**Motivations for transforming data using unsupervised learning:**

Visualization, compressing the data, and finding a representation that is more informative for further processing.

**One of the simplest and most widely used algorithms:**

principal component analysis.

**Principal components** allow us to summarize this set with a smaller # of representative variables for original variability. Principal component analysis is a method that rotates the dataset in a way such that the rotated features are statistically uncorrelated.

**PCA serves for:**

Dimension reduction: data pre-processing before supervised techniques are applied.

Lossy data compression

Feature extraction

A tool for data visualization

**Two common used definitions of PCA:**

Orthogonal Projection

Linear projection

**In NMF**,

Aims to extract useful features. We want the components and the coefficients to be nonnegative; that is, we want both the components and the coefficients to be greater than or equal to zero.

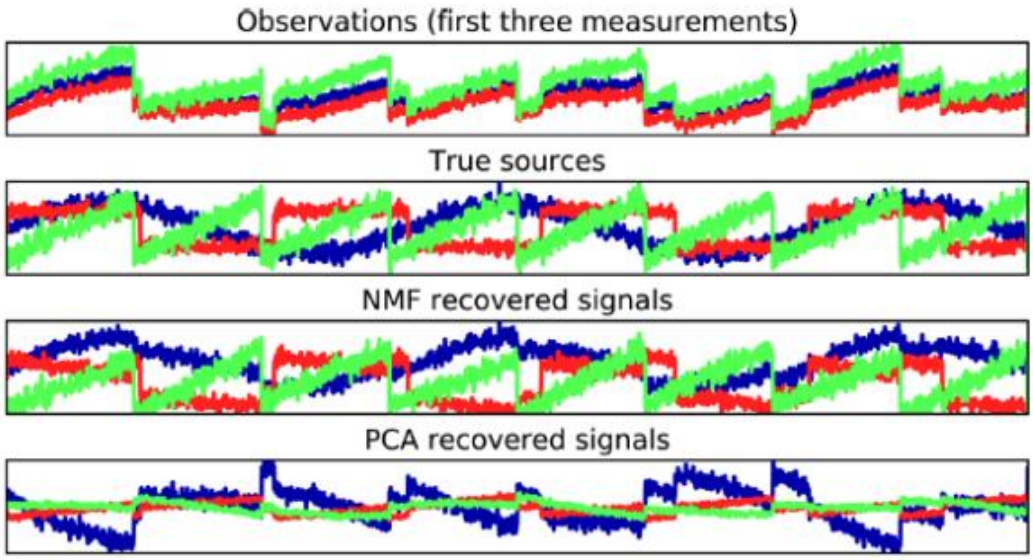


*Figure 3-19. Recovering mixed sources using NMF and PCA*

NMF did a reasonable job of discovering the original sources.

while PCA failed and used the first component to explain the majority of the variation in the data.

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Manifold learning algorithms are mainly aimed at visualization, and so are rarely used to generate more than two new features.

**t-SNE** computes a new representation of the training data, but don't allow transformations of new data.