	0	1	0	0	6	1	8	75.00%
	5	0	2	4	0	0	1	7	14.29%
SP18	1	0	1	0	2	0	0	3	33.33%
	2	0	1	1	2	0	3	7	14.29%
	3	0	0	2	4	0	0	6	66.67%
	4	0	2	2	0	2	0	6	33.33%
	5	0	0	2	0	2	4	8	50.00%
SP19	1	0	3	1	0	1	0	5	60.00%
	2	0	1	3	1	1	4	7	42.86%
	3	0	0	0	4	1	0	5	80.00%
	4	0	1	0	0	4	0	5	80.00%
	5	0	1	0	0	4	3	8	37.50%
SP20	1	0	1	1	2	2	2	8	12.50%
	2	0	0	1	2	1	1	5	20.00%
	3	0	0	1	6	0	0	7	85.71%
	4	0	1	0	1	3	2	7	42.86%
	5	0	1	0	0	1	1	3	33.33%

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TRAINING

		0	1	2	3	4	5	TOTAL	% CORR
SP1	1	0	6	0	0	0	0	6	100.00%
	2	0	0	4	0	0	0	4	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	1	0	5	6	83.33%
SP2	1	0	3	0	0	0	0	3	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP3	1	0	6	0	0	0	0	6	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP4	1	0	5	0	0	0	0	5	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	4	0	0	4	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP5	1	0	4	0	0	0	0	4	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP6	1	0	5	0	0	0	0	5	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP7	1	0	4	0	0	0	0	4	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	2	0	1	3	66.67%
	4	0	0	1	0	7	0	8	87.50%
	5	0	0	0	0	0	7	7	100.00%
SP8	1	0	3	0	0	0	0	3	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP9	1	0	5	0	0	0	0	5	100.00%
	2	0	0	6	1	0	0	7	85.71%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	5	0	5	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP10	1	0	8	0	0	0	0	8	100.00%
	2	0	0	5	0	0	0	5	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	3	3	100.00%

TESTING

		0	1	2	3	4	5	TOTAL	% CORR
SP1	1	0	2	1	3	2	1	9	22.22%
	2	0	2	1	5	1	2	11	9.09%
	3	0	3	1	2	3	1	10	20.00%
	4	0	1	0	1	4	0	6	66.67%
	5	0	0	2	2	3	2	9	22.22%
SP2	1	0	1	0	5	5	1	12	8.33%
	2	0	0	0	2	4	3	9	0.00%
	3	0	1	1	0	6	1	9	0.00%
	4	0	0	2	2	3	1	8	37.50%
	5	0	0	3	0	1	3	7	42.86%
SP3	1	0	1	3	3	0	2	9	11.11%
	2	0	1	1	3	0	4	9	11.11%
	3	0	1	3	4	0	2	10	40.00%
	4	0	1	1	4	1	4	11	9.09%
	5	0	1	0	0	2	3	6	50.00%
SP4	1	0	1	4	3	1	1	10	10.00%
	2	0	1	1	2	3	1	8	12.50%
	3	0	0	3	3	5	0	11	27.27%
	4	0	2	0	2	3	1	8	37.50%
	5	0	1	2	1	3	1	8	12.50%
SP5	1	0	1	7	3	0	0	11	9.09%
	2	0	0	1	3	0	3	7	14.29%
	3	0	5	1	1	0	1	8	12.50%
	4	0	1	4	2	0	4	11	0.00%
	5	0	0	1	2	2	3	8	37.50%
SP6	1	0	2	4	1	0	3	10	20.00%
	2	0	2	2	2	1	2	9	22.22%
	3	0	2	1	4	1	1	9	44.44%
	4	0	0	1	4	3	1	9	33.33%
	5	0	2	1	0	1	4	8	50.00%
SP7	1	0	1	5	1	3	1	11	9.09%
	2	0	0	5	1	1	0	7	71.43%
	3	0	0	6	2	2	2	12	16.67%
	4	0	0	2	1	4	0	7	57.14%
	5	0	1	1	0	3	3	8	37.50%
SP8	1	0	0	7	4	1	0	12	0.00%
	2	0	0	3	2	0	3	8	37.50%
	3	0	1	1	4	1	2	9	44.44%
	4	0	1	4	1	2	1	9	22.22%
	5	0	0	2	0	1	4	7	57.14%
SP9	1	0	2	6	1	1	0	10	20.00%
	2	0	2	1	3	0	2	8	12.50%
	3	0	0	4	4	1	1	10	40.00%
	4	0	0	1	3	4	2	10	40.00%
	5	0	1	0	2	2	2	7	28.57%
SP10	1	0	2	0	4	0	1	7	28.57%
	2	0	2	1	2	2	3	10	10.00%
	3	0	1	2	2	0	3	8	25.00%
	4	0	1	2	3	0	2	8	0.00%
	5	0	0	3	1	3	5	12	41.67%

S. Kohonen — TRAINING — TESTING :SP11M2-SP20M2

TRAINING

		0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	9	0	0	0	0	9	100.00%
	2	0	0	11	0	0	0	11	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP12	1	0	12	0	0	0	0	12	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP13	1	0	9	0	0	0	0	9	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	11	0	11	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP14	1	0	10	0	0	0	0	10	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	11	0	0	11	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP15	1	0	11	0	0	0	0	11	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	0	11	0	11	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP16	1	0	10	0	0	0	0	10	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP17	1	0	11	0	0	0	0	11	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	12	0	0	12	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP18	1	0	12	0	0	0	0	12	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP19	1	0	10	0	0	0	0	10	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	10	0	10	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP20	1	0	7	0	0	0	0	7	100.00%
	2	0	0	10	0	0	0	10	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	12	12	100.00%

TESTING

		0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	3	0	2	0	1	6	50.00%
	2	0	3	0	0	0	1	4	0.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	5	0	4	0	0	9	0.00%
	5	0	2	0	1	0	3	6	50.00%
SP12	1	0	1	0	0	2	0	3	33.33%
	2	0	3	0	1	0	2	6	0.00%
	3	0	0	2	1	1	2	6	16.67%
	4	0	4	1	1	1	0	7	14.29%
	5	0	3	2	0	0	3	8	37.50%
SP13	1	0	1	1	1	2	1	6	16.67%
	2	0	4	1	1	0	0	6	16.67%
	3	0	0	1	3	1	0	5	60.00%
	4	0	2	0	1	1	0	4	25.00%
	5	0	3	1	2	0	3	9	33.33%
SP14	1	0	1	2	0	1	1	5	20.00%
	2	0	5	0	2	0	0	7	0.00%
	3	0	0	1	2	0	1	4	50.00%
	4	0	0	0	2	0	5	7	0.00%
	5	0	0	1	2	1	3	7	42.86%
SP15	1	0	1	1	1	0	1	4	25.00%
	2	0	5	1	0	1	1	8	12.50%
	3	0	2	2	1	1	1	7	14.29%
	4	0	2	0	1	0	1	4	0.00%
	5	0	3	1	0	1	2	7	28.57%
SP16	1	0	0	1	0	2	2	5	0.00%
	2	0	2	2	0	1	1	6	33.33%
	3	0	0	0	2	4	0	6	33.33%
	4	0	0	2	0	3	1	6	50.00%
	5	0	1	2	1	0	3	7	42.86%
SP17	1	0	1	0	1	0	2	4	25.00%
	2	0	1	1	2	0	4	8	12.50%
	3	0	0	0	3	0	0	3	100.00%
	4	1	0	0	4	0	3	8	0.00%
	5	0	0	0	1	0	6	7	85.71%
SP18	1	0	0	2	0	1	0	3	0.00%
	2	0	3	4	0	0	0	7	57.14%
	3	0	3	1	2	0	0	6	33.33%
	4	0	2	0	0	2	2	6	33.33%
	5	0	3	0	0	0	5	8	62.50%
SP19	1	0	1	0	1	1	2	5	20.00%
	2	1	1	0	1	1	3	7	0.00%
	3	0	0	1	2	2	0	5	40.00%
	4	0	0	0	0	5	0	5	100.00%
	5	0	1	1	1	2	3	8	37.50%
SP20	1	0	1	1	1	2	3	8	12.50%
	2	0	1	0	0	1	3	5	0.00%
	3	0	0	2	1	0	4	7	14.29%
	4	0	0	0	1	1	5	7	14.29%
	5	0	2	1	0	0	0	3	0.00%

S.Kohonen TRAINING M5

		0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	9	0	0	0	0	9	100.00%
	2	0	0	11	0	0	0	11	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP12	1	0	12	0	0	0	0	12	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP13	1	0	9	0	0	0	0	9	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	11	0	11	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP14	1	0	10	0	0	0	0	10	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	11	0	0	11	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP15	1	0	11	0	0	0	0	11	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	0	10	1	11	90.91%
	5	0	0	0	0	0	8	8	100.00%
SP16	1	0	10	0	0	0	0	10	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP17	1	0	11	0	0	0	0	11	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	12	0	0	12	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP18	1	0	12	0	0	0	0	12	100.00%
	2	0	0	7	0	0	1	8	87.50%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	1	0	8	0	9	88.89%
	5	0	0	0	0	0	7	7	100.00%
SP19	1	0	10	0	0	0	0	10	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	10	0	10	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP20	1	0	7	0	0	0	0	7	100.00%
	2	0	0	10	0	0	0	10	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	12	12	100.00%

TESTING

		0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	2	1	2	0	1	6	33.33%
	2	0	2	0	1	0	1	4	0.00%
	3	0	1	2	2	0	0	5	40.00%
	4	0	1	2	2	2	2	9	22.22%
	5	0	2	4	0	0	2	6	33.33%
SP12	1	0	1	2	0	0	0	3	33.33%
	2	0	2	0	2	0	2	6	0.00%
	3	0	2	1	3	0	0	6	50.00%
	4	0	2	1	2	0	2	7	0.00%
	5	0	0	3	1	0	4	8	50.00%
SP13	1	0	1	0	3	1	1	6	16.67%
	2	0	1	1	1	0	3	6	16.67%
	3	0	0	1	0	0	4	5	0.00%
	4	0	0	0	0	2	2	4	50.00%
	5	0	1	2	1	0	5	9	55.56%
SP14	1	0	0	2	1	0	2	5	0.00%
	2	0	1	1	2	1	2	7	14.29%
	3	0	0	1	3	0	0	4	75.00%
	4	0	1	1	2	3	0	7	42.86%
	5	0	1	3	0	1	2	7	28.57%
SP15	1	0	1	0	2	0	1	4	25.00%
	2	0	2	1	2	0	3	8	12.50%
	3	0	2	0	4	0	1	7	57.14%
	4	0	0	0	2	0	2	4	0.00%
	5	0	1	1	1	0	4	7	57.14%
SP16	1	0	1	0	1	2	1	5	20.00%
	2	0	0	0	1	3	2	6	0.00%
	3	0	0	0	3	2	1	6	50.00%
	4	0	0	0	2	2	2	6	33.33%
	5	0	2	0	0	1	4	7	57.14%
SP17	1	0	0	2	0	1	1	4	0.00%
	2	0	0	1	3	2	2	8	12.50%
	3	0	0	0	1	1	1	3	33.33%
	4	0	0	0	3	5	0	8	62.50%
	5	0	2	1	0	1	3	7	42.86%
SP18	1	0	1	0	1	1	0	3	33.33%
	2	0	3	1	2	0	1	7	14.29%
	3	0	2	2	2	0	0	6	33.33%
	4	0	2	0	1	2	1	6	33.33%
	5	0	4	1	1	2	0	8	0.00%
SP19	1	0	1	2	0	1	1	5	20.00%
	2	0	1	1	3	1	1	7	14.29%
	3	0	0	0	2	3	0	5	40.00%
	4	0	1	2	1	1	0	5	20.00%
	5	0	2	2	2	1	1	8	12.50%
SP20	1	0	0	3	1	3	1	8	0.00%
	2	0	1	2	1	1	0	5	40.00%
	3	0	0	1	4	0	2	7	57.14%
	4	0	0	2	2	1	3	7	14.29%
	5	0	0	0	2	0	1	3	33.33%

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		0	1	2	3	4	5	TOTAL	%CORR
SP11	1	0	9	0	0	0	0	9	100.00%
	2	0	0	11	0	0	0	11	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	1	5	0	6	83.33%
	5	0	0	1	0	0	8	9	88.89%
SP12	1	0	11	0	1	0	0	12	91.67%
	2	0	0	7	2	0	0	9	77.78%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	1	0	6	7	85.71%
SP13	1	0	9	0	0	0	0	9	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	11	0	11	100.00%
	5	0	0	0	1	0	5	6	83.33%
SP14	1	0	9	0	1	0	0	10	90.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	11	0	0	11	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	1	0	0	7	8	87.50%
SP15	1	0	11	0	0	0	0	11	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	0	10	1	11	90.91%
	5	0	0	0	1	0	7	8	87.50%
SP16	1	0	10	0	0	0	0	10	100.00%
	2	0	0	7	1	1	0	9	77.78%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	1	1	6	8	75.00%
SP17	1	0	10	0	1	0	0	11	90.91%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	12	0	0	12	100.00%
	4	0	0	1	1	5	0	7	71.43%
	5	0	0	0	1	0	7	8	87.50%
SP18	1	0	11	0	1	0	0	12	91.67%
	2	0	0	7	1	0	0	8	87.50%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	2	7	0	9	77.78%
	5	0	0	0	2	0	5	7	71.43%
SP19	1	0	9	0	1	0	0	10	90.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	2	8	0	10	80.00%
	5	0	0	0	1	0	6	7	85.71%
SP20	1	0	7	0	0	0	0	7	100.00%
	2	0	0	8	2	0	0	10	80.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	1	0	11	12	91.67%

TESTING

		0	1	2	3	4	5	TOTAL	%CORR
SP11	1	0	4	0	2	0	0	6	66.67%
	2	0	1	0	1	1	1	4	0.00%
	3	0	0	1	3	0	1	5	60.00%
	4	0	2	0	2	3	2	9	33.33%
	5	0	1	0	0	1	4	6	66.67%
SP12	1	0	1	0	0	1	1	3	33.33%
	2	0	2	0	4	0	0	6	0.00%
	3	0	1	1	3	0	1	6	50.00%
	4	0	1	1	3	2	0	7	28.57%
	5	0	2	1	2	2	1	8	12.50%
SP13	1	0	5	0	0	1	0	6	83.33%
	2	0	2	0	3	0	1	6	0.00%
	3	0	1	0	4	0	0	5	80.00%
	4	0	1	1	1	1	0	4	25.00%
	5	0	2	0	2	2	3	9	33.33%
SP14	1	0	4	0	0	0	1	5	80.00%
	2	0	4	0	1	2	0	7	0.00%
	3	0	0	0	3	0	1	4	75.00%
	4	0	1	0	3	2	1	7	28.57%
	5	0	1	0	2	1	3	7	42.86%
SP15	1	0	2	0	1	0	1	4	50.00%
	2	0	2	0	2	4	0	8	0.00%
	3	0	1	0	2	2	2	7	28.57%
	4	0	1	1	0	1	1	4	25.00%
	5	0	2	0	0	3	2	7	28.57%
SP16	1	0	3	0	2	0	0	5	60.00%
	2	0	2	0	1	2	1	6	0.00%
	3	0	0	0	1	4	1	6	16.67%
	4	0	1	1	2	2	0	6	33.33%
	5	0	2	0	0	1	4	7	57.14%
SP17	1	0	1	0	0	1	2	4	25.00%
	2	0	2	0	4	0	2	8	0.00%
	3	0	0	0	3	0	0	3	100.00%
	4	0	4	0	1	2	1	8	25.00%
	5	0	3	0	1	0	3	7	42.86%
SP18	1	0	1	0	0	1	1	3	33.33%
	2	0	3	0	2	1	1	7	0.00%
	3	0	1	1	3	1	0	6	50.00%
	4	0	3	2	1	0	0	6	0.00%
	5	0	5	1	0	1	1	8	12.50%
SP19	1	0	3	0	0	1	1	5	60.00%
	2	0	3	1	1	2	0	7	14.29%
	3	0	0	2	3	0	0	5	60.00%
	4	0	1	2	0	1	1	5	20.00%
	5	0	2	0	2	3	1	8	12.50%
SP20	1	0	2	0	1	4	1	8	25.00%
	2	0	0	0	4	1	0	5	0.00%
	3	0	1	0	5	1	0	7	71.43%
	4	0	2	0	3	1	1	7	14.29%
	5	0	0	0	2	1	0	3	0.00%

Radial Basis Neural Network Training Data A1

Input Class		0	1	2	3	4	5	TOTAL	% CORR
SP1	1	0	6	0	0	0	0	6	100.00%
	2	0	0	4	0	0	0	4	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP2	1	0	3	0	0	0	0	3	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP3	1	0	6	0	0	0	0	6	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP4	1	0	5	0	0	0	0	5	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	4	0	0	4	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP5	1	0	4	0	0	0	0	4	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP6	1	0	5	0	0	0	0	5	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP7	1	0	4	0	0	0	0	4	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	3	0	0	3	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP8	1	0	3	0	0	0	0	3	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP9	1	0	5	0	0	0	0	5	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	5	0	5	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP10	1	0	8	0	0	0	0	8	100.00%
	2	0	0	5	0	0	0	5	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	3	3	100.00%

Radial Basis Neural Network Testing Data A1

Input Class		0	1	2	3	4	5	TOTAL	% CORR
SP1	1	0	6	0	0	3	0	9	66.67%
	2	0	2	0	3	4	2	11	0.00%
	3	0	1	2	6	1	0	10	60.00%
	4	0	0	0	1	5	0	6	83.33%
	5	0	1	4	0	2	2	9	22.22%
SP2	1	0	8	0	1	2	1	12	66.67%
	2	0	2	0	2	3	2	9	0.00%
	3	0	1	0	8	0	0	9	88.89%
	4	0	2	0	0	5	1	8	62.50%
	5	0	1	0	0	1	5	7	71.43%
SP3	1	0	5	0	1	0	3	9	55.56%
	2	1	2	0	2	0	4	9	0.00%
	3	1	1	0	3	3	2	10	30.00%
	4	0	0	0	3	0	8	11	0.00%
	5	0	3	0	0	0	3	6	50.00%
SP4	1	0	6	4	0	0	0	10	60.00%
	2	0	1	1	1	0	5	8	12.50%
	3	0	0	9	2	0	0	11	18.18%
	4	0	0	7	1	0	0	8	0.00%
	5	0	1	3	0	0	4	8	50.00%
SP5	1	0	11	0	0	0	0	11	100.00%
	2	1	5	0	1	0	0	7	0.00%
	3	0	6	0	2	0	0	8	25.00%
	4	0	11	0	0	0	0	11	0.00%
	5	0	6	1	0	0	1	8	12.50%
SP6	1	0	6	0	2	1	1	10	60.00%
	2	0	2	1	2	1	3	9	11.11%
	3	0	2	0	4	3	0	9	44.44%
	4	0	0	0	6	3	0	9	33.33%
	5	0	2	1	1	2	2	8	25.00%
SP7	1	0	9	0	0	0	2	11	81.82%
	2	0	5	2	0	0	0	7	28.57%
	3	0	1	8	2	0	1	12	16.67%
	4	0	3	2	0	1	1	7	14.29%
	5	0	6	0	0	0	2	8	25.00%
SP8	1	0	10	0	0	0	2	12	83.33%
	2	0	4	2	2	0	0	8	25.00%
	3	0	3	0	6	0	0	9	66.67%
	4	0	7	0	0	0	2	9	0.00%
	5	0	2	4	0	0	1	7	14.29%
SP9	1	0	7	2	0	0	1	10	70.00%
	2	0	1	6	0	0	1	8	75.00%
	3	0	1	8	1	0	0	10	10.00%
	4	0	0	8	1	0	1	10	0.00%
	5	0	0	4	0	0	3	7	42.86%
SP0	1	0	5	0	1	1	0	7	71.43%
	2	4	2	0	3	1	0	10	0.00%
	3	2	0	2	4	0	0	8	50.00%
	4	3	1	0	3	1	0	8	12.50%
	5	3	5	1	1	1	1	12	8.33%

Radial Basis Neural Network Training Data A1

	Input Class	Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	9	0	0	0	0	9	100.00%
	2	0	0	11	0	0	0	11	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP12	1	0	12	0	0	0	0	12	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP13	1	0	9	0	0	0	0	9	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	11	0	11	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP14	1	0	10	0	0	0	0	10	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	11	0	0	11	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP15	1	0	11	0	0	0	0	11	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	0	11	0	11	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP16	1	0	10	0	0	0	0	10	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP17	1	0	11	0	0	0	0	11	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	12	0	0	12	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP18	1	0	12	0	0	0	0	12	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP19	1	0	10	0	0	0	0	10	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	10	0	10	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP20	1	0	7	0	0	0	0	7	100.00%
	2	0	0	10	0	0	0	10	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	12	12	100.00%

Radial Basis Neural Network Testing Data A1

	Input Class	Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	6	0	0	0	0	6	100.00%
	2	0	4	0	0	0	0	4	0.00%
	3	0	2	0	3	0	0	5	60.00%
	4	0	8	0	0	0	1	9	0.00%
	5	0	4	2	0	0	0	6	0.00%
SP12	1	0	1	0	0	1	1	3	33.33%
	2	0	3	0	1	1	1	6	0.00%
	3	0	1	1	4	0	0	6	66.67%
	4	0	3	0	3	0	1	7	0.00%
	5	0	4	2	0	0	2	8	25.00%
SP13	1	1	5	0	0	0	0	6	83.33%
	2	3	1	0	1	0	1	6	0.00%
	3	3	1	0	1	0	0	5	20.00%
	4	4	0	0	0	0	0	4	0.00%
	5	4	1	0	0	0	4	9	44.44%
SP14	1	0	5	0	0	0	0	5	100.00%
	2	0	6	0	1	0	0	7	0.00%
	3	0	3	0	1	0	0	4	25.00%
	4	0	6	0	0	1	0	7	14.29%
	5	0	5	2	0	0	0	7	0.00%
SP15	1	0	3	0	0	1	0	4	75.00%
	2	0	5	1	0	1	1	8	12.50%
	3	1	5	0	1	0	0	7	14.29%
	4	0	4	0	0	0	0	4	0.00%
	5	0	6	0	0	1	0	7	0.00%
SP16	1	0	5	0	0	0	0	5	100.00%
	2	0	5	0	0	0	1	6	0.00%
	3	0	5	1	0	0	0	6	0.00%
	4	0	6	0	0	0	0	6	0.00%
	5	0	4	1	0	0	2	7	28.57%
SP17	1	0	1	0	1	2	0	4	25.00%
	2	0	4	0	3	1	0	8	0.00%
	3	0	0	0	3	0	0	3	100.00%
	4	0	2	0	2	4	0	8	50.00%
	5	0	4	1	0	1	1	7	14.29%
SP18	1	0	2	0	0	1	0	3	66.67%
	2	0	5	0	0	1	1	7	0.00%
	3	0	3	0	2	1	0	6	33.33%
	4	0	2	0	0	4	0	6	66.67%
	5	0	4	1	0	2	1	8	12.50%
SP19	1	0	4	0	1	0	0	5	80.00%
	2	0	5	0	2	0	0	7	0.00%
	3	0	0	0	4	1	0	5	80.00%
	4	0	2	0	3	0	0	5	0.00%
	5	0	6	0	0	0	2	8	25.00%
SP20	1	0	5	0	0	2	1	8	62.50%
	2	0	4	0	0	0	1	5	0.00%
	3	2	3	1	0	1	0	7	0.00%
	4	0	3	0	1	1	2	7	14.29%
	5	0	2	0	0	0	1	3	33.33%

Radial Basis Neural Network Training Data A2

Input Class		Output Class					TOTAL	% CORR
		0	1	2	3			
SP1	1	0	6	0	0		6	100.00%
	2	0	0	6	0		6	100.00%
	3	0	0	0	18		18	100.00%
SP2	1	0	3	0	0		3	100.00%
	2	0	0	8	0		8	100.00%
	3	0	0	0	19		19	100.00%
SP3	1	0	6	0	0		6	100.00%
	2	0	0	9	0		9	100.00%
	3	0	0	0	15		15	100.00%
SP4	1	0	5	0	0		5	100.00%
	2	0	0	7	0		7	100.00%
	3	0	0	0	18		18	100.00%
SP5	1	0	4	0	0		4	100.00%
	2	0	0	7	0		7	100.00%
	3	0	0	0	19		19	100.00%
SP6	1	0	5	0	0		5	100.00%
	2	0	0	7	0		7	100.00%
	3	0	0	0	18		18	100.00%
SP7	1	0	4	0	0		4	100.00%
	2	0	0	7	0		7	100.00%
	3	0	0	0	19		19	100.00%
SP8	1	0	3	0	0		3	100.00%
	2	0	0	8	0		8	100.00%
	3	0	0	0	19		19	100.00%
SP9	1	0	5	0	0		5	100.00%
	2	0	0	8	0		8	100.00%
	3	0	0	0	17		17	100.00%
SP10		1	0	8	0	0	8	100.00%
	2	0	0	3	0		3	100.00%
	3	0	0	0	19		19	100.00%

Radial Basis Neural Network Testing Data A2

Input Class		Output Class					TOTAL	% CORR
		0	1	2	3			
SP1	1	0	6	0	3		9	66.67%
	2	0	1	2	6		9	22.22%
	3	0	4	1	22		27	81.48%
SP2	1	0	2	8	2		12	16.67%
	2	0	0	7	0		7	100.00%
	3	0	0	16	10		26	38.46%
SP3	1	0	5	4	0		9	55.56%
	2	0	0	6	0		6	100.00%
	3	1	2	27	0		30	0.00%
SP4	1	0	2	1	7		10	20.00%
	2	0	0	3	5		8	37.50%
	3	0	0	4	23		27	85.19%
SP5	1	0	3	0	8		11	27.27%
	2	0	0	0	8		8	0.00%
	3	0	0	0	26		26	100.00%
SP6	1	0	6	3	1		10	60.00%
	2	0	2	5	1		8	62.50%
	3	2	2	15	8		27	29.63%
SP7	1	0	3	2	6		11	27.27%
	2	0	0	3	5		8	37.50%
	3	0	0	1	25		26	96.15%
SP8	1	0	4	1	7		12	33.33%
	2	0	0	1	6		7	14.29%
	3	0	0	2	24		26	92.31%
SP9	1	0	3	1	6		10	30.00%
	2	0	1	1	5		7	14.29%
	3	0	2	3	23		28	82.14%
SP10		1	0	3	0	4	7	42.86%
	2	0	0	1	11		12	8.33%
	3	0	0	0	26		26	100.00%

Radial Basis Neural Network Training Data A2

Input Class		0	1	2	3	TOTAL	% CORR
SP11	1	0	9	0	0	9	100.00%
	2	0	0	9	0	9	100.00%
	3	0	0	0	27	27	100.00%
SP12	1	0	12	0	0	12	100.00%
	2	0	0	7	0	7	100.00%
	3	0	0	0	26	26	100.00%
SP13	1	0	9	0	0	9	100.00%
	2	0	0	6	0	6	100.00%
	3	0	0	0	30	30	100.00%
SP14	1	0	10	0	0	10	100.00%
	2	0	0	8	0	8	100.00%
	3	0	0	0	27	27	100.00%
SP15	1	0	11	0	0	11	100.00%
	2	0	0	8	0	8	100.00%
	3	0	0	0	26	26	100.00%
SP16	1	0	10	0	0	10	100.00%
	2	0	0	8	0	8	100.00%
	3	0	0	0	27	27	100.00%
SP17	1	0	11	0	0	11	100.00%
	2	0	0	8	0	8	100.00%
	3	0	0	0	26	26	100.00%
SP18	1	0	12	0	0	12	100.00%
	2	0	0	7	0	7	100.00%
	3	0	0	0	26	26	100.00%
SP19	1	0	10	0	0	10	100.00%
	2	0	0	7	0	7	100.00%
	3	0	0	0	28	28	100.00%
SP20	1	0	7	0	0	7	100.00%
	2	0	0	12	0	12	100.00%
	3	0	0	0	26	26	100.00%

Radial Basis Neural Network Testing Data A2

Input Class		0	1	2	3	TOTAL	% CORR
SP11	1	1	2	2	1	6	33.33%
	2	0	0	2	4	6	33.33%
	3	2	0	11	5	18	27.78%
SP12	1	0	1	0	2	3	33.33%
	2	0	2	2	4	8	25.00%
	3	0	0	2	17	19	89.47%
SP13	1	0	4	0	2	6	66.67%
	2	0	1	3	5	9	33.33%
	3	0	0	1	14	15	93.33%
SP14	1	0	3	0	2	5	60.00%
	2	0	1	0	6	7	0.00%
	3	0	0	0	18	18	100.00%
SP15	1	0	2	0	2	4	50.00%
	2	0	3	0	4	7	0.00%
	3	0	2	0	17	19	89.47%
SP16	1	0	3	0	2	5	60.00%
	2	0	0	0	1	7	0.00%
	3	0	0	0	18	18	100.00%
SP17	1	0	2	0	2	4	50.00%
	2	0	4	2	1	7	28.57%
	3	0	6	6	7	19	36.84%
SP18	1	0	2	0	1	3	66.67%
	2	0	2	1	5	8	12.50%
	3	0	0	1	18	19	94.74%
SP19	1	0	2	2	1	5	40.00%
	2	0	2	6	0	8	75.00%
	3	0	5	5	7	17	41.18%
SP20	1	0	5	0	3	8	62.50%
	2	0	0	2	1	3	66.67%
	3	2	1	1	15	19	78.95%

Radial Basis Neural Network Training Data
CO1

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP1	1	0	6	0	0	0	0	6	100.00%
	2	0	0	24	0	0	0	24	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP2	1	0	3	0	0	0	0	3	100.00%
	2	0	0	27	0	0	0	27	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP3	1	0	6	0	0	0	0	6	100.00%
	2	0	0	24	0	0	0	24	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP4	1	0	5	0	0	0	0	5	100.00%
	2	0	0	25	0	0	0	25	100.00%
	3	2	0	0	2	0	0	4	50.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP5	1	0	4	0	0	0	0	4	100.00%
	2	0	0	26	0	0	0	26	100.00%
	3	1	0	0	6	0	0	7	85.71%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP6	1	0	5	0	0	0	0	5	100.00%
	2	0	0	25	0	0	0	25	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP7	1	0	4	0	0	0	0	4	100.00%
	2	0	0	26	0	0	0	26	100.00%
	3	1	0	0	2	0	0	3	66.67%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP8	1	0	3	0	0	0	0	3	100.00%
	2	0	0	27	0	0	0	27	100.00%
	3	1	0	0	5	0	0	6	83.33%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP9	1	0	5	0	0	0	0	5	100.00%
	2	0	0	25	0	0	0	25	100.00%
	3	2	0	0	3	0	0	5	60.00%
	4	1	0	0	0	4	0	5	80.00%
	5	0	0	0	0	0	8	8	100.00%
SP10	1	0	8	0	0	0	0	8	100.00%
	2	0	0	22	0	0	0	22	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	3	3	100.00%

Radial Basis Neural Network Testing Data
CO1

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP1	1	0	3	6	0	1	0	9	33.33%
	2	0	0	36	0	3	2	36	100.00%
	3	5	1	0	2	2	0	10	20.00%
	4	4	0	1	0	1	0	6	16.67%
	5	3	1	3	0	2	0	9	0.00%
SP2	1	0	4	8	2	5	0	12	33.33%
	2	0	2	31	3	1	0	33	93.94%
	3	4	0	0	5	0	0	9	55.56%
	4	4	1	2	1	0	0	8	0.00%
	5	0	0	1	0	0	0	7	0.00%
SP3	1	0	6	3	0	1	0	9	66.67%
	2	0	4	32	0	2	1	36	88.89%
	3	6	0	0	2	2	0	10	20.00%
	4	7	0	0	0	2	2	11	18.18%
	5	4	0	0	0	0	2	6	33.33%
SP4	1	0	3	7	1	2	1	10	30.00%
	2	0	4	31	0	0	4	35	88.57%
	3	5	0	2	3	1	0	11	27.27%
	4	5	1	2	0	0	0	8	0.00%
	5	3	1	0	0	0	4	8	50.00%
SP5	1	0	3	8	1	3	1	11	27.27%
	2	0	2	32	0	0	1	34	94.12%
	3	5	0	0	3	0	0	8	37.50%
	4	6	0	2	2	1	0	11	9.09%
	5	3	0	2	0	1	2	8	25.00%
SP6	1	0	1	9	1	4	1	10	10.00%
	2	0	1	34	1	0	1	35	97.14%
	3	4	0	2	3	0	0	9	33.33%
	4	3	0	2	2	0	2	9	0.00%
	5	2	0	2	0	1	3	8	37.50%
SP7	1	0	1	10	0	0	3	11	9.09%
	2	1	1	32	0	1	1	34	94.12%
	3	8	0	2	1	0	1	12	8.33%
	4	2	0	3	0	1	1	7	14.29%
	5	4	0	3	0	0	1	8	12.50%
SP8	1	0	3	9	1	2	1	12	25.00%
	2	0	5	28	3	1	0	33	84.85%
	3	3	0	1	5	0	0	9	55.56%
	4	7	0	1	0	1	0	9	11.11%
	5	3	0	4	0	0	0	7	0.00%
SP9	1	0	4	6	0	1	1	10	40.00%
	2	0	7	28	0	0	1	35	80.00%
	3	6	0	3	1	0	0	10	10.00%
	4	6	0	4	0	0	0	10	0.00%
	5	5	0	1	0	0	1	7	14.29%
SP10	1	0	2	5	0	3	0	7	28.57%
	2	0	7	31	1	1	0	38	81.58%

Radial Basis Neural Network Training Data
CO1

Input Class		0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	9	0	0	0	0	9	100.00%
	2	0	0	36	0	0	0	36	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP12	1	0	12	0	0	0	0	12	100.00%
	2	0	0	33	0	0	0	33	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP13	1	0	9	0	0	0	0	9	100.00%
	2	0	0	36	0	0	0	36	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP14	1	0	10	0	0	0	0	10	100.00%
	2	0	0	35	0	0	0	35	100.00%
	3	2	0	0	2	0	0	4	50.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP15	1	0	11	0	0	0	0	11	100.00%
	2	0	0	34	0	0	0	34	100.00%
	3	1	0	0	6	0	0	7	85.71%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP16	1	0	10	0	0	0	0	10	100.00%
	2	0	0	35	0	0	0	35	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP17	1	0	11	0	0	0	0	11	100.00%
	2	0	0	34	0	0	0	34	100.00%
	3	1	0	0	2	0	0	3	66.67%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP18	1	0	12	0	0	0	0	12	100.00%
	2	0	0	33	0	0	0	33	100.00%
	3	1	0	0	5	0	0	6	83.33%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP19	1	0	10	0	0	0	0	10	100.00%
	2	0	0	35	0	0	0	35	100.00%
	3	2	0	0	3	0	0	5	60.00%
	4	1	0	0	0	4	0	5	80.00%
	5	0	0	0	0	0	8	8	100.00%
SP20	1	0	7	0	0	0	0	7	100.00%
	2	0	0	38	0	0	0	38	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	3	3	100.00%

Radial Basis Neural Network Testing Data
CO1

Input Class		0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	3	3	0	1	0	6	50.00%
	2	1	3	20	0	3	2	24	83.33%
	3	5	1	0	2	2	0	10	20.00%
	4	4	0	1	0	1	0	6	16.67%
	5	3	1	3	0	2	0	9	0.00%
SP12	1	0	1	2	2	5	0	3	33.33%
	2	0	0	27	3	1	0	27	100.00%
	3	4	0	0	5	0	0	9	55.56%
	4	4	1	2	1	0	0	8	0.00%
	5	0	0	1	0	0	0	7	0.00%
SP13	1	0	2	4	0	1	0	6	33.33%
	2	0	1	23	0	2	1	24	95.83%
	3	6	0	0	2	2	0	10	20.00%
	4	7	0	0	0	2	2	11	18.18%
	5	4	0	0	0	0	2	6	33.33%
SP14	1	0	2	3	1	2	1	5	40.00%
	2	0	1	24	0	0	4	25	96.00%
	3	5	0	2	3	1	0	11	27.27%
	4	5	1	2	0	0	0	8	0.00%
	5	3	1	0	0	0	4	8	50.00%
SP15	1	1	2	1	1	3	1	4	50.00%
	2	2	3	21	0	0	1	26	80.77%
	3	5	0	0	3	0	0	8	37.50%
	4	6	0	2	2	1	0	11	9.09%
	5	3	0	2	0	1	2	8	25.00%
SP16	1	0	1	4	1	4	1	5	20.00%
	2	0	1	24	1	0	1	25	96.00%
	3	4	0	2	3	0	0	9	33.33%
	4	3	0	2	2	0	2	9	0.00%
	5	2	0	2	0	1	3	8	37.50%
SP17	1	1	2	1	0	0	3	4	50.00%
	2	0	4	22	0	1	1	26	84.62%
	3	8	0	2	1	0	1	12	8.33%
	4	2	0	3	0	1	1	7	14.29%
	5	4	0	3	0	0	1	8	12.50%
SP18	1	0	1	2	1	2	1	3	33.33%
	2	0	4	23	3	1	0	27	85.19%
	3	3	0	1	5	0	0	9	55.56%
	4	7	0	1	0	1	0	9	11.11%
	5	3	0	4	0	0	0	7	0.00%
SP19	1	0	2	3	0	1	1	5	40.00%
	2	1	4	20	0	0	1	25	80.00%
	3	6	0	3	1	0	0	10	10.00%
	4	6	0	4	0	0	0	10	0.00%
	5	5	0	1	0	0	1	7	14.29%
SP20	1	0	3	5	0	3	0	8	37.50%
	2	0	2	20	1	1	0	22	90.91%
	3	1	1	0	5	1	0	8	62.50%
	4	4	2	0	1	1	0	8	12.50%
	5	6	1	1	1	2	1	12	8.33%

Radial Basis Neural Network Training Data
CO2

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP1	1	0	4	0	0	0	0	4	100.00%
	2	0	0	26	0	0	0	26	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP2	1	0	6	0	0	0	0	6	100.00%
	2	0	0	24	0	0	0	24	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP3	1	0	6	0	0	0	0	6	100.00%
	2	0	0	24	0	0	0	24	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP4	1	0	7	0	0	0	0	7	100.00%
	2	0	0	23	0	0	0	23	100.00%
	3	2	0	0	2	0	0	4	50.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP5	1	0	8	0	0	0	0	8	100.00%
	2	0	0	22	0	0	0	22	100.00%
	3	1	0	0	6	0	0	7	85.71%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP6	1	0	6	0	0	0	0	6	100.00%
	2	0	0	24	0	0	0	24	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP7	1	0	8	0	0	0	0	8	100.00%
	2	0	0	22	0	0	0	22	100.00%
	3	1	0	0	2	0	0	3	66.67%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP8	1	0	7	0	0	0	0	7	100.00%
	2	0	0	23	0	0	0	23	100.00%
	3	1	0	0	5	0	0	6	83.33%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP9	1	0	7	0	0	0	0	7	100.00%
	2	0	0	23	0	0	0	23	100.00%
	3	2	0	0	3	0	0	5	60.00%
	4	1	0	0	0	4	0	5	80.00%
	5	0	0	0	0	0	8	8	100.00%
SP10	1	0	5	0	0	0	0	5	100.00%
	2	0	0	25	0	0	0	25	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	3	3	100.00%

Radial Basis Neural Network Testing Data
CO2

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP1	1	0	3	8	0	1	0	11	27.27%
	2	0	4	30	0	3	2	34	88.24%
	3	5	1	0	2	2	0	10	20.00%
	4	4	0	1	0	1	0	6	16.67%
	5	3	1	3	0	2	0	9	0.00%
SP2	1	0	1	8	2	5	0	9	11.11%
	2	0	2	34	3	1	0	36	94.44%
	3	4	0	0	5	0	0	9	55.56%
	4	4	1	2	1	0	0	8	0.00%
	5	0	0	1	0	0	0	7	0.00%
SP3	1	0	4	5	0	1	0	9	44.44%
	2	0	5	31	0	2	1	36	86.11%
	3	6	0	0	2	2	0	10	20.00%
	4	7	0	0	0	2	2	11	18.18%
	5	4	0	0	0	0	2	6	33.33%
SP4	1	0	1	7	1	2	1	8	12.50%
	2	3	3	31	0	0	4	37	83.78%
	3	5	0	2	3	1	0	11	27.27%
	4	5	1	2	0	0	0	8	0.00%
	5	3	1	0	0	0	4	8	50.00%
SP5	1	0	2	5	1	3	1	7	28.57%
	2	0	6	32	0	0	1	38	84.21%
	3	5	0	0	3	0	0	8	37.50%
	4	6	0	2	2	1	0	11	9.09%
	5	3	0	2	0	1	2	8	25.00%
SP6	1	0	1	8	1	4	1	9	11.11%
	2	1	2	33	1	0	1	36	91.67%
	3	4	0	2	3	0	0	9	33.33%
	4	3	0	2	2	0	2	9	0.00%
	5	2	0	2	0	1	3	8	37.50%
SP7	1	0	1	6	0	0	3	7	14.29%
	2	0	2	36	0	1	1	38	94.74%
	3	8	0	2	1	0	1	12	8.33%
	4	2	0	3	0	1	1	7	14.29%
	5	4	0	3	0	0	1	8	12.50%
SP8	1	0	2	6	1	2	1	8	25.00%
	2	0	3	34	3	1	0	37	91.89%
	3	3	0	1	5	0	0	9	55.56%
	4	7	0	1	0	1	0	9	11.11%
	5	3	0	4	0	0	0	7	0.00%
SP9	1	0	4	4	0	1	1	8	50.00%
	2	5	9	23	0	0	1	37	62.16%
	3	6	0	3	1	0	0	10	10.00%
	4	6	0	4	0	0	0	10	0.00%
	5	5	0	1	0	0	1	7	14.29%
SP10	1	0	0	10	0	3	0	10	0.00%
	2	1	2	32	1	1	0	35	91.43%

Radial Basis Neural Network Training Data
CO_2

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	11	0	0	0	0	11	100.00%
	2	0	0	34	0	0	0	34	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP12	1	0	9	0	0	0	0	9	100.00%
	2	0	0	36	0	0	0	36	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP13	1	0	9	0	0	0	0	9	100.00%
	2	0	0	36	0	0	0	36	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP14	1	0	8	0	0	0	0	8	100.00%
	2	0	0	37	0	0	0	37	100.00%
	3	2	0	0	2	0	0	4	50.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP15	1	0	7	0	0	0	0	7	100.00%
	2	0	0	38	0	0	0	38	100.00%
	3	1	0	0	6	0	0	7	85.71%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP16	1	0	9	0	0	0	0	9	100.00%
	2	0	0	36	0	0	0	36	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP17	1	0	7	0	0	0	0	7	100.00%
	2	0	0	38	0	0	0	38	100.00%
	3	1	0	0	2	0	0	3	66.67%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP18	1	0	8	0	0	0	0	8	100.00%
	2	0	0	37	0	0	0	37	100.00%
	3	1	0	0	5	0	0	6	83.33%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP19	1	0	8	0	0	0	0	8	100.00%
	2	0	0	37	0	0	0	37	100.00%
	3	2	0	0	3	0	0	5	60.00%
	4	1	0	0	0	4	0	5	80.00%
	5	0	0	0	0	0	8	8	100.00%
SP20	1	0	10	0	0	0	0	10	100.00%
	2	0	0	35	0	0	0	35	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	3	3	100.00%

Radial Basis Neural Network Testing Data
CO_2

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	1	3	0	1	0	4	25.00%
	2	0	5	21	0	3	2	26	80.77%
	3	5	1	0	2	2	0	5	40.00%
	4	4	0	1	0	1	0	9	11.11%
	5	3	1	3	0	2	0	6	0.00%
SP12	1	0	0	6	2	5	0	6	0.00%
	2	0	2	22	3	1	0	24	91.67%
	3	4	0	0	5	0	0	6	83.33%
	4	4	1	2	1	0	0	7	0.00%
	5	0	0	1	0	0	0	8	0.00%
SP13	1	0	2	4	0	1	0	6	33.33%
	2	0	0	24	0	2	1	24	100.00%
	3	6	0	0	2	2	0	5	40.00%
	4	7	0	0	0	2	2	4	50.00%
	5	4	0	0	0	0	2	9	22.22%
SP14	1	0	0	7	1	2	1	7	0.00%
	2	0	1	22	0	0	4	23	95.65%
	3	5	0	2	3	1	0	4	75.00%
	4	5	1	2	0	0	0	7	0.00%
	5	3	1	0	0	0	4	7	57.14%
SP15	1	0	3	5	1	3	1	8	37.50%
	2	0	1	21	0	0	1	22	95.45%
	3	5	0	0	3	0	0	7	42.86%
	4	6	0	2	2	1	0	4	25.00%
	5	3	0	2	0	1	2	7	28.57%
SP16	1	0	0	6	1	4	1	6	0.00%
	2	0	1	23	1	0	1	24	95.83%
	3	4	0	2	3	0	0	6	50.00%
	4	3	6	2	2	0	2	6	0.00%
	5	2	0	2	0	1	3	7	42.86%
SP17	1	0	1	7	0	0	3	8	12.50%
	2	1	1	20	0	1	1	22	90.91%
	3	8	0	2	1	0	1	3	33.33%
	4	2	0	3	0	1	1	8	12.50%
	5	4	0	3	0	0	1	7	14.29%
SP18	1	0	0	7	1	2	1	7	0.00%
	2	0	2	21	3	1	0	23	91.30%
	3	3	0	1	5	0	0	8	62.50%
	4	7	0	1	0	1	0	37	2.70%
	5	3	0	4	0	0	0	6	0.00%
SP19	1	0	0	7	0	1	1	7	0.00%
	2	0	0	23	0	0	1	23	100.00%
	3	6	0	3	1	0	0	8	12.50%
	4	6	0	4	0	0	0	37	0.00%
	5	5	0	1	0	0	1	5	20.00%
SP20	1	0	0	5	0	3	0	5	0.00%
	2	0	0	25	1	1	0	25	100.00%
	3	1	1	0	5	1	0	10	50.00%
	4	4	2	0	1	1	0	35	2.86%
	5	6	1	1	1	2	1	12	8.33%

Radial Basis Neural Network Training Data
F3

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP1	1	0	6	0	0	0	0	6	100.00%
	2	0	0	4	0	0	0	4	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP2	1	0	3	0	0	0	0	3	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP3	1	0	6	0	0	0	0	6	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP4	1	0	5	0	0	0	0	5	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	4	0	0	4	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP5	1	0	4	0	0	0	0	4	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP6	1	0	5	0	0	0	0	5	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP7	1	0	4	0	0	0	0	4	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	3	0	0	3	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP8	1	0	3	0	0	0	0	3	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP9	1	0	5	0	0	0	0	5	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	5	0	5	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP10	1	0	8	0	0	0	0	8	100.00%
	2	0	0	5	0	0	0	5	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	3	3	100.00%

Radial Basis Neural Network Testing Data
F3

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP1	1	0	2	3	0	3	1	9	22.22%
	2	0	3	1	0	4	3	11	9.09%
	3	0	4	0	4	0	2	10	40.00%
	4	0	0	1	1	4	0	6	66.67%
	5	0	0	5	1	2	1	9	11.11%
SP2	1	0	2	0	0	8	2	12	16.67%
	2	0	0	0	2	5	2	9	0.00%
	3	0	0	0	7	1	1	9	77.78%
	4	0	1	0	1	6	0	8	75.00%
	5	0	0	2	0	1	4	7	57.14%
SP3	1	0	6	0	2	1	0	9	66.67%
	2	1	3	1	1	1	2	9	11.11%
	3	0	1	2	3	4	0	10	30.00%
	4	0	8	1	1	1	0	11	9.09%
	5	0	1	1	2	2	0	6	0.00%
SP4	1	0	7	0	0	2	1	10	70.00%
	2	0	0	1	1	1	5	8	12.50%
	3	0	1	5	4	0	1	11	36.36%
	4	0	1	1	1	5	0	8	62.50%
	5	0	1	1	0	1	5	8	62.50%
SP5	1	0	5	2	2	0	2	11	45.45%
	2	0	1	2	1	1	2	7	28.57%
	3	0	0	1	7	0	0	8	87.50%
	4	0	3	2	0	6	0	11	54.55%
	5	1	0	2	1	0	4	8	50.00%
SP6	1	0	4	0	0	2	4	10	40.00%
	2	0	3	1	1	1	3	9	11.11%
	3	0	4	0	4	0	1	9	44.44%
	4	0	6	0	0	3	0	9	33.33%
	5	0	2	1	0	0	5	8	62.50%
SP7	1	0	0	2	0	6	3	11	0.00%
	2	0	0	2	0	3	2	7	28.57%
	3	0	0	0	8	4	0	12	66.67%
	4	0	1	3	0	3	0	7	42.86%
	5	0	2	2	1	0	3	8	37.50%
SP8	1	0	0	3	3	6	0	12	0.00%
	2	0	0	1	3	1	3	8	12.50%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	2	3	4	0	9	44.44%
	5	0	0	1	3	0	3	7	42.86%
SP9	1	1	3	1	2	3	0	10	30.00%
	2	0	1	2	3	1	1	8	25.00%
	3	0	0	2	6	0	2	10	60.00%
	4	1	2	1	2	4	0	10	40.00%
	5	0	2	2	1	0	2	7	28.57%
SP10	1	0	6	0	1	0	0	7	85.71%
	2	0	3	3	2	2	0	10	30.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	3	2	1	2	0	8	25.00%
	5	0	0	8	3	1	0	12	0.00%

Radial Basis Neural Network Training Data
F3

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	9	0	0	0	0	9	100.00%
	2	0	0	11	0	0	0	11	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP12	1	0	12	0	0	0	0	12	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP13	1	0	9	0	0	0	0	9	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	11	0	11	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP14	1	0	10	0	0	0	0	10	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	11	0	0	11	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP15	1	0	11	0	0	0	0	11	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	0	11	0	11	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP16	1	0	10	0	0	0	0	10	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP17	1	0	11	0	0	0	0	11	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	12	0	0	12	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP18	1	0	12	0	0	0	0	12	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP19	1	0	10	0	0	0	0	10	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	10	0	10	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP20	1	0	7	0	0	0	0	7	100.00%
	2	0	0	10	0	0	0	10	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	12	12	100.00%

Radial Basis Neural Network Testing Data
F3

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	4	1	0	1	0	6	66.67%
	2	0	3	0	0	0	1	4	0.00%
	3	0	0	2	3	0	0	5	60.00%
	4	0	2	5	0	2	0	9	22.22%
	5	0	2	1	1	0	2	6	33.33%
SP12	1	0	2	0	0	1	0	3	66.67%
	2	0	1	0	0	1	4	6	0.00%
	3	0	2	1	3	0	0	6	50.00%
	4	0	4	0	0	2	1	7	28.57%
	5	0	2	1	1	2	2	8	25.00%
SP13	1	0	4	1	0	1	0	6	66.67%
	2	0	1	1	2	0	2	6	16.67%
	3	0	1	1	3	0	0	5	60.00%
	4	0	1	0	0	3	0	4	75.00%
	5	0	6	1	1	0	1	9	11.11%
SP14	1	0	5	0	0	0	0	5	100.00%
	2	0	1	1	4	1	0	7	14.29%
	3	0	1	1	2	0	0	4	50.00%
	4	0	2	0	1	4	0	7	57.14%
	5	0	1	3	3	0	0	7	0.00%
SP15	1	0	3	1	0	0	0	4	75.00%
	2	0	4	1	0	2	1	8	12.50%
	3	0	3	0	4	0	0	7	57.14%
	4	0	0	0	0	3	1	4	75.00%
	5	0	3	1	0	1	2	7	28.57%
SP16	1	0	2	2	0	0	1	5	40.00%
	2	0	3	1	0	1	1	6	16.67%
	3	0	0	1	5	0	0	6	83.33%
	4	0	1	1	0	3	1	6	50.00%
	5	0	2	2	2	0	1	7	14.29%
SP17	1	0	1	0	0	2	1	4	25.00%
	2	1	1	0	1	3	2	8	0.00%
	3	0	0	0	3	0	0	3	100.00%
	4	0	1	2	0	5	0	8	62.50%
	5	0	2	1	0	1	3	7	42.86%
SP18	1	0	1	0	0	1	1	3	33.33%
	2	0	2	0	1	2	2	7	0.00%
	3	0	2	0	4	0	0	6	66.67%
	4	0	2	0	0	4	0	6	66.67%
	5	0	2	0	2	0	4	8	50.00%
SP19	1	0	3	0	0	2	0	5	60.00%
	2	0	4	1	1	1	0	7	14.29%
	3	0	0	1	4	0	0	5	80.00%
	4	0	1	0	0	4	0	5	80.00%
	5	0	3	1	1	1	2	8	25.00%
SP20	1	0	5	1	1	1	0	8	62.50%
	2	0	1	0	0	2	2	5	0.00%
	3	0	0	0	5	0	2	7	71.43%
	4	0	0	0	1	6	0	7	85.71%
	5	0	1	1	0	0	1	3	33.33%

Radial Basis Neural Network Training Data
K11

Input Class		Output Class							
		0	1	2	3	4	5	TOTAL	% CORR
SP1	1	0	6	0	0	0	0	6	100.00%
	2	0	0	4	0	0	0	4	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP2	1	0	3	0	0	0	0	3	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP3	1	0	6	0	0	0	0	6	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP4	1	0	5	0	0	0	0	5	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	4	0	0	4	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP5	1	0	4	0	0	0	0	4	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP6	1	0	5	0	0	0	0	5	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP7	1	0	4	0	0	0	0	4	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	3	0	0	3	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP8	1	0	3	0	0	0	0	3	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP9	1	0	5	0	0	0	0	5	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	5	0	5	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP10	1	0	8	0	0	0	0	8	100.00%
	2	0	0	5	0	0	0	5	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	3	3	100.00%

Radial Basis Neural Network Testing Data
K11

Input Class		Output Class							
		0	1	2	3	4	5	TOTAL	% CORR
SP1	1	0	2	4	2	1	0	9	22.22%
	2	0	1	5	1	3	1	11	45.45%
	3	0	2	3	5	0	0	10	50.00%
	4	0	1	1	0	3	1	6	50.00%
	5	1	0	2	0	5	1	9	11.11%
SP2	1	0	3	0	4	3	2	12	25.00%
	2	0	0	0	2	4	3	9	0.00%
	3	0	1	0	4	3	1	9	44.44%
	4	0	1	2	0	3	2	8	37.50%
	5	0	1	1	0	0	5	7	71.43%
SP3	1	0	2	0	4	1	2	9	22.22%
	2	0	0	2	2	1	4	9	22.22%
	3	0	1	1	6	1	1	10	60.00%
	4	0	3	2	1	0	5	11	0.00%
	5	0	0	2	0	0	4	6	66.67%
SP4	1	0	3	2	3	1	1	10	30.00%
	2	0	1	3	4	0	0	8	37.50%
	3	0	0	2	8	1	0	11	72.73%
	4	0	2	0	0	2	4	8	25.00%
	5	0	0	2	0	2	4	8	50.00%
SP5	1	0	6	1	2	0	2	11	54.55%
	2	0	0	4	1	2	0	7	57.14%
	3	0	0	3	5	0	0	8	62.50%
	4	0	3	4	0	3	1	11	27.27%
	5	0	4	1	0	1	2	8	25.00%
SP6	1	0	1	3	2	0	4	10	10.00%
	2	0	0	3	2	1	3	9	33.33%
	3	2	1	1	4	0	1	9	44.44%
	4	0	0	4	0	1	4	9	11.11%
	5	0	0	5	0	0	3	8	37.50%
SP7	1	0	1	4	2	4	0	11	9.09%
	2	0	0	2	2	1	2	7	28.57%
	3	1	1	2	8	0	0	'2	66.67%
	4	0	1	4	0	2	0	7	28.57%
	5	0	1	1	0	3	3	8	37.50%
SP8	1	0	2	6	2	1	1	12	16.67%
	2	0	0	3	1	1	3	8	37.50%
	3	0	1	3	5	0	0	9	55.56%
	4	0	0	5	0	2	2	9	22.22%
	5	0	0	2	0	1	4	7	57.14%
SP9	1	0	5	4	0	0	1	10	50.00%
	2	0	1	5	1	0	2	8	62.50%
	3	0	7	1	2	0	10	10	20.00%
	4	1	1	6	0	1	1	10	10.00%
	5	0	1	1	0	0	5	7	71.43%
SP10	1	0	3	0	2	1	1	7	42.86%
	2	0	2	4	3	1	0	10	40.00%
	3	0	2	1	5	0	0	8	62.50%
	4	0	1	4	1	1	1	8	12.50%
	5	0	2	2	2	0	6	12	50.00%

Radial Basis Neural Network Training Data
K11

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	9	0	0	0	0	9	100.00%
	2	0	0	11	0	0	0	11	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP12	1	0	12	0	0	0	0	12	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP13	1	0	9	0	0	0	0	9	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	11	0	11	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP14	1	0	10	0	0	0	0	10	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	11	0	0	11	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP15	1	0	11	0	0	0	0	11	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	0	11	0	11	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP16	1	0	10	0	0	0	0	10	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP17	1	0	11	0	0	0	0	11	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	12	0	0	12	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP18	1	0	12	0	0	0	0	12	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP19	1	0	10	0	0	0	0	10	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	10	0	10	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP20	1	0	7	0	0	0	0	7	100.00%
	2	0	0	10	0	0	0	10	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	12	12	100.00%

Radial Basis Neural Network Testing Data
K11

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	3	0	1	0	2	6	50.00%
	2	0	1	1	1	0	1	4	25.00%
	3	0	0	1	3	0	1	5	60.00%
	4	0	0	0	0	5	4	9	55.56%
	5	0	0	1	0	0	5	6	83.33%
SP12	1	0	1	0	1	1	0	3	33.33%
	2	0	1	1	3	0	1	6	16.67%
	3	0	0	1	5	0	0	6	83.33%
	4	0	0	1	3	3	0	7	42.86%
	5	0	2	0	1	3	2	8	25.00%
SP13	1	0	1	1	2	2	0	6	16.67%
	2	0	0	3	0	1	2	6	50.00%
	3	0	0	1	4	0	0	5	80.00%
	4	0	0	1	0	2	1	4	50.00%
	5	0	0	2	0	4	3	9	33.33%
SP14	1	0	3	0	1	1	0	5	60.00%
	2	0	0	2	0	2	3	7	28.57%
	3	0	0	2	2	0	0	4	50.00%
	4	0	1	1	1	3	1	7	42.86%
	5	0	1	0	0	1	5	7	71.43%
SP15	1	0	2	0	0	0	2	4	50.00%
	2	0	1	3	1	2	1	8	37.50%
	3	0	1	2	4	0	0	7	57.14%
	4	0	0	2	0	2	0	4	50.00%
	5	0	3	1	0	1	2	7	28.57%
SP16	1	0	1	0	0	3	1	5	20.00%
	2	0	0	1	0	2	3	6	16.67%
	3	0	2	0	4	0	0	6	66.67%
	4	0	1	0	1	4	0	6	66.67%
	5	0	2	0	1	1	3	7	42.86%
SP17	1	0	2	0	1	0	1	4	50.00%
	2	0	3	2	1	1	1	8	25.00%
	3	0	0	0	3	0	0	3	100.00%
	4	1	0	0	0	3	4	8	37.50%
	5	1	0	3	0	0	3	7	42.86%
SP18	1	0	2	0	1	0	0	3	66.67%
	2	0	3	1	3	0	0	7	14.29%
	3	0	1	1	4	0	0	6	66.67%
	4	0	4	0	0	1	1	6	16.67%
	5	0	2	0	0	2	4	8	50.00%
SP19	1	0	3	0	1	1	0	5	60.00%
	2	0	0	3	1	1	2	7	42.86%
	3	2	0	1	2	0	0	5	40.00%
	4	0	2	0	0	2	1	5	40.00%
	5	0	3	1	0	1	3	8	37.50%
SP20	1	0	4	0	2	1	1	8	50.00%
	2	0	0	0	0	2	3	5	0.00%
	3	1	2	0	3	0	1	7	42.86%
	4	0	1	0	1	2	3	7	28.57%
	5	0	1	0	0	1	1	3	33.33%

Radial Basis Neural Network Training Data
K1

Input Class	Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP1 1	0	6	0	0	0	0	6	100.00%
2	0	0	4	0	0	0	4	100.00%
3	0	0	0	5	0	0	5	100.00%
4	0	0	0	0	9	0	9	100.00%
5	0	0	0	0	0	6	6	100.00%
SP2 1	0	3	0	0	0	0	3	100.00%
2	0	0	6	0	0	0	6	100.00%
3	0	0	0	6	0	0	6	100.00%
4	0	0	0	0	7	0	7	100.00%
5	0	0	0	0	0	8	8	100.00%
SP3 1	0	6	0	0	0	0	6	100.00%
2	0	0	6	0	0	0	6	100.00%
3	0	0	0	5	0	0	5	100.00%
4	0	0	0	0	4	0	4	100.00%
5	0	0	0	0	0	9	9	100.00%
SP4 1	0	5	0	0	0	0	5	100.00%
2	0	0	7	0	0	0	7	100.00%
3	0	0	0	4	0	0	4	100.00%
4	0	0	0	0	7	0	7	100.00%
5	0	0	0	0	0	7	7	100.00%
SP5 1	0	4	0	0	0	0	4	100.00%
2	0	0	8	0	0	0	8	100.00%
3	0	0	0	7	0	0	7	100.00%
4	0	0	0	0	4	0	4	100.00%
5	0	0	0	0	0	7	7	100.00%
SP6 1	0	5	0	0	0	0	5	100.00%
2	0	0	6	0	0	0	6	100.00%
3	0	0	0	6	0	0	6	100.00%
4	0	0	0	0	6	0	6	100.00%
5	0	0	0	0	0	7	7	100.00%
SP7 1	0	4	0	0	0	0	4	100.00%
2	0	0	8	0	0	0	8	100.00%
3	0	0	0	3	0	0	3	100.00%
4	0	0	0	0	8	0	8	100.00%
5	0	0	0	0	0	7	7	100.00%
SP8 1	0	3	0	0	0	0	3	100.00%
2	0	0	7	0	0	0	7	100.00%
3	0	0	0	6	0	0	6	100.00%
4	0	0	0	0	6	0	6	100.00%
5	0	0	0	0	0	8	8	100.00%
SP9 1	0	5	0	0	0	0	5	100.00%
2	0	0	7	0	0	0	7	100.00%
3	0	0	0	5	0	0	5	100.00%
4	0	0	0	0	5	0	5	100.00%
5	0	0	0	0	0	8	8	100.00%
SP10 1	0	8	0	0	0	0	8	100.00%
2	0	0	5	0	0	0	5	100.00%
3	0	0	0	7	0	0	7	100.00%
4	0	0	0	0	7	0	7	100.00%
5	0	0	0	0	0	3	3	100.00%

Radial Basis Neural Network Testing Data
K1

Input Class	Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP1 1	0	3	2	0	3	1	9	33.33%
2	0	0	6	1	3	1	11	54.55%
3	0	1	1	5	1	2	10	50.00%
4	0	1	2	0	2	1	6	33.33%
5	0	0	4	0	2	3	9	33.33%
SP2 1	0	5	1	2	4	0	12	41.67%
2	0	0	1	2	4	2	9	11.11%
3	0	2	0	5	1	1	9	55.56%
4	0	0	0	0	5	3	8	62.50%
5	0	1	1	1	0	4	7	57.14%
SP3 1	0	7	0	1	1	0	9	77.78%
2	0	1	4	3	0	1	9	44.44%
3	0	1	0	7	1	1	10	70.00%
4	0	3	3	1	3	1	11	27.27%
5	0	1	1	0	2	2	6	33.33%
SP4 1	0	4	0	2	4	0	10	40.00%
2	0	1	1	3	2	1	8	12.50%
3	0	2	1	8	0	0	11	72.73%
4	0	3	3	0	1	1	8	12.50%
5	0	2	1	3	0	2	8	25.00%
SP5 1	0	5	3	3	0	0	11	45.45%
2	0	1	2	2	2	0	7	28.57%
3	0	0	0	8	0	0	8	100.00%
4	0	1	5	1	1	3	11	9.09%
5	0	0	3	0	0	5	8	62.50%
SP6 1	1	3	0	0	2	4	10	30.00%
2	0	1	2	1	4	1	9	22.22%
3	0	0	4	4	0	1	9	44.44%
4	0	1	2	0	3	3	9	33.33%
5	0	0	3	0	2	3	8	37.50%
SP7 1	0	2	0	0	8	1	11	18.18%
2	0	2	1	0	1	3	7	14.29%
3	1	1	1	6	1	2	12	50.00%
4	0	0	1	0	6	0	7	85.71%
5	0	1	0	0	3	4	8	50.00%
SP8 1	0	2	1	1	7	1	12	16.67%
2	0	2	2	0	3	1	8	25.00%
3	0	2	0	6	1	0	9	66.67%
4	0	0	3	0	5	1	9	55.56%
5	0	1	3	0	1	2	7	28.57%
SP9 1	0	6	1	0	1	2	10	60.00%
2	0	3	4	0	0	1	8	50.00%
3	0	5	1	3	0	1	10	30.00%
4	0	2	4	0	0	4	10	0.00%
5	0	3	2	0	0	2	7	28.57%
SP10 1	0	2	1	4	0	0	7	28.57%
2	0	1	1	2	4	2	10	10.00%
3	0	2	0	5	0	1	8	62.50%
4	0	2	0	1	4	1	8	50.00%
5	0	3	1	2	2	4	12	33.33%

Radial Basis Neural Network Training Data
K1

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	9	0	0	0	0	9	100.00%
	2	0	0	11	0	0	0	11	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP12	1	0	12	0	0	0	0	12	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP13	1	0	9	0	0	0	0	9	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	11	0	11	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP14	1	0	10	0	0	0	0	10	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	11	0	0	11	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP15	1	0	11	0	0	0	0	11	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	0	11	0	11	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP16	1	0	10	0	0	0	0	10	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP17	1	0	11	0	0	0	0	11	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	12	0	0	12	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP18	1	0	12	0	0	0	0	12	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP19	1	0	10	0	0	0	0	10	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	10	0	10	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP20	1	0	7	0	0	0	0	7	100.00%
	2	0	0	10	0	0	0	10	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	12	12	100.00%

Radial Basis Neural Network Testing Data
K1

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	3	0	0	2	1	6	50.00%
	2	0	1	1	0	2	0	4	25.00%
	3	0	0	1	4	0	0	5	80.00%
	4	0	2	5	0	2	0	9	22.22%
	5	0	2	0	0	3	1	6	16.67%
SP12	1	0	1	0	0	2	0	3	33.33%
	2	1	0	0	1	4	0	6	0.00%
	3	0	0	1	5	0	0	6	83.33%
	4	0	0	1	2	4	0	7	57.14%
	5	0	0	0	0	8	0	8	0.00%
SP13	1	0	2	0	0	4	0	6	33.33%
	2	0	1	2	0	2	1	6	33.33%
	3	0	0	1	4	0	0	5	80.00%
	4	0	0	1	1	1	1	4	25.00%
	5	0	2	2	0	2	3	9	33.33%
SP14	1	0	2	0	1	2	0	5	40.00%
	2	0	1	1	1	3	1	7	14.29%
	3	0	1	1	1	0	1	4	25.00%
	4	0	2	0	0	4	1	7	57.14%
	5	0	1	0	0	6	0	7	0.00%
SP15	1	0	2	0	0	1	1	4	50.00%
	2	0	2	3	0	2	1	8	37.50%
	3	0	3	0	3	0	1	7	42.86%
	4	0	1	1	0	2	0	4	50.00%
	5	0	1	2	0	4	0	7	0.00%
SP16	1	0	2	0	0	3	0	5	40.00%
	2	0	1	2	1	2	0	6	33.33%
	3	0	1	0	5	0	0	6	83.33%
	4	0	0	2	0	3	1	6	50.00%
	5	0	2	0	0	3	2	7	28.57%
SP17	1	0	2	0	1	0	1	4	50.00%
	2	0	1	1	3	3	0	8	12.50%
	3	0	0	0	3	0	0	3	100.00%
	4	0	2	0	0	4	2	8	50.00%
	5	0	4	1	1	0	1	7	14.29%
SP18	1	0	1	1	1	0	0	3	33.33%
	2	0	1	2	0	2	2	7	28.57%
	3	0	2	1	3	0	0	6	50.00%
	4	0	2	0	0	3	1	6	50.00%
	5	0	2	1	0	3	2	8	25.00%
SP19	1	0	1	1	0	3	0	5	20.00%
	2	0	1	3	0	2	1	7	42.86%
	3	1	0	0	4	0	0	5	80.00%
	4	0	2	1	0	2	0	5	40.00%
	5	0	2	1	0	5	0	8	0.00%
SP20	1	1	3	0	0	1	3	8	37.50%
	2	1	0	1	2	0	1	5	20.00%
	3	0	0	1	6	0	0	7	85.71%
	4	0	2	1	1	1	2	7	14.29%
	5	0	1	1	0	1	0	3	0.00%

Radial Basis Neural Network Training Data
M2

Input Class		0	1	2	3	4	5	TOTAL	% CORR
SP1	1	0	6	0	0	0	0	6	100.00%
	2	0	0	4	0	0	0	4	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP2	1	0	3	0	0	0	0	3	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP3	1	0	6	0	0	0	0	6	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP4	1	0	5	0	0	0	0	5	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	4	0	0	4	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP5	1	0	4	0	0	0	0	4	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP6	1	0	5	0	0	0	0	5	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP7	1	0	4	0	0	0	0	4	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	3	0	0	3	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP8	1	0	3	0	0	0	0	3	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP9	1	0	5	0	0	0	0	5	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	5	0	5	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP10	1	0	8	0	0	0	0	8	100.00%
	2	0	0	5	0	0	0	5	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	3	3	100.00%

Radial Basis Neural Network Testing Data
M2

Input Class		0	1	2	3	4	5	TOTAL	% CORR
SP1	1	0	1	0	1	1	6	9	11.11%
	2	0	1	1	2	2	5	11	9.09%
	3	0	2	0	2	3	3	10	20.00%
	4	0	0	1	0	4	1	6	66.67%
	5	0	2	0	0	3	4	9	44.44%
SP2	1	0	2	0	7	1	2	12	16.67%
	2	0	1	0	2	2	4	9	0.00%
	3	0	0	0	3	3	3	9	33.33%
	4	0	0	2	1	4	1	8	50.00%
	5	0	1	1	0	1	4	7	57.14%
SP3	1	0	2	0	0	3	4	9	22.22%
	2	0	0	0	2	2	5	9	0.00%
	3	0	0	0	3	3	4	10	30.00%
	4	0	1	0	2	1	7	11	9.09%
	5	0	0	0	0	1	5	6	83.33%
SP4	1	0	2	4	0	3	1	10	20.00%
	2	0	3	1	0	3	1	8	12.50%
	3	0	0	0	1	7	3	11	9.09%
	4	0	0	1	0	3	4	8	37.50%
	5	0	1	2	0	1	4	8	50.00%
SP5	1	0	0	2	2	0	7	11	0.00%
	2	2	0	1	0	0	4	7	14.29%
	3	1	0	4	2	0	1	8	25.00%
	4	1	0	2	1	0	7	11	0.00%
	5	1	0	1	1	3	2	8	25.00%
SP6	1	0	1	1	1	2	5	10	10.00%
	2	0	1	0	3	2	3	9	0.00%
	3	0	3	1	2	1	2	9	22.22%
	4	0	1	2	2	0	4	9	0.00%
	5	0	0	3	0	1	4	8	50.00%
SP7	1	0	2	4	1	2	2	11	18.18%
	2	0	2	1	1	1	2	7	14.29%
	3	0	0	1	5	3	3	12	41.67%
	4	0	0	0	2	4	1	7	57.14%
	5	0	1	0	1	4	2	8	25.00%
SP8	1	0	0	3	3	1	5	12	0.00%
	2	0	0	1	4	0	3	8	12.50%
	3	0	0	1	6	0	2	9	66.67%
	4	0	0	0	2	4	3	9	44.44%
	5	0	0	1	1	3	2	7	28.57%
SP9	1	0	1	6	1	2	0	10	10.00%
	2	0	2	2	1	0	3	8	25.00%
	3	0	2	3	2	1	2	10	20.00%
	4	0	0	4	1	2	3	10	20.00%
	5	0	1	0	0	0	6	7	85.71%
SP10	1	0	4	0	1	1	1	7	57.14%
	2	0	7	0	1	1	1	10	0.00%
	3	0	8	0	0	0	0	8	0.00%
	4	0	4	0	2	0	2	8	0.00%
	5	0	2	1	3	1	5	12	41.67%

Radial Basis Neural Network Training Data
M2

Input Class		0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	9	0	0	0	0	9	100.00%
	2	0	0	11	0	0	0	11	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP12	1	0	12	0	0	0	0	12	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP13	1	0	9	0	0	0	0	9	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	11	0	11	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP14	1	0	10	0	0	0	0	10	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	11	0	0	11	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP15	1	0	11	0	0	0	0	11	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	0	11	0	11	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP16	1	0	10	0	0	0	0	10	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP17	1	0	11	0	0	0	0	11	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	12	0	0	12	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP18	1	0	12	0	0	0	0	12	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP19	1	0	10	0	0	0	0	10	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	10	0	10	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP20	1	0	7	0	0	0	0	7	100.00%
	2	0	0	10	0	0	0	10	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	12	12	100.00%

Radial Basis Neural Network Testing Data
M2

Input Class		0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	1	2	2	0	1	6	16.67%
	2	0	1	1	0	0	2	4	25.00%
	3	0	1	1	3	0	0	5	60.00%
	4	0	3	1	3	1	1	9	11.11%
	5	0	0	1	1	0	4	6	66.67%
SP12	1	0	1	0	1	1	0	3	33.33%
	2	0	2	1	1	0	2	6	16.67%
	3	0	0	4	1	0	1	6	16.67%
	4	0	0	3	1	1	2	7	14.29%
	5	0	0	5	0	0	3	8	37.50%
SP13	1	0	1	1	1	3	0	6	16.67%
	2	0	3	1	2	0	0	6	16.67%
	3	0	2	0	3	0	0	5	60.00%
	4	0	0	0	2	1	1	4	25.00%
	5	0	4	0	2	1	2	9	22.22%
SP14	1	0	3	1	0	0	1	5	60.00%
	2	0	4	0	3	0	0	7	0.00%
	3	0	1	0	2	0	1	4	50.00%
	4	0	0	0	3	2	2	7	28.57%
	5	0	0	1	1	2	3	7	42.86%
SP15	1	0	1	1	1	0	1	4	25.00%
	2	1	6	0	0	1	0	8	0.00%
	3	0	2	2	1	1	1	7	14.29%
	4	1	0	0	1	0	2	4	0.00%
	5	0	2	2	0	0	3	7	42.86%
SP16	1	0	1	2	0	1	1	5	20.00%
	2	0	2	2	1	0	1	6	33.33%
	3	0	0	1	3	2	0	6	50.00%
	4	0	0	0	0	3	3	6	50.00%
	5	0	0	0	1	2	4	7	57.14%
SP17	1	0	1	0	2	0	1	4	25.00%
	2	0	2	0	4	0	2	8	0.00%
	3	0	0	0	2	0	1	3	66.67%
	4	0	2	1	2	1	2	8	12.50%
	5	1	0	0	1	0	5	7	71.43%
SP18	1	0	0	0	1	1	1	3	0.00%
	2	0	4	2	0	1	0	7	28.57%
	3	0	3	0	3	0	0	6	50.00%
	4	0	3	0	0	2	1	6	33.33%
	5	0	0	1	1	1	5	8	62.50%
SP19	1	0	2	0	0	0	3	5	40.00%
	2	0	1	1	0	1	4	7	14.29%
	3	0	2	1	1	0	1	5	20.00%
	4	0	0	1	1	2	1	5	40.00%
	5	0	0	1	0	3	4	8	50.00%
SP20	1	0	1	2	1	0	4	8	12.50%
	2	0	1	0	0	1	3	5	0.00%
	3	0	0	1	2	1	3	7	28.57%
	4	0	0	1	0	1	5	7	14.29%
	5	0	1	1	0	0	1	3	33.33%

Radial Basis Neural Network Training Data
M5

Input Class		Output Class							
		0	1	2	3	4	5	TOTAL	% CORR
SP1	1	0	6	0	0	0	0	6	100.00%
	2	0	0	4	0	0	0	4	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP2	1	0	3	0	0	0	0	3	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP3	1	0	6	0	0	0	0	6	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP4	1	0	5	0	0	0	0	5	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	4	0	0	4	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP5	1	0	4	0	0	0	0	4	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP6	1	0	5	0	0	0	0	5	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP7	1	0	4	0	0	0	0	4	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	3	0	0	3	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP8	1	0	3	0	0	0	0	3	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP9	1	0	5	0	0	0	0	5	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	5	0	5	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP10	1	0	8	0	0	0	0	8	100.00%
	2	0	0	5	0	0	0	5	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	3	3	100.00%

Radial Basis Neural Network Testing Data
M5

Input Class		Output Class							
		0	1	2	3	4	5	TOTAL	% CORR
SP1	1	0	1	0	0	2	6	9	11.11%
	2	0	4	0	1	2	4	11	0.00%
	3	0	4	0	3	0	3	10	30.00%
	4	0	1	0	0	3	2	6	50.00%
	5	0	1	0	1	3	4	9	44.44%
SP2	1	1	1	0	1	4	5	12	8.33%
	2	0	1	0	0	2	6	9	0.00%
	3	0	0	0	2	4	3	9	22.22%
	4	0	0	2	0	5	1	8	62.50%
	5	0	0	1	0	2	4	7	57.14%
SP3	1	0	0	0	0	3	6	9	0.00%
	2	0	1	1	0	0	7	9	11.11%
	3	0	2	0	0	2	6	10	0.00%
	4	0	0	0	2	2	7	11	18.18%
	5	0	0	0	1	0	5	6	83.33%
SP4	1	0	1	3	0	3	3	10	10.00%
	2	0	3	0	0	3	2	8	0.00%
	3	0	0	1	2	6	2	11	18.18%
	4	0	1	1	0	4	2	8	50.00%
	5	0	2	0	0	1	5	8	62.50%
SP5	1	1	0	2	1	1	6	11	0.00%
	2	0	0	0	0	1	6	7	0.00%
	3	2	0	0	2	3	1	8	25.00%
	4	1	0	1	0	0	9	11	0.00%
	5	1	0	3	0	1	3	8	37.50%
SP6	1	0	1	1	1	2	5	10	10.00%
	2	0	0	0	1	2	6	9	0.00%
	3	0	3	3	1	1	1	9	11.11%
	4	0	1	1	2	1	4	9	11.11%
	5	0	0	1	0	0	7	8	87.50%
SP7	1	0	0	2	0	2	7	11	0.00%
	2	0	1	1	0	3	2	7	14.29%
	3	0	0	3	2	5	2	12	16.67%
	4	0	0	0	0	5	2	7	71.43%
	5	0	0	0	1	2	5	8	62.50%
SP8	1	0	0	3	0	3	6	12	0.00%
	2	0	0	1	3	1	3	8	12.50%
	3	0	0	2	3	1	3	9	33.33%
	4	0	1	1	1	4	2	9	44.44%
	5	0	0	0	2	0	5	7	71.43%
SP9	1	0	0	3	2	1	4	10	0.00%
	2	0	4	1	0	0	3	8	12.50%
	3	0	3	2	2	0	3	10	20.00%
	4	0	1	3	1	0	5	10	0.00%
	5	0	2	0	0	0	5	7	71.43%
SP10	1	0	3	1	1	1	1	7	42.86%
	2	0	7	1	1	1	0	10	10.00%
	3	0	6	0	2	0	0	8	25.00%
	4	0	5	0	1	2	0	8	25.00%
	5	0	5	1	2	1	3	12	25.00%

Radial Basis Neural Network Training Data
M5

Input Class				Output Class					
		0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	9	0	0	0	0	9	100.00%
	2	0	0	11	0	0	0	11	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP12	1	0	12	0	0	0	0	12	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP13	1	0	9	0	0	0	0	9	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	11	0	11	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP14	1	0	10	0	0	0	0	10	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	11	0	0	11	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP15	1	0	11	0	0	0	0	11	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	0	11	0	11	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP16	1	0	10	0	0	0	0	10	100.00%
	2	0	0	9	0	0	0	9	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP17	1	0	11	0	0	0	0	11	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	12	0	0	12	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP18	1	0	12	0	0	0	0	12	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	9	0	0	9	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP19	1	0	10	0	0	0	0	10	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	10	0	0	10	100.00%
	4	0	0	0	0	10	0	10	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP20	1	0	7	0	0	0	0	7	100.00%
	2	0	0	10	0	0	0	10	100.00%
	3	0	0	0	8	0	0	8	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	12	12	100.00%

Radial Basis Neural Network Testing Data
M5

Input Class				Output Class					
		0	1	2	3	4	5	TOTAL	% CORR
SP11	1	0	3	0	2	0	1	6	50.00%
	2	0	3	0	0	0	1	4	0.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	5	0	4	0	0	9	0.00%
	5	0	2	0	1	0	3	6	50.00%
SP12	1	0	1	0	0	2	0	3	33.33%
	2	0	3	0	1	0	2	6	0.00%
	3	0	0	2	1	1	2	6	16.67%
	4	0	4	1	1	1	0	7	14.29%
	5	0	3	2	0	0	3	8	37.50%
SP13	1	0	1	1	1	2	1	6	16.67%
	2	0	4	1	1	0	0	6	16.67%
	3	0	0	1	3	1	0	5	60.00%
	4	0	2	0	1	1	0	4	25.00%
	5	0	3	1	2	0	3	9	33.33%
SP14	1	0	1	2	0	1	1	5	20.00%
	2	0	5	0	2	0	0	7	0.00%
	3	0	0	1	2	0	1	4	50.00%
	4	0	0	0	2	0	5	7	0.00%
	5	0	0	1	2	1	3	7	42.86%
SP15	1	0	1	1	1	0	1	4	25.00%
	2	0	5	1	0	1	1	8	12.50%
	3	0	2	2	1	1	1	7	14.29%
	4	0	2	0	1	0	1	4	0.00%
	5	0	3	1	0	1	2	7	28.57%
SP16	1	0	0	1	0	2	2	5	0.00%
	2	0	2	2	0	1	1	6	33.33%
	3	0	0	0	2	4	0	6	33.33%
	4	0	0	2	0	3	1	6	50.00%
	5	0	1	2	1	0	3	7	42.86%
SP17	1	0	1	0	1	0	2	4	25.00%
	2	0	1	1	2	0	4	8	12.50%
	3	0	0	0	3	0	0	3	100.00%
	4	1	0	0	4	0	3	8	0.00%
	5	0	0	0	1	0	6	7	85.71%
SP18	1	0	0	2	0	1	0	3	0.00%
	2	0	3	4	0	0	0	7	57.14%
	3	0	3	1	2	0	0	6	33.33%
	4	0	2	0	0	2	2	6	33.33%
	5	0	3	0	0	0	5	8	62.50%
SP19	1	0	1	0	1	1	2	5	20.00%
	2	1	1	0	1	1	3	7	0.00%
	3	0	0	1	2	2	0	5	40.00%
	4	0	0	0	0	5	0	5	100.00%
	5	0	1	1	1	2	3	8	37.50%
SP20	1	0	1	1	1	2	3	8	12.50%
	2	0	1	0	0	1	3	5	0.00%
	3	0	0	2	1	0	4	7	14.29%
	4	0	0	0	1	1	5	7	14.29%
	5	0	2	1	0	0	0	3	0.00%

Radial Basis Neural Network Training Data
S1

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP1	1	0	6	0	0	0	0	6	100.00%
	2	0	0	4	0	0	0	4	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	9	0	9	100.00%
	5	0	0	0	0	0	6	6	100.00%
SP2	1	0	3	0	0	0	0	3	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP3	1	0	6	0	0	0	0	6	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	9	9	100.00%
SP4	1	0	5	0	0	0	0	5	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	4	0	0	4	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP5	1	0	4	0	0	0	0	4	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	4	0	4	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP6	1	0	5	0	0	0	0	5	100.00%
	2	0	0	6	0	0	0	6	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP7	1	0	4	0	0	0	0	4	100.00%
	2	0	0	8	0	0	0	8	100.00%
	3	0	0	0	3	0	0	3	100.00%
	4	0	0	0	0	8	0	8	100.00%
	5	0	0	0	0	0	7	7	100.00%
SP8	1	0	3	0	0	0	0	3	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	6	0	0	6	100.00%
	4	0	0	0	0	6	0	6	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP9	1	0	5	0	0	0	0	5	100.00%
	2	0	0	7	0	0	0	7	100.00%
	3	0	0	0	5	0	0	5	100.00%
	4	0	0	0	0	5	0	5	100.00%
	5	0	0	0	0	0	8	8	100.00%
SP10	1	0	8	0	0	0	0	8	100.00%
	2	0	0	5	0	0	0	5	100.00%
	3	0	0	0	7	0	0	7	100.00%
	4	0	0	0	0	7	0	7	100.00%
	5	0	0	0	0	0	3	3	100.00%

Radial Basis Neural Network Testing Data
S1

Input Class		Output Class 0	1	2	3	4	5	TOTAL	% CORR
SP1	1	3	1	1	0	3	1	9	11.11%
	2	4	2	0	0	2	3	11	0.00%
	3	5	0	1	0	3	1	10	0.00%
	4	0	0	0	1	1	4	6	16.67%
	5	5	0	0	0	2	2	9	22.22%
SP2	1	6	2	2	0	1	1	12	16.67%
	2	3	0	2	0	2	2	9	22.22%
	3	4	0	0	0	3	2	9	0.00%
	4	5	0	0	2	1	0	8	12.50%
	5	5	0	0	0	2	0	7	0.00%
SP3	1	6	0	1	0	1	1	9	0.00%
	2	3	0	1	0	0	5	9	11.11%
	3	3	0	2	3	2	0	10	30.00%
	4	5	0	2	0	0	4	11	0.00%
	5	0	0	1	0	0	5	6	83.33%
SP4	1	3	1	2	0	3	1	10	10.00%
	2	3	0	1	0	2	2	8	12.50%
	3	4	0	1	1	2	3	11	9.09%
	4	5	1	1	0	0	1	8	0.00%
	5	3	0	0	1	1	3	8	37.50%
SP5	1	4	0	3	1	3	0	11	0.00%
	2	4	0	2	1	0	0	7	28.57%
	3	3	0	4	1	0	0	8	12.50%
	4	4	1	4	1	1	0	11	9.09%
	5	1	1	3	0	2	1	8	12.50%
SP6	1	3	1	1	2	0	3	10	10.00%
	2	3	0	3	1	0	2	9	11.11%
	3	3	0	1	3	0	2	9	33.33%
	4	3	0	2	1	0	3	9	0.00%
	5	2	0	0	1	1	4	8	50.00%
SP7	1	5	0	2	0	3	1	11	0.00%
	2	1	1	1	0	3	1	7	14.29%
	3	2	0	6	2	2	0	12	16.67%
	4	4	0	2	0	0	1	7	0.00%
	5	3	0	2	0	2	1	8	12.50%
SP8	1	5	0	5	0	1	1	12	0.00%
	2	3	0	1	2	1	1	8	12.50%
	3	4	0	1	3	0	1	9	33.33%
	4	7	0	0	0	2	0	9	22.22%
	5	2	0	0	1	2	2	7	28.57%
SP9	1	3	1	2	3	0	1	10	10.00%
	2	2	1	2	0	0	3	8	25.00%
	3	3	1	5	1	0	0	10	10.00%
	4	3	0	2	1	1	3	10	10.00%
	5	2	0	1	0	2	2	7	28.57%
SP10	1	4	1	1	0	1	0	7	14.29%
	2	4	1	1	0	3	1	10	10.00%
	3	2	0	2	3	0	1	8	37.50%
	4	4	2	2	0	0	0	8	0.00%
	5	6	2	0	1	3	0	12	0.00%

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