Dimensionality reduction

Types of statistical analysis

Univariate

- One variable

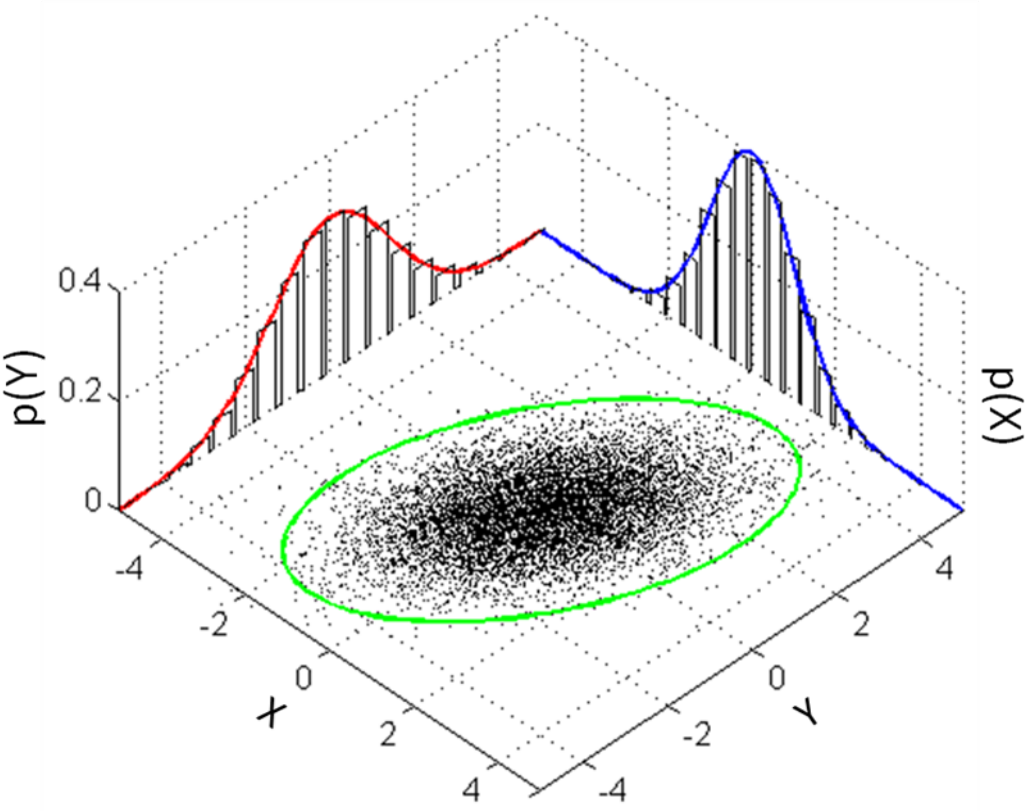
Bivariate

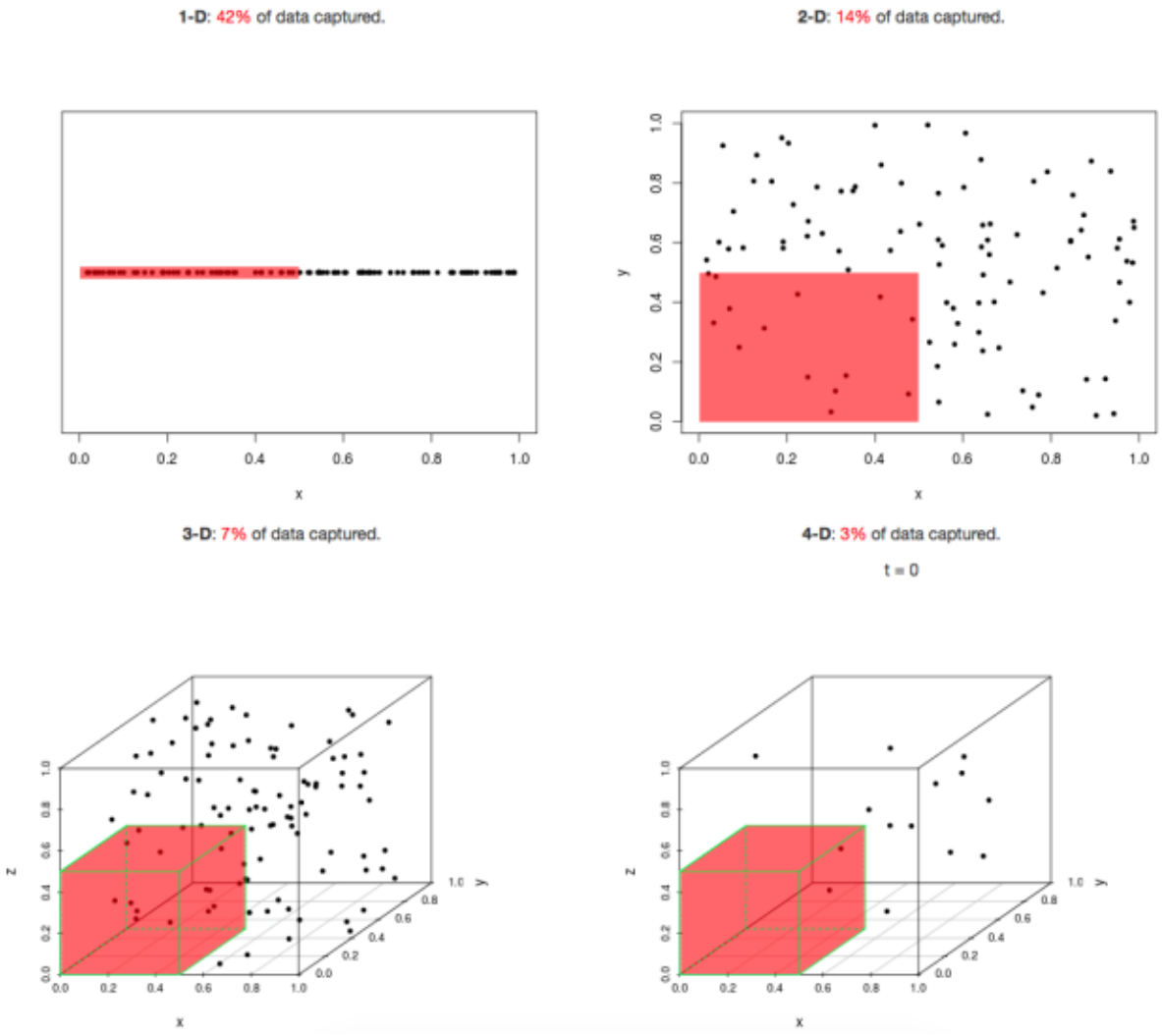
- Two variables (x and y)

Multivariate

also **multidimensional**

- Many variables


0.4
0.2
0
p(Y)
-4
-2
0
2
4
X
4
2
0
-2
-4
Y
p(X)



The *curse* of higher dimensions

- Computational ineffectivity.
- Low data density in higher dimensions.
- Problematic visualization, human brain does not easily cope with more than 3D.
- Difficult interpretation.

→ Dimensionality reduction

Dimensionality reduction techniques

Principal component analysis (PCA)

- Numeric (continuous) data.

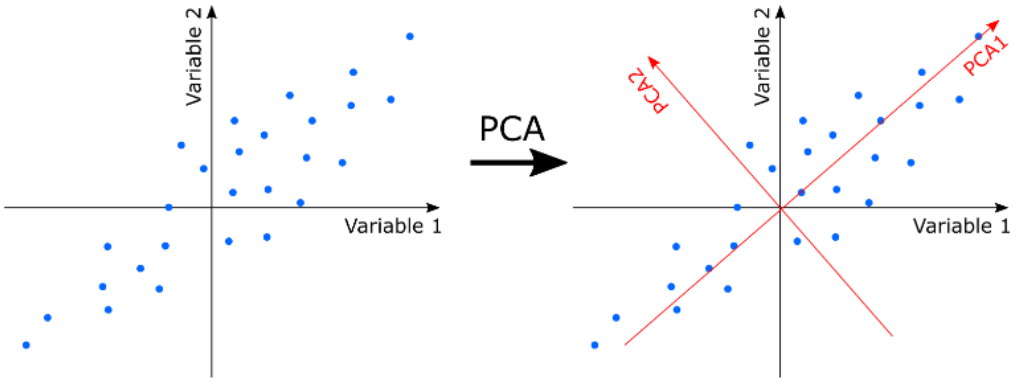
Correspondence analysis (CA)

- Categorical data.

Principal component analysis

The goal of PCA is to find **low-dimensional representation** of the observations that explain a good fraction of the original variation.

- First principal component is a **direction** that **maximizes the variance** of the projected data.
- Second PC is **orthogonal** to the previous one.



Biplot