PMR – PCA

30/10/09

$y = \underline{w} \cdot \underline{x}$

$\langle y^2 \rangle = \underline{w}^T \langle \underline{x}\,\underline{x}^T \rangle \underline{w}$

$= \underline{w}^T \Sigma \underline{w}$

Maximize subject to $w^T w = 1$

$\therefore J = \underline{w}^T \Sigma \underline{w} - \lambda (\underline{w}^T \underline{w} - 1)$

$\frac{\partial J}{\partial \underline{w}} = 2 \Sigma \underline{w} - 2 \lambda \underline{w} = 0$

$\Rightarrow \Sigma \underline{w} = \lambda \underline{w}$ [eigenvector equation]

$\therefore \langle y^2 \rangle = w^T \Sigma w = \lambda \underline{w}^T \underline{w} = \lambda$

To maximize $\langle y^2 \rangle$ choose $\underline{w}$ corresponding to largest eigenvalue