# Terminologies

## **Kronecker product**

Denoted as ⊗. Is a special matrix multiplication for arbitrary size matrices. Def is at <https://en.wikipedia.org/wiki/Kronecker_product>.

# Matrix decomposition

## Principal Component Analysis (PCA)

Goal: to find the orthogonal basis of some (high dimensional) data, to find the basis that can best retain information from big to small, and the basis are mutually orthogonal (so that same info is not recorded multiple times).

Conclusion: if to represent these data as matrix (eg each row is a data, each column is a dimension), then the eigenvectors are the axis of principal components and corresponding eigenvalues are the significance of this axis. This is prove by langrange multiplier to of optimizing the objective function.

## Independent Component Analysis (ICA)

ICA attempts to perform blind source separation by decomposing a multivariate signal into additive subcomponents that are maximally independent.

For example, in an EEG signal, decompose the signal to different signals using ICA and just delete the unwanted signals and add everything else back.