Aalto University
School of Electrical
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CS-C3240 – Machine Learning D

Feature Engineering

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Outline

Neural Networks for dimensionality reduction

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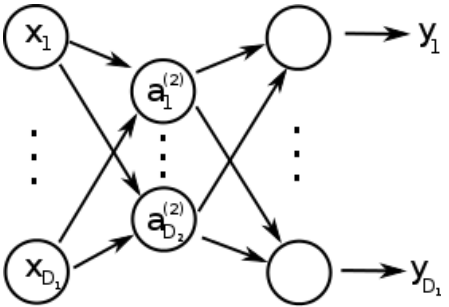
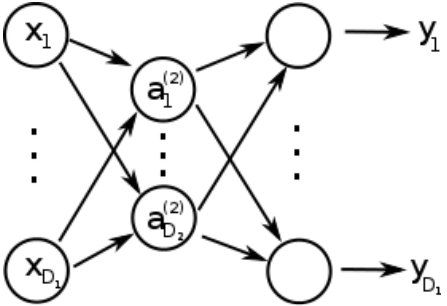
Dimensionality reduction can be achieved with a multilayer perceptron with

- → Same number $D_1 = D_L$ of inputs as outputs
- → A single hidden layer with $D_2 < D_1$ nodes



Neural Networks for dimensionality reduction

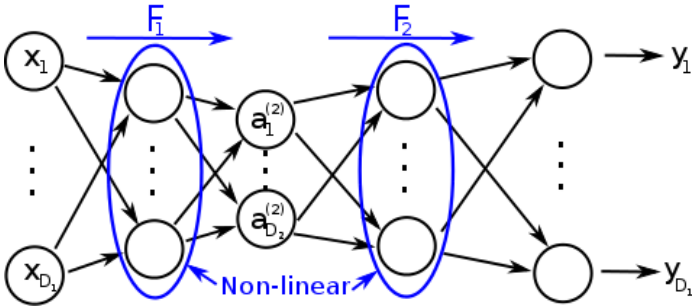


For linear activation functions, it can be shown that the error function has a global minimum

Furthermore, at this minimum, the network projects the input vectors onto the D_2-dimensional sub-space spanned by the first D_2 principal components

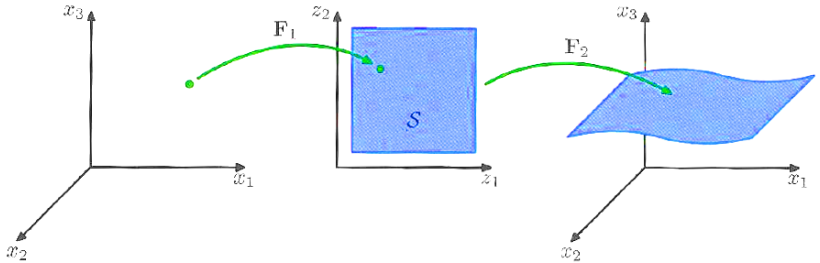
→ Linear dimensionality reduction (Same as for PCA)

Neural Networks for dimensionality reduction



With more than 2 layers and non-linear activation functions, also non-linear dimensionality reduction is possible

Neural Networks for dimensionality reduction



With more than 2 layers and non-linear activation functions, also non-linear dimensionality reduction is possible

Questions?

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Literature

- C.M. Bishop: Pattern recognition and machine learning, Springer, 2007.
- R.O. Duda, P.E. Hart, D.G. Stork: Pattern Classification, Wiley, 2001.