Principal Component Analysis (PCA) is a way to reduce the dimensionality of Data.

Data in real life is high dimensional.

- Housing data
  - size of house
  - type
  - geographic location
  - ...
- Image data.

Useful Books:
- Mathematics for ML: Deisenroth, 2018
- Pattern Recognition and Machine Learning: Bishop, 2006

Highly dimensional data is hard to visualize and interpret. Storage is also expensive.

When high dimensional data is overcomplete — many dimensions are redundant and can be explained by a combination of other dimensions.

- e.g. a gray-scale channel can be explained by a combination of red, blue, green channels.

Dimensionality reduction exploits structure and correlation.
↳ similar to a compression technique.
→ a lower dimension representation of a high dimensional data point is called a feature or code.

PCA is a classical technique for linear dimensionality reduction.

Course will cover necessary math required to derive PCA:
(1) stat. rep. of data mean/var. w- change, inner product, orthogonal proj..