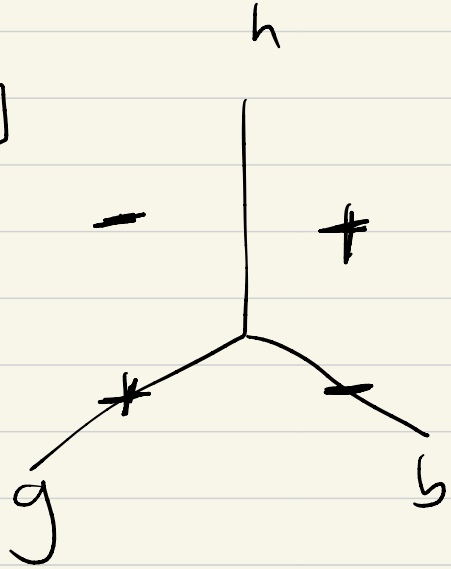
Neural nets

$f(\bar{x}) = [g \; b \; n]$

good	1	0	0
bad	0	1	0
not good	1	0	1
not bad	0	1	1



$\bar{w}^T f(\bar{x})$ → make this not just a simple feature vector

$\bar{w}^T \bar{z}$

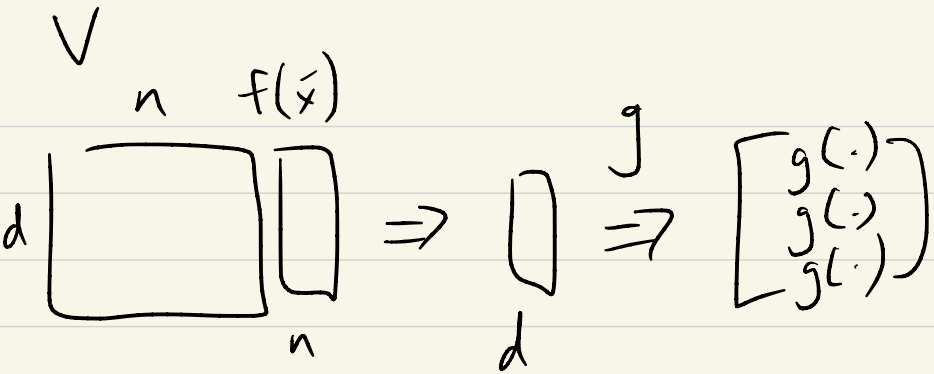
intermediate features

$\bar{z} = g(V f(\bar{x}))$

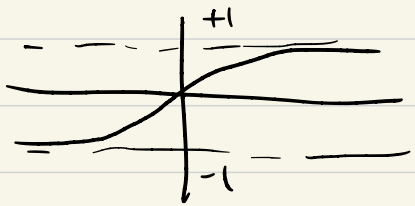
$f(\bar{x})$: BoW, n features

V: d x n matrix

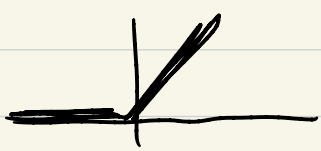
g: nonlinearity applied to each coordinate



g: tanh



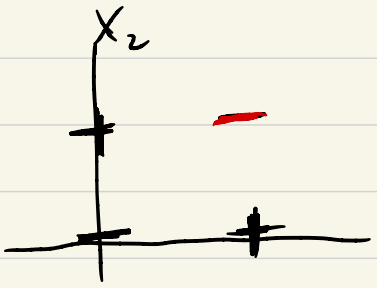
ReLU



V: trainable weights

g: nonlinearity

XOR:



$f(\bar{x})$	0	0	−
	0	1	+
	1	0	+
	1	1	−

I made this up

$$V = \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 1 & 1 \end{bmatrix}$$

$g = \tanh$

$$Vf(\bar{x}) = \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} x_1 \\ x_2 \\ x_1 + x_2 \end{bmatrix}$$

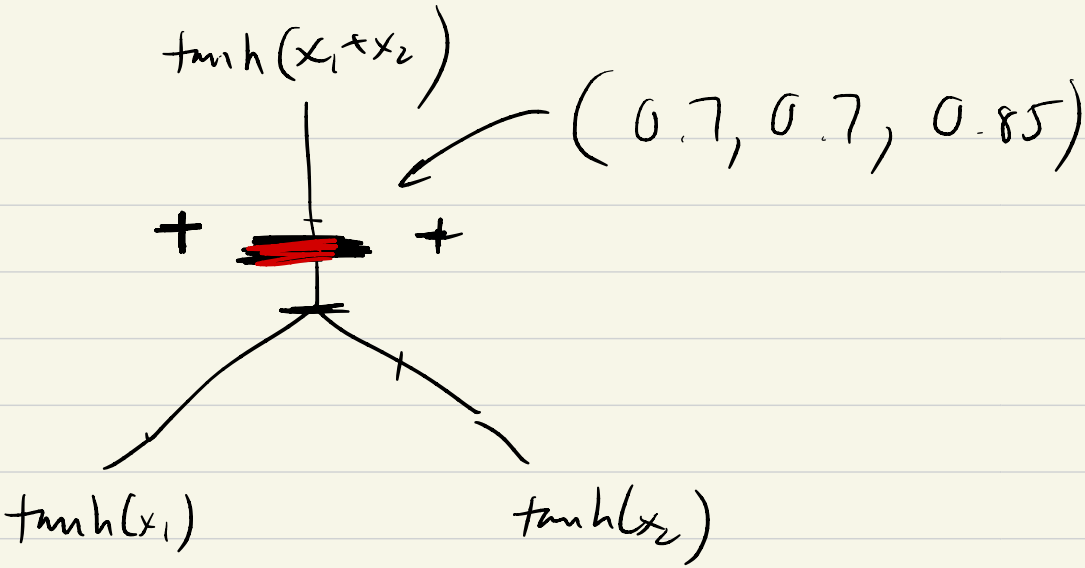
3×2 $\quad$ 2

$$\begin{bmatrix} \tanh(x_1) \\ \tanh(x_2) \\ \tanh(x_1 + x_2) \end{bmatrix}$$

$\tanh(0) = 0$

$\tanh(1) = 0.7$

$\tanh(2) \approx 0.85$



Classification:

$$\bar{w}^T \bar{z} = \bar{w}^T g(V f(\bar{x}))$$

data is separable in new space