CS 797O: Neural Nets and Deep Learning
Unit 3: Assignment 1- Neuralworks Iris
Self-Organizing Maps (SOM)

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1 Basic Network

Grid Size = 10 x 10
Configuration = Square
Training Epochs = 75

1.1 Network Training

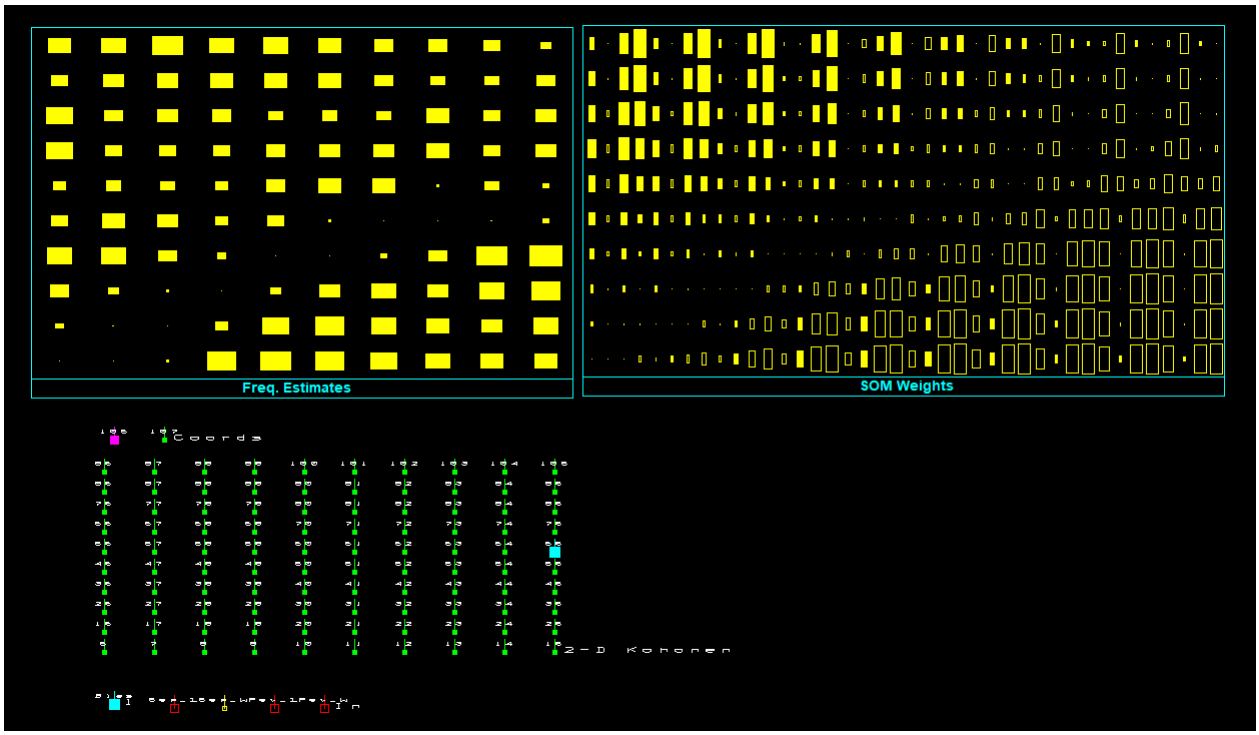

Figure 1: Basic Network Training

1.2 Network Testing

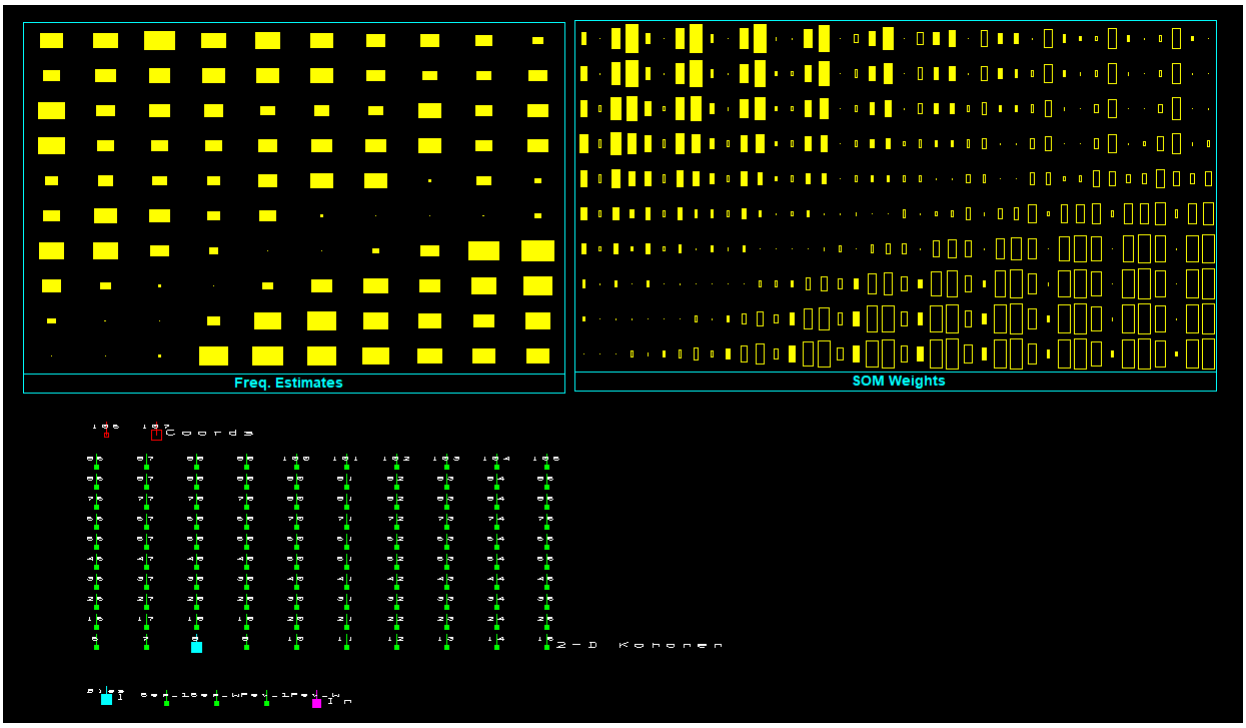

Figure 2: Basic Network Testing

1.3 Network Configuration

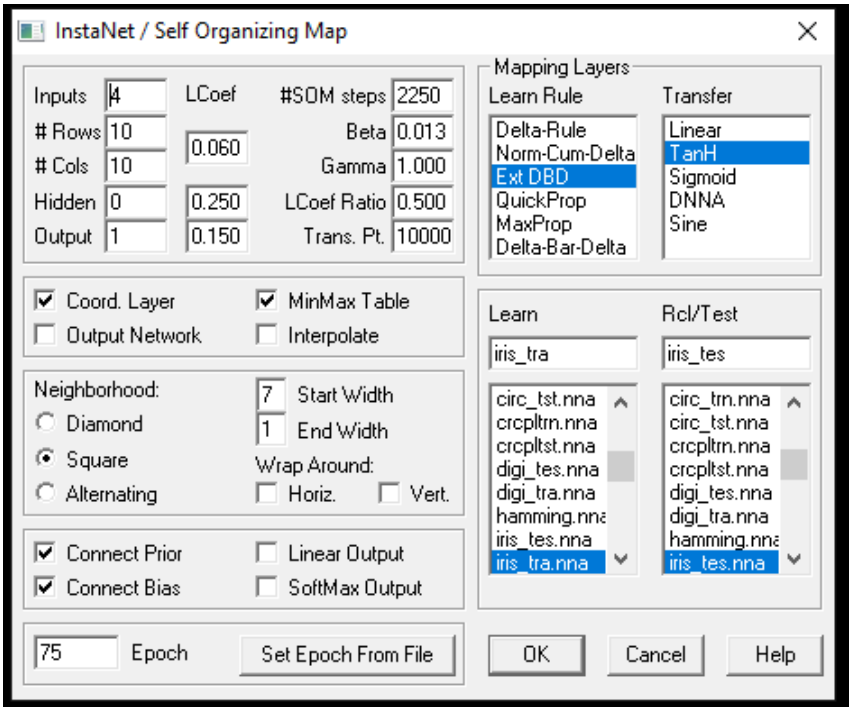

Figure 3: Basic Network Configuration

1.4 Excel Plot

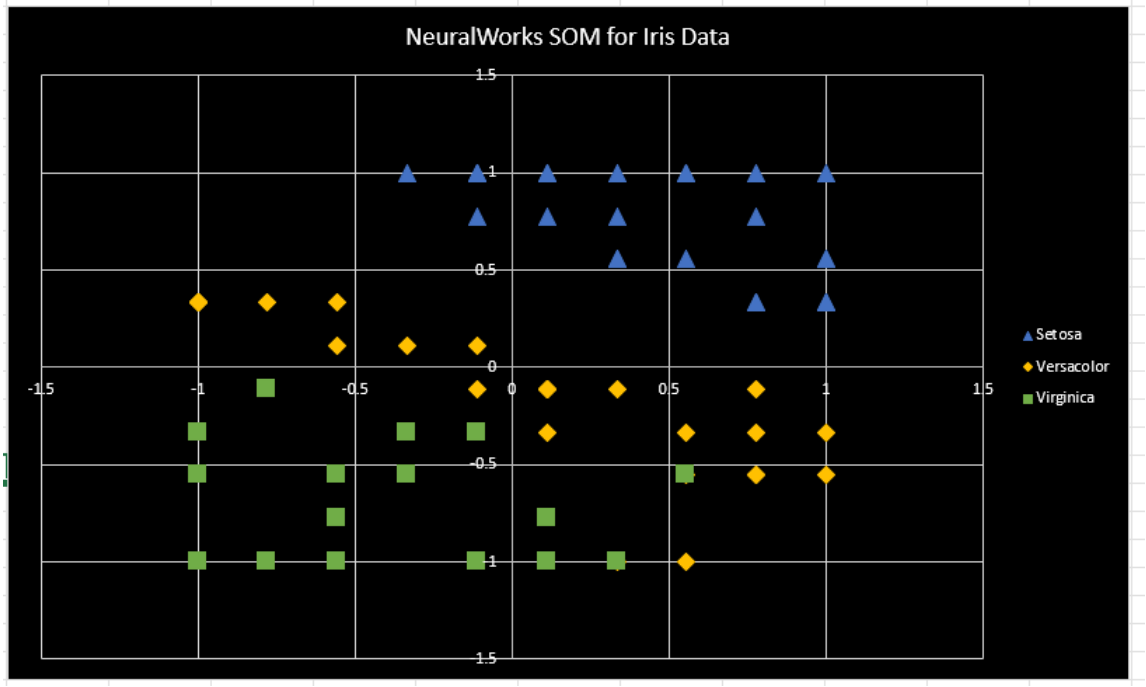

Figure 4: Basic Network Scatter Plot

2 Network 1

Grid Size = 15 x 15
Configuration = Diamond
Training Epochs = 400

2.1 Network Training

Figure 5: Network 1 Training

2.2 Network Testing

Figure 6: Network 1 Testing

2.3 Network Configuration

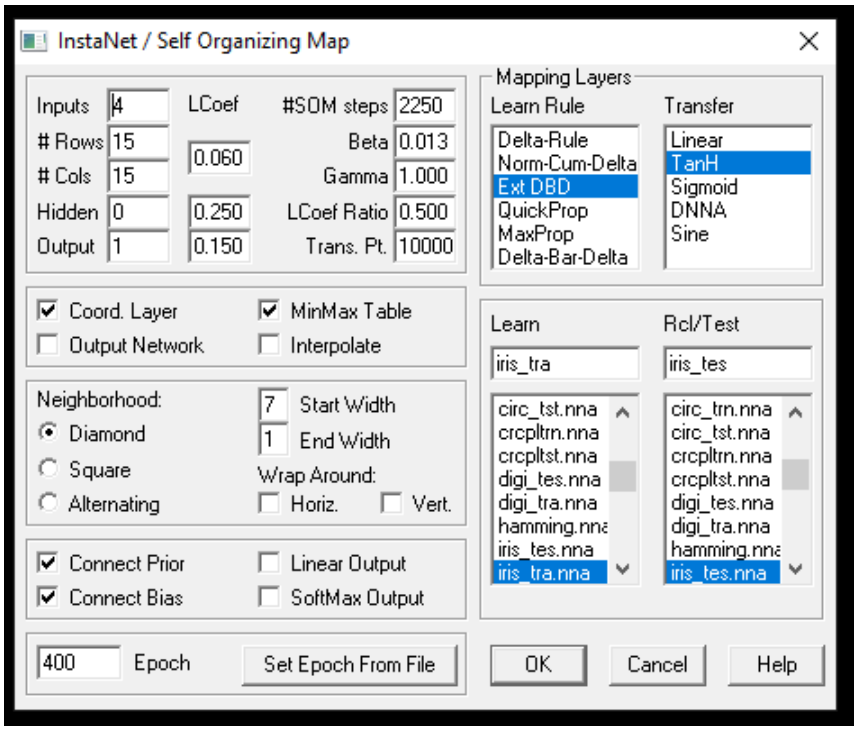

Figure 7: Network 1 Configuration

2.4 Excel Plot

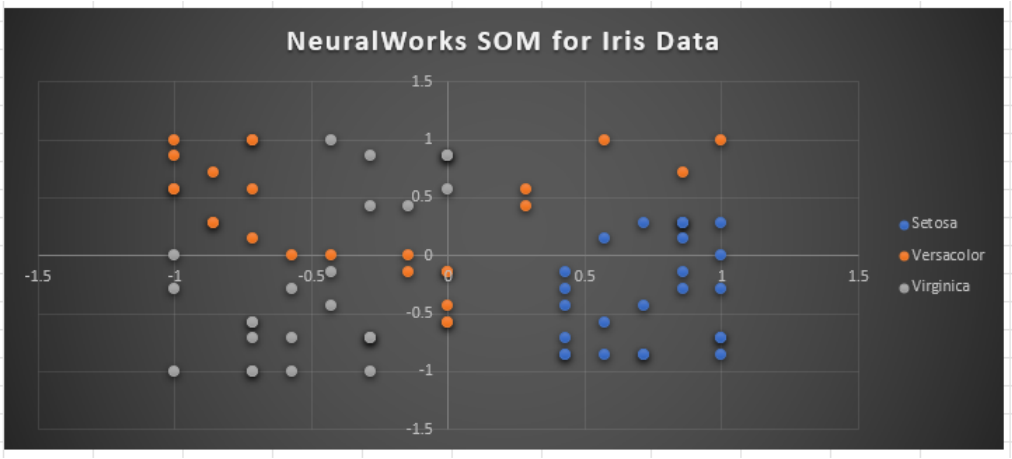

Figure 8: Network 1 Scatter Plot

3 Network 2

Grid Size = 20 x 20
Configuration = Diamond
Training Epochs = 200

3.1 Network Training

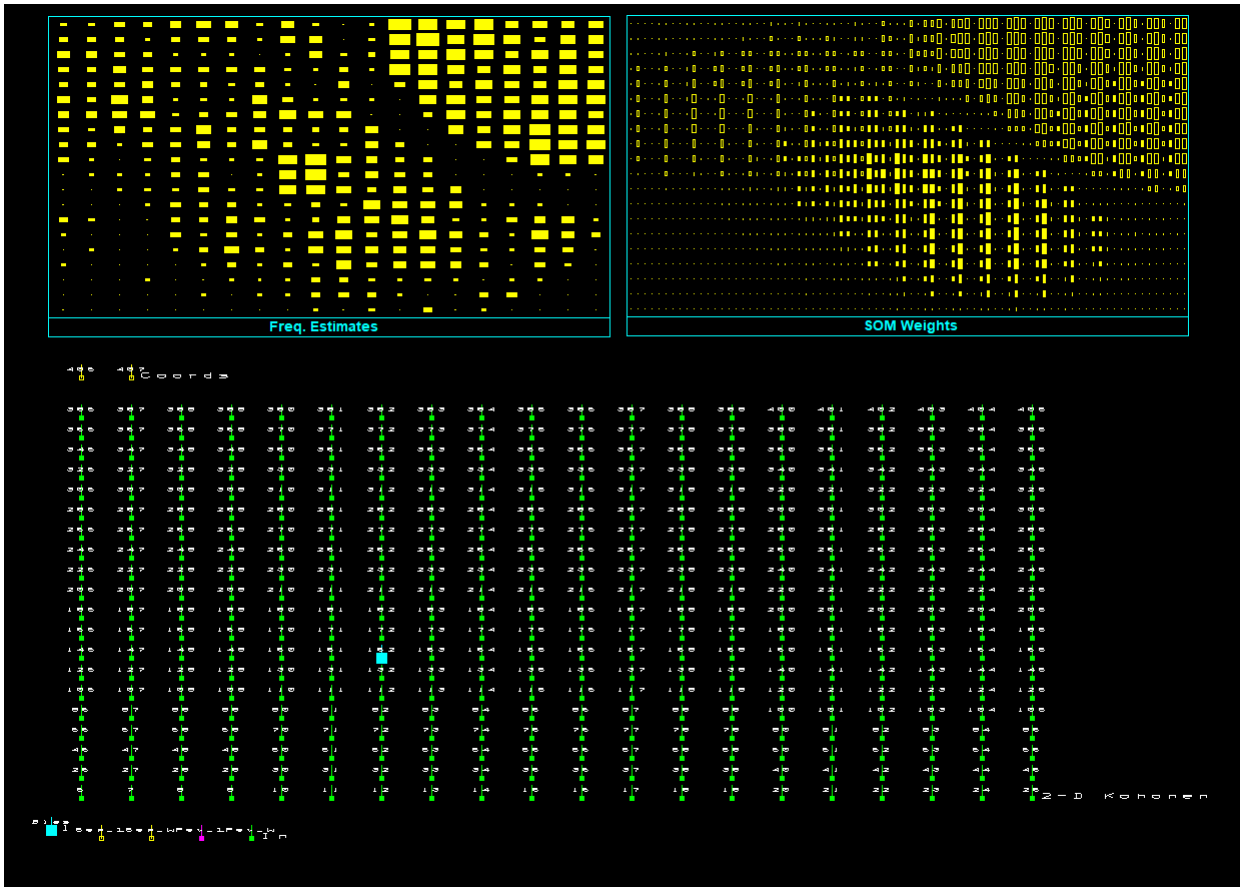

Figure 9: Network 2 Training

3.2 Network Testing

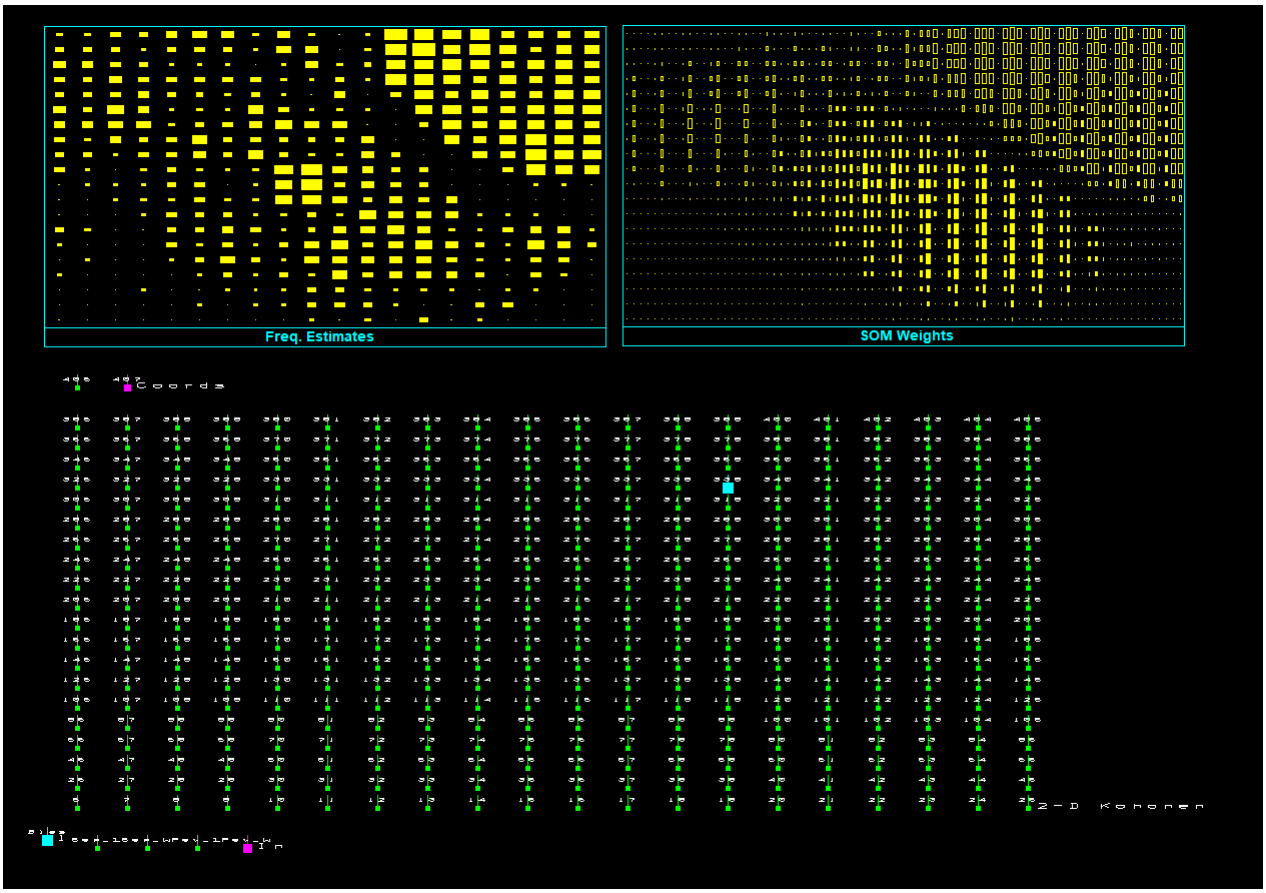

Figure 10: Network 2 Testing

3.3 Network Configuration

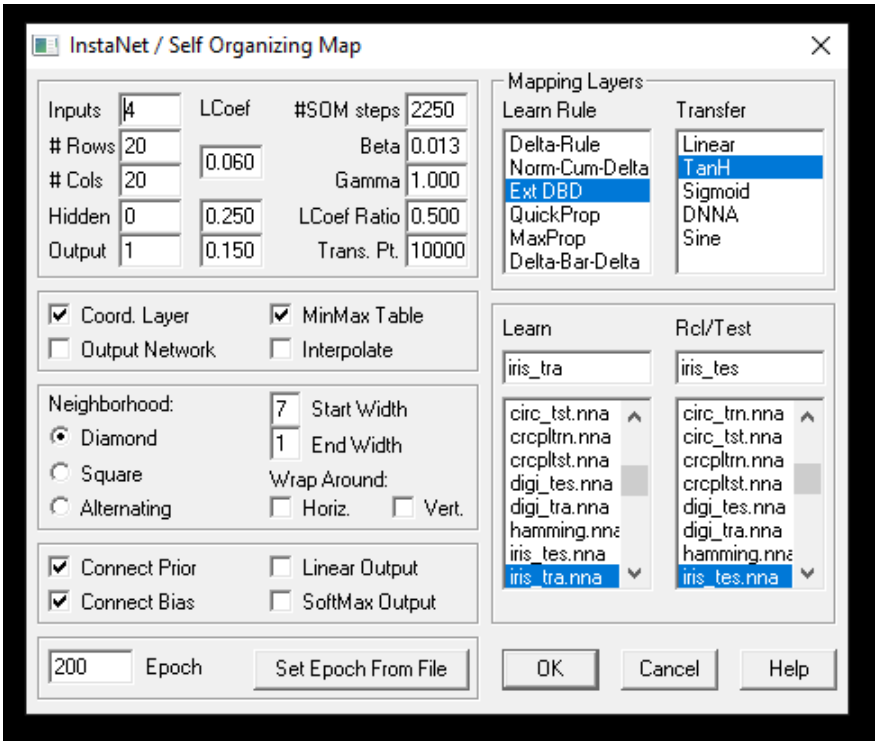

Figure 11: Network 2 Configuration

3.4 Excel Plot

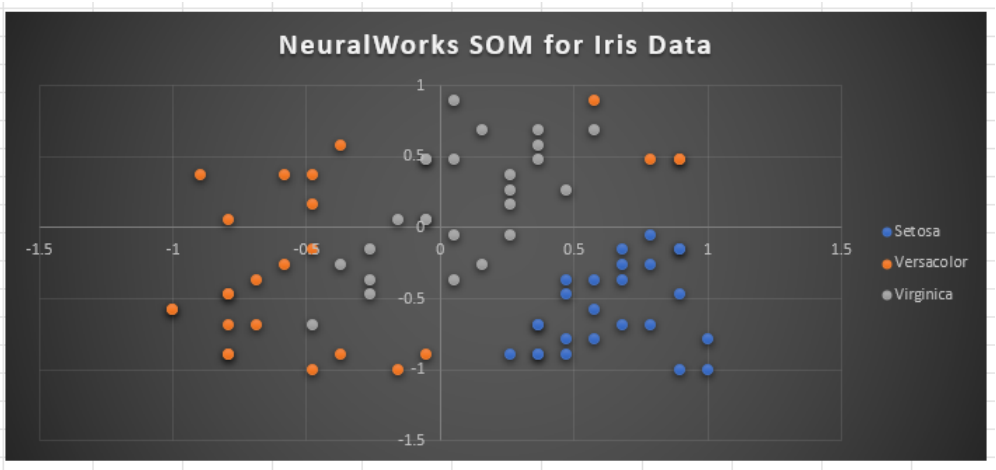

Figure 12: Network 2 Scatter Plot

4 Network 3

Grid Size = 20 x 20
Configuration = Diamond

Training Epochs = 400

4.1 Network Training

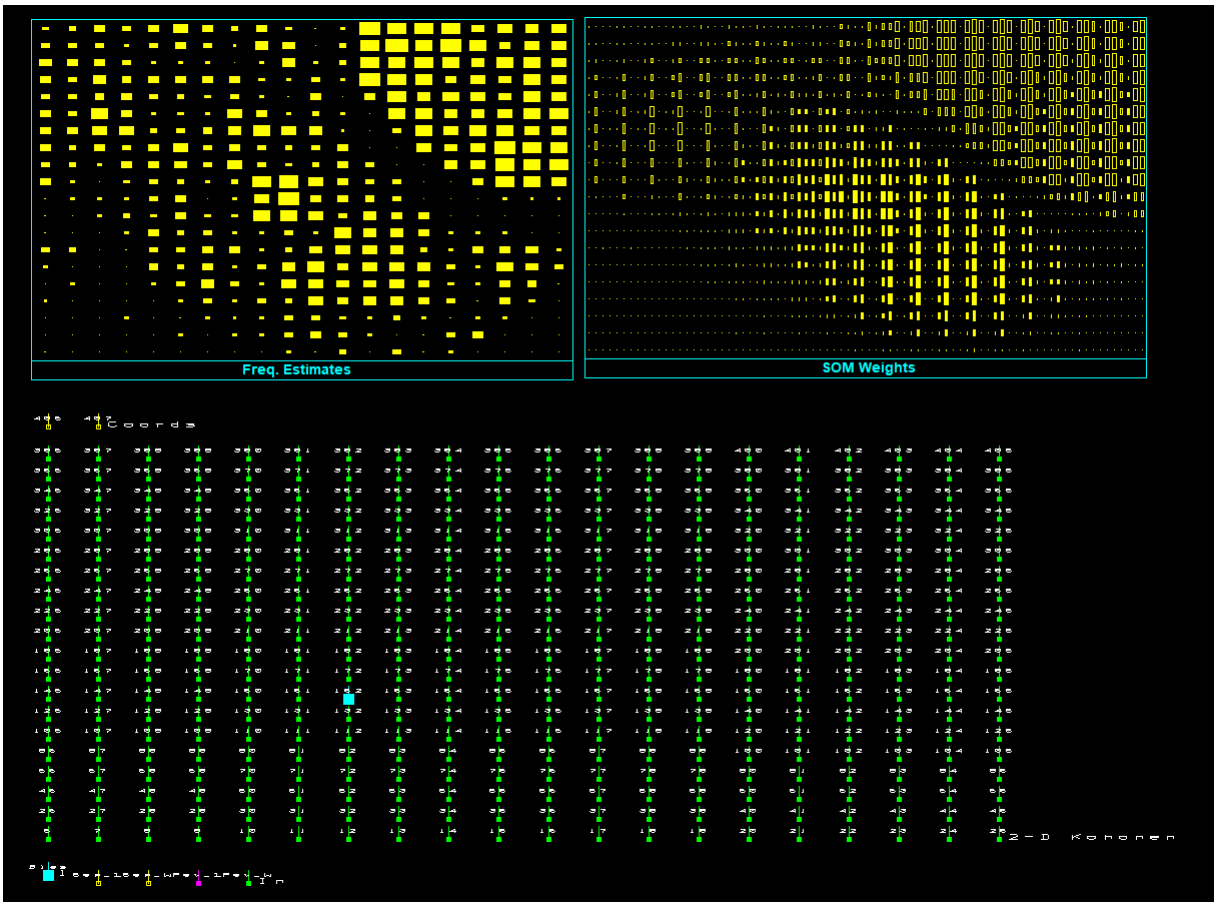

Figure 13: Network 3 Training

4.2 Network Testing

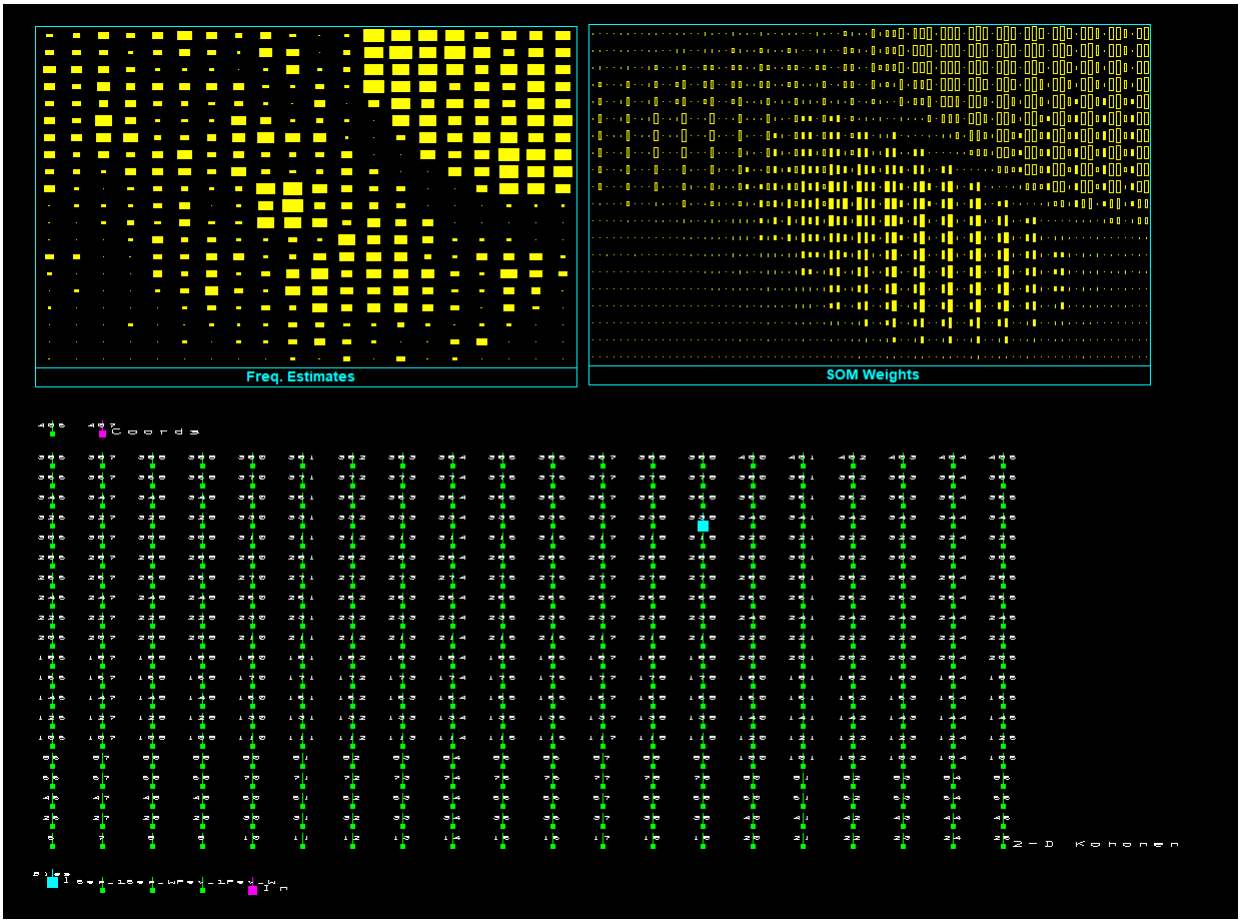

Figure 14: Network 3 Testing

4.3 Network Configuration

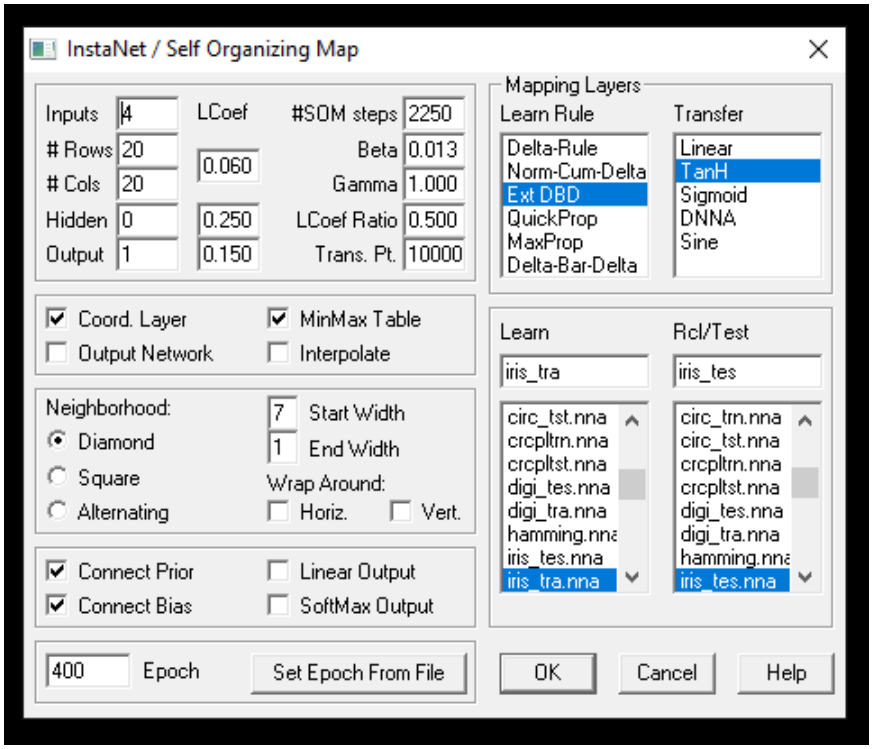

Figure 15: Network 3 Configuration

4.4 Excel Plot

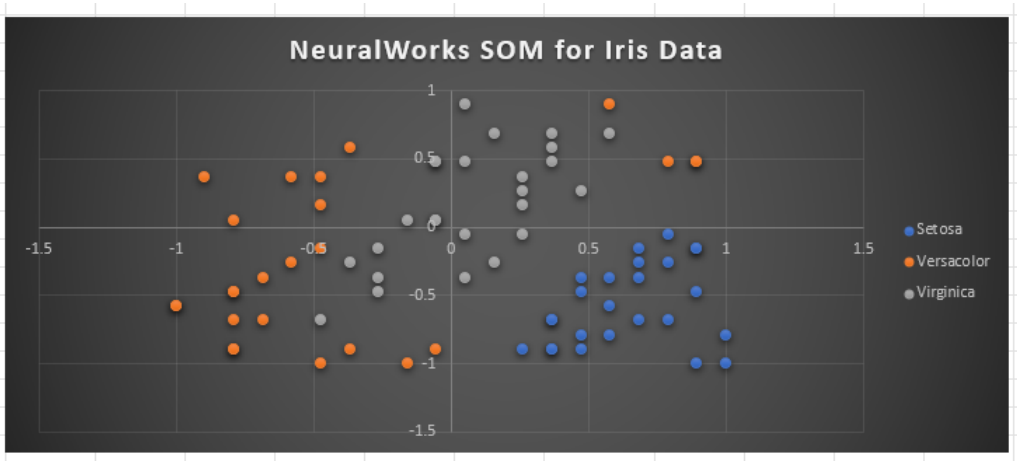

Figure 16: Network 3 Scatter Plot

5 Findings

-**In general using diamond configuration helps in better clustering because the winning weights are less connected to distant weights.** Since the no. of connections are less, the winner neuron/weight

has to cooperate (update weight) with less neighboring weights compared to square configuration. For example, for neighborhood radius R=1, in square configuration including winner weight, 9 weights are to be updated. But for same R, in diamond configuration 5 weights will be updated. And this continues to occur for other values of R. Usage of diamond configuration helps in minimizing long-range weight update and better cluster formation. In network 2 and 3 we can observe this effect.

-**Increasing grid size improves performance because the SOM weights gets better distributed over the input space due to decreased competition among them.** If grid size is larger (more weights in SOM), the weights tend not to compete for getting representation power over smaller input subspaces. As a result of that, the feature map generation process gets paced up and generates a better representation. For example, network 2 performs better than network 1. Other than a larger grid size (20x20) network 2 is similar to network 1.

-**Increasing epochs helps in generating a better and stable feature map because the weights get more time to adjust themselves and their neighbors**. Network 1, 2, and 3 perform better than basic network and they have more epochs than the basic net (400, 200, 400 respectively). But if the no. of epochs are set too high, further improvement may not occur. Network 2 and network 3 have the same diamond configuration and grid size. Increasing the no. of epochs for network 3 from 200 to 400, has not improved the feature map. In this case, the weights are getting saturated after around 200 epochs. So, addition of another 200 epochs is creating no effect on the weights.