**Motivating and setting the foundation for mixture models**

**Reading:** Slides presented in this module
10 min

**Video:** Motiving probabilistic clustering models
8 min

**Video:** Aggregating over unknown classes in an image dataset
6 min

**Video:** Univariate Gaussian distributions
2 min

**Video:** Bivariate and multivariate Gaussians
7 min

**Mixtures of Gaussians for clustering**

**Video:** Mixture of Gaussians
6 min

**Video:** Interpreting the mixture of Gaussian terms
5 min

# A worked-out example for EM

When it comes to k-means, the notion of clusters is straightforward -- each point belongs to the cluster with the nearest centroid (mean). If someone gave us some data points and centroids, we can readily label each point for cluster.

The notion of clusters for EM is not as immediately intuitive. Before jumping into the minutiae of EM, it is best to develop your intuition as to what clusters really mean.

## Prelude: cluster assignment in k-means

Let us consider a toy example with three data points in 2D:

| Dataset | X | Y |
|---|---|---|
| Data point 0 | 10 | 5 |
| Data point 1 | 2 | 1 |
| Data point 2 | 3 | 7 |