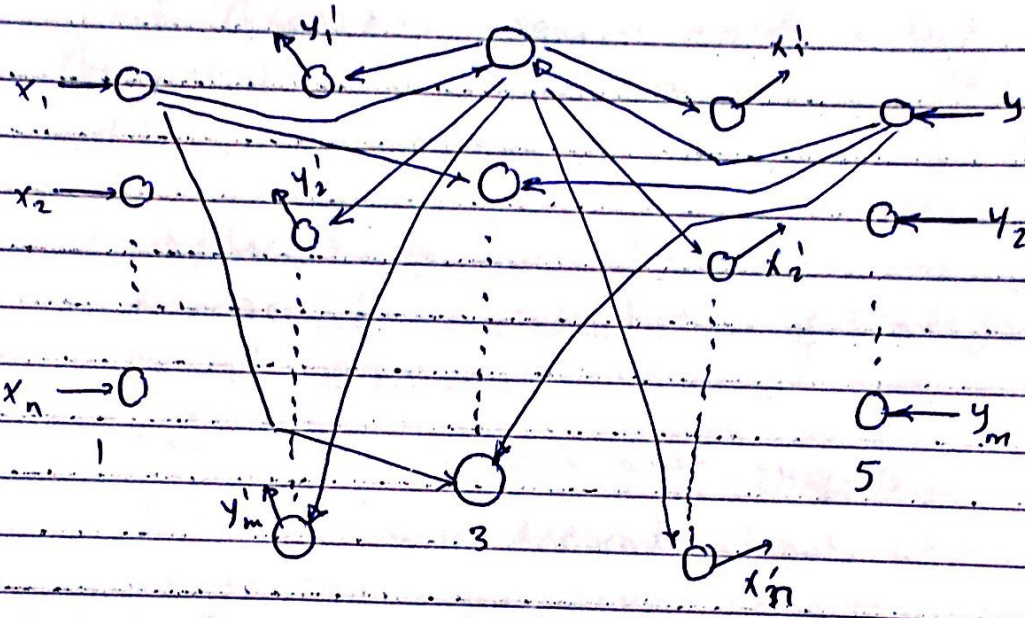
The Counter propagation Neural Network

Two types of CPNN:

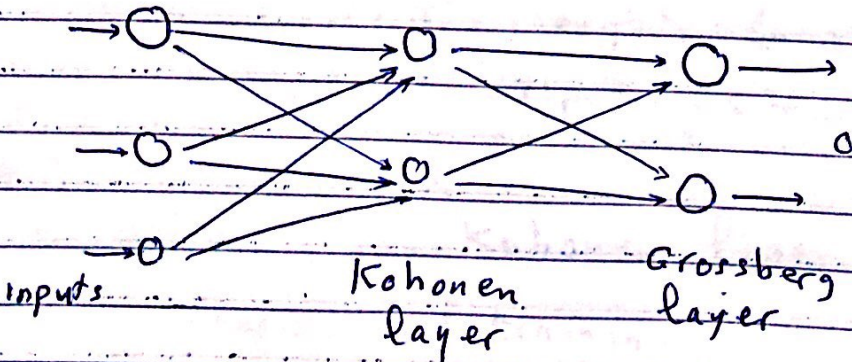
1- Full CPNN

Consists of 5 layers: two input layers, two output layers and one hidden layer



2- Feed forward CPNN

Consists of 3 layers



100 times faster than backpropagation network

How do they work?

Kohonen Layer:

+ Neurons sum all of the weighted inputs received
+ The neuron with the largest sum outputs a 1 and the other neurons output a 0.

Grossberg layer:

Each Grossberg neuron merely outputs the weight of the connection between itself and the one active Kohonen neuron.

Why two different types of Layers?

+ More accurate representation of biological neural networks
+ Each Layer has its own purpose:
  Kohonen layer separates inputs into classes
  Inputs in the same class will turn on the same Kohonen neuron.

Grossberg layer
  adjusts the weights to obtain acceptable outputs for each class.

Training Cp Network

+ Training the Kohonen layer
  - Unsupervised training
  - input vectors are normalized
  - The one active Kohonen neuron updates its weights according to:

$W_{new} = W_{old} + \alpha(input - W_{old})$

α is the learning rate.

Training the Grossberg layer:

+ uses supervised training
+ weight update algorithm is similar to that used in back propagation

Hidden Layers:

one layer is sufficient for most problems

Two layers are required when the function is discontinuous.

Number of Neurons:

Too few neurons causes the NN not to learn the details.

Too many neurons causes the NN to learn insignificant details.

start small no. of neurons and increase the number until satisfactory results are obtained