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In-Class Activity 6 – SOM

1 What are SOMs?

SOMs are a type of unsupervised training where networks learn to form their own classifications of the training data without extra help. One neuron is activated in each iteration, and they compete among other neurons to be the activated ("winning") neuron. The activated neuron influences other neurons and brings them closer together.

What are the components and architecture of a SOM?

A SOM is made up of input nodes and computational nodes called neurons. Each computational node is connected to each input node to form a lattice. The four major components are initialization (all the connection weights are initialized with small random values), competition (the neurons compute their values of a discriminant function for each input pattern and the neuron with the smallest value of the discriminant function is the "winner"), cooperation (the winning neuron determines the spatial location of a topological neighborhood of excited neurons), and adaptation (the excited neurons decrease their individual values of the discriminant function in relation to the input pattern so that the response of a winning neuron to the next input pattern is increased).

What is/are the general purpose(s)/use(s) of a SOM?

The purpose of using a SOM is for reducing dimensionality (converting data from a high-dimensional space to a low-dimensional space) and to transform an incoming signal pattern of arbitrary dimension into a one- or two-dimensional discrete map (and to perform this topologically).

2 What is the problem being solved (problem description)?

The problem that is being solved is attempting to determine mood from facial expressions.

What are the inputs? (Including dimension and complexity)

The inputs are anger, sadness, disgust, happiness, surprise, fear, and neutral.

How can a SOM help this problem? / What is the motivation to use SOMs in this situation?

A SOM can help this problem because the neurons can take a face in as input, and after many iterations, the neurons will begin to classify the face because it'll choose the mood of other faces that are most like the input.

What does the output look like after using a SOM? (Describe briefly)

The neurons group into a region on the facial extraction map, and depending on the region where they group together, it determines what mood the person's face represents.

How is this output more useful/more appropriate? (Based on the given problem)

This output is more useful because it's very simple to just count the number of neurons that are grouped in a particular region on the facial extraction map and choose the region with the greatest number of neurons rather than using other machine learning methods that would be a lot more complex due to a high number of dimensions and facial features.