**Full Counterpropagation Algorithm**

**Step 0:** Set the weights and the initial learning rate.

**Step 1:** Perform step 2 to 7 if stopping condition is false for phase I training.

**Step 2:** For each of the training input vector pair x:y presented, perform step 3 to .

**Step 3:** Make the X-input layer activations to vector X.

Make the Y-input layer activation to vector Y.

**Step 4:** Find the winning cluster unit.

If dot product method is used, find the cluster unit zj with target net input; for j=1 to p,

zinj=∑xi.vij + ∑yk.wkj

If Euclidean distance method is used, find the cluster unit zj whose squared distance from input vectors is the smallest:

Dj=∑(xi-vij)^2 + ∑(yk-wkj)^2

If there occurs a tie in case of selection of winner unit, the unit with the smallest index is the winner. Take the winner unit index as J.

**Step 5:** Update the weights over the calculated winner unit zj.

For i=1 to n,  viJ(new)=viJ(old) + α[xi-viJ(old)]

For k =1 to m,  wkJ(new)=wkJ(old) + β[yk-wkJ(old)]

**Step 6:** Reduce the learning rates.

 α (t+1)=0.5α(t);  β(t+1)=0.5β(t)

**Step 7:** Test stopping condition for phase I training.

**Step 8:** Perform step 9 to 15 when stopping condition is false for phase II training.

**Step 9:** Perform step 10 to 13 for each training input vector pair x:y.  Here α and β are small constant values.

**Step 10:** Make the X-input layer activations to vector x. Make the Y-input layer activations to vector y.

**Step 11:**  Find the winning cluster unit (Using the formula from step 4). Take the winner unit index as J.

**Step 12:** Update the weights entering into unit zJ.

For i=1 to n,  viJ(new)=viJ(old) + α[xi-viJ(old)]

For k =1 to m,  wkJ(new)=wkJ(old) + β[yk-wkJ(old)]

**Step 13:** Update the weights from unit zj to the output layers.

For i=1 to n,  tJi(new)=tJi(old) + b[xi-tJi(old)]

For k =1 to m,  uJk(new)=uJk(old) + a[yk-uJk(old)]

**Step 14:** Reduce the learning rates a and b.

a(t+1)=0.5a(t);  b(t+1)=0.5b(t)

**Step 15:** Test stopping condition for phase II training.