P10 - PCA

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1 Principal Component Analysis (PCA)

Exercise: Given the following training data:

$$\mathbf{x}^{(1)} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{x}^{(2)} = \begin{pmatrix} 4 \\ 0 \end{pmatrix}, \mathbf{x}^{(3)} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}, \mathbf{x}^{(4)} = \begin{pmatrix} 6 \\ 3 \end{pmatrix}$$

a) Compute the K-L transformation.
b) What is the rotation applied to go from the original coordinate system to the eigenvector coordinate system?
c) Which eigenvector is most significant?
d) Can we apply the Kaiser criterion?
e) Map the points onto the most significant dimension.

2 Thinking Questions

When is an autoencoder equivalent to a PCA? What are the main differences?

Solution:
Linear units where the number of the hidden units corresponds to the number of the principal components (the eigenvectors with large eigenvalues) In PCA the eigenvalues indicate which dimensions are important. In a linear autoencoder the number of hidden units has to be determined by experiments

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