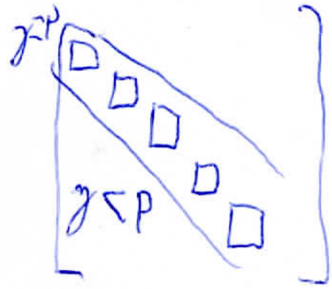
9) 3.1) if h is a linear transformation of $\phi(x)$ then

$$h = A_\theta \phi(x)$$

$$h_i = \left(\sum_{j=1}^{D} w_{ij} x_j\right) \times \left(\sum_{p=1}^{D} w_{ip} x_p\right)$$

$$= \sum_{j,p}^{D} (w_{ij} w_{ip}) (x_j x_p)$$



$$= \sum_{j=p} w_{ij} \cdot w_{ip} \cdot x_j \cdot x_p + 2 \sum_{j<p} w_{ij} \cdot w_{ip} \cdot x_j \cdot x_p$$

$$= \sum_{j=p} w_{ij} \cdot w_{ip} \cdot x_j \cdot x_p + \sum_{j<p} 2\, w_{ij} \cdot w_{ip} \cdot x_j \cdot x_p$$

q all pairs of j,p

$q = (j,p)$

$j \leq p$

$$= \sum_{q=1}^{\frac{D(D+1)}{2}} (A_\theta)_{iq} \, (\phi(x))_q$$

R: $(A_\theta)_{iq} = \begin{cases} w_{ij}\, w_{iR} & \text{if } j=p \\ 2\, w_{ij}\, w_{ip} & \text{if } j<p \end{cases}$

$(\phi(x))_q = x_j x_p$

9) 3.2)

~~$A_\theta \phi(x)$~~

$$\hat{y} = V^T h$$

as seen in 3.2)

$$\hat{y} = V^T A_\theta \phi(x)$$

$$= [V] \begin{bmatrix} A_\theta \end{bmatrix} \begin{bmatrix} \phi(x) \end{bmatrix}$$

$$\underbrace{\qquad}_{C_\theta^T}$$

$$C_\theta = A_\theta^T V$$

$$C_\theta^T = V^T A_\theta$$

R: No, because there are still the necessity of parameter changes