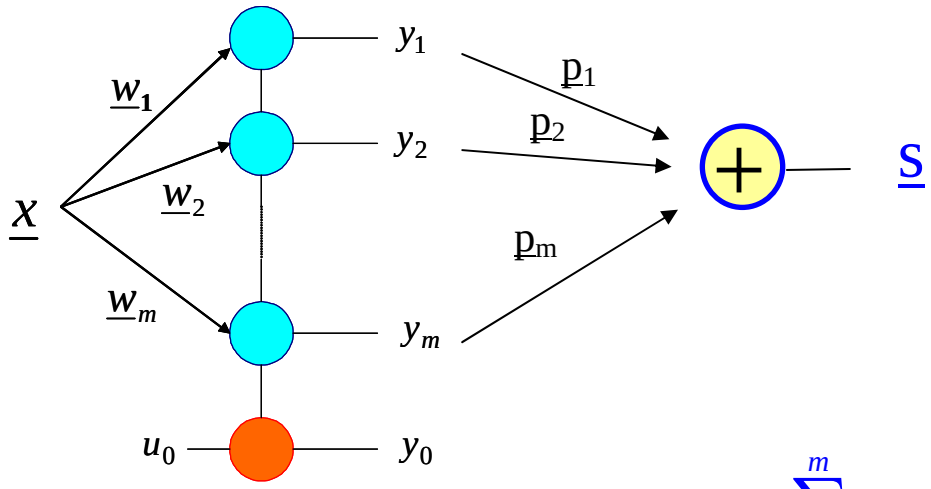
Counterpropagation (tipo feedforward)

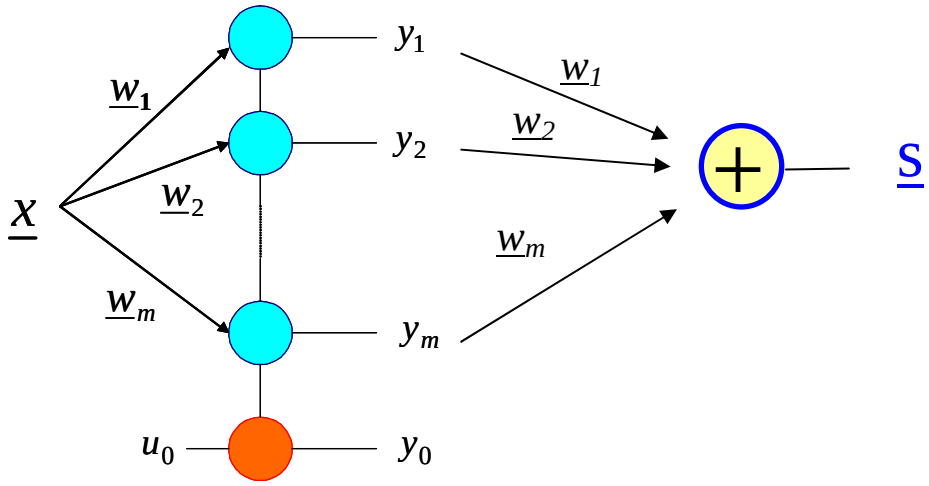


$$\underline{s} = \sum_{j=1}^{m} y_j \underline{p}_j$$

Memória hetero associativa

$\underline{s} = \underline{p}_i \quad (y_i = 1)$

Se $\underline{\mathbf{p}_i} = \underline{\mathbf{w}_i}$ $\underline{\mathbf{x}} = \underline{\mathbf{w}_i} + \underline{\mathbf{r}}$ ⇨ $\underline{\mathbf{s}} = \underline{\mathbf{w}_i}$

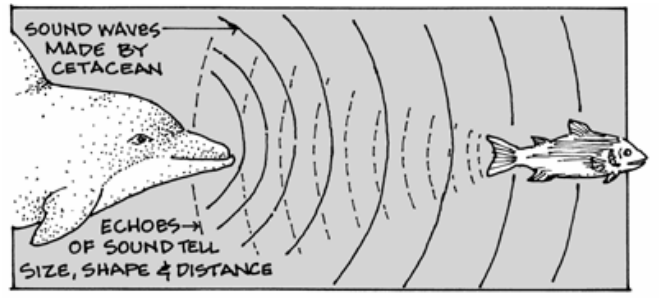


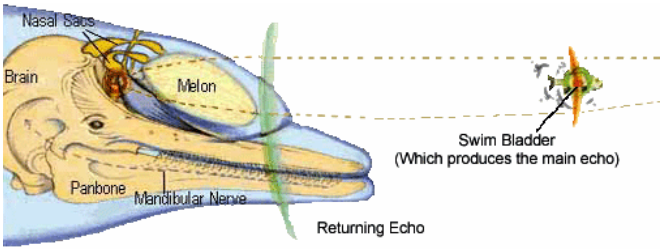
Memória endereçável por conteúdo

Memória auto associativa

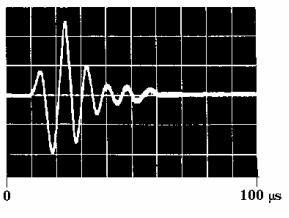
Filtragem não linear
Detecção de padrões desconhecidos

Ex 1: Dolphin Ecolocation





Time to frequency patterns:



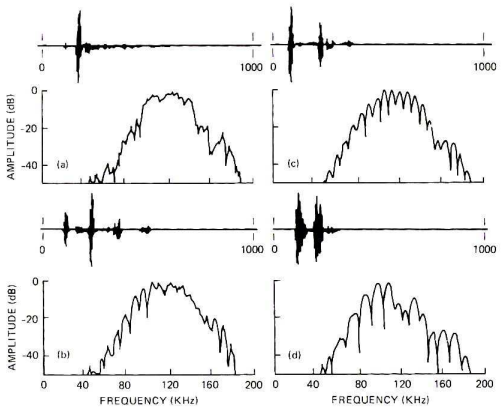
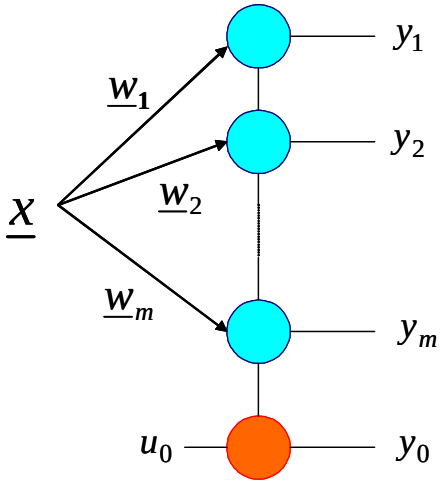
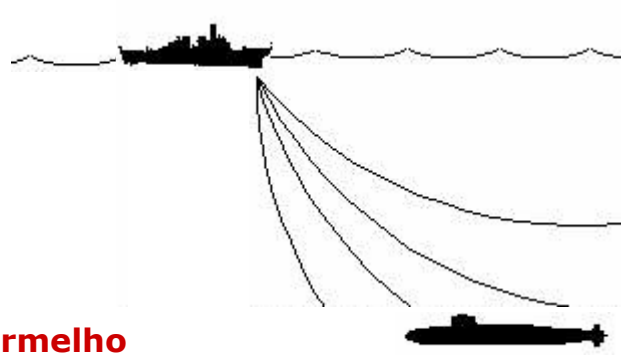


Figure 10-11. Amplitude display and Fourier transform for each item in the dolphin echolocation experiment. (From H. L. Roitblatt, et al. Dolphin Echolocation: Identification of returning echoes using a counterpropagation network. *Proc. IJCNN.* © 1989 IEEE.)



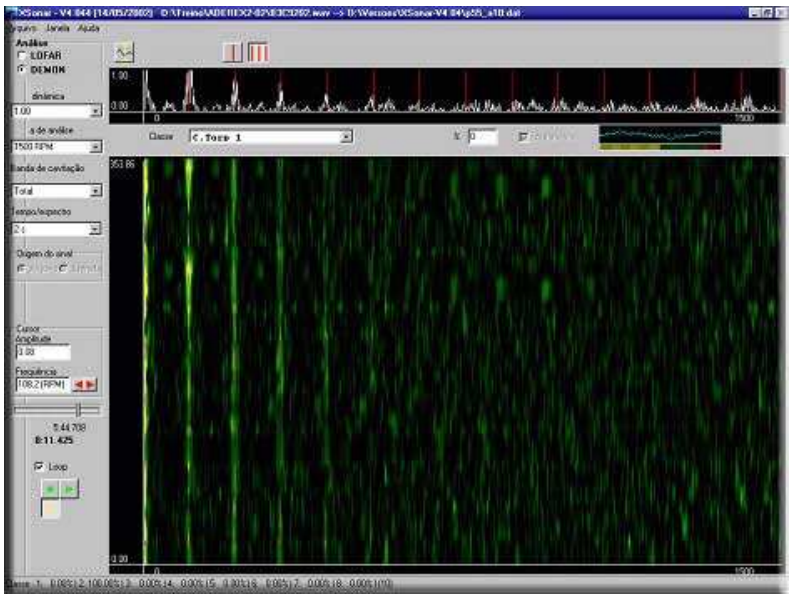
Ex 2: Sonar Passivo



A Caçada Ao Outubro Vermelho
(The Hunt For Red October)

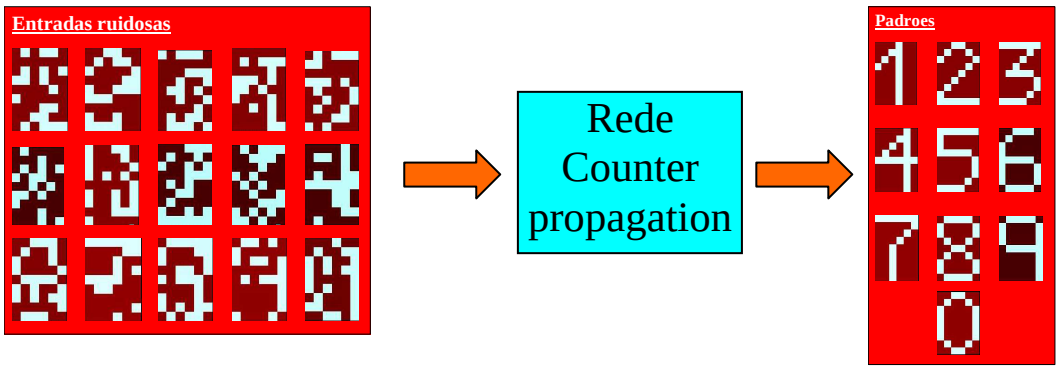
Classificador de Contatos Sonar (IPqM / UFRJ):

Classificação de alvos via análises Lowfar e Demon do ruído irradiado utilizando-se **reconhecimento de padrões através de redes neurais**.

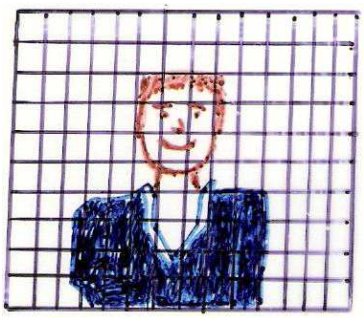


Ex 3: OCR: Figuras com ruído

Obtenções de padrões a partir de sinais ruidosos:



Compressão de informações



Compressão de imagens

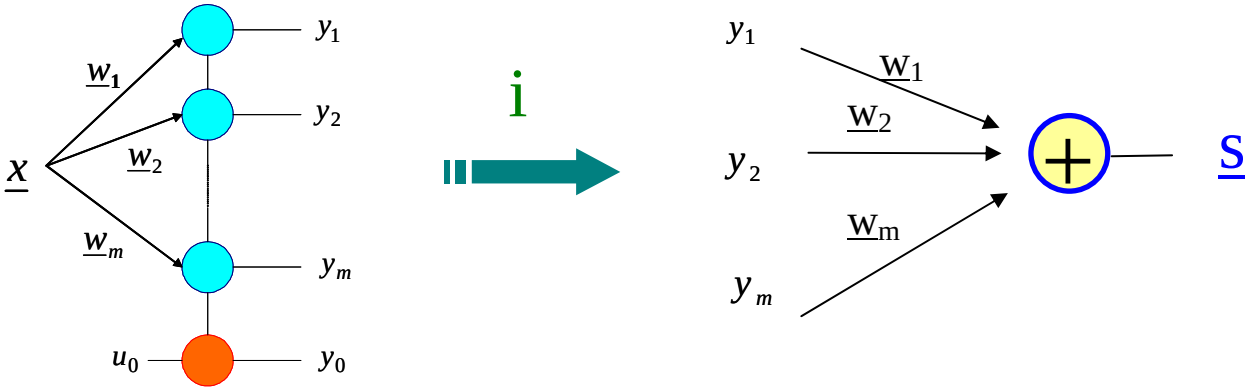


Imagem P&B

BMP
1 quadro 4x4 pix = 16 pix
16 pix/quadro 8 bits/pix = 128 bits/quadro

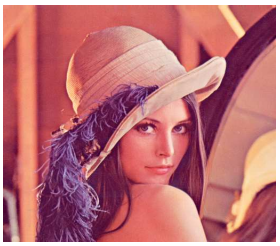
Compressao RN
1 quadro 4x4 pix
8 padroes/quadro 3 bits/padrao = 24 bits/quadro

Taxa de compressao: 128/24 = 5.3 x

Exemplo de Compressão

Imagens original e comprimidas

(1x)



(11x)

(15x)

(28x)

Efeito do codebook (compressão aprox 20x)

codebook Lena

codebook house