Practical Machine Learning in R

Clustering

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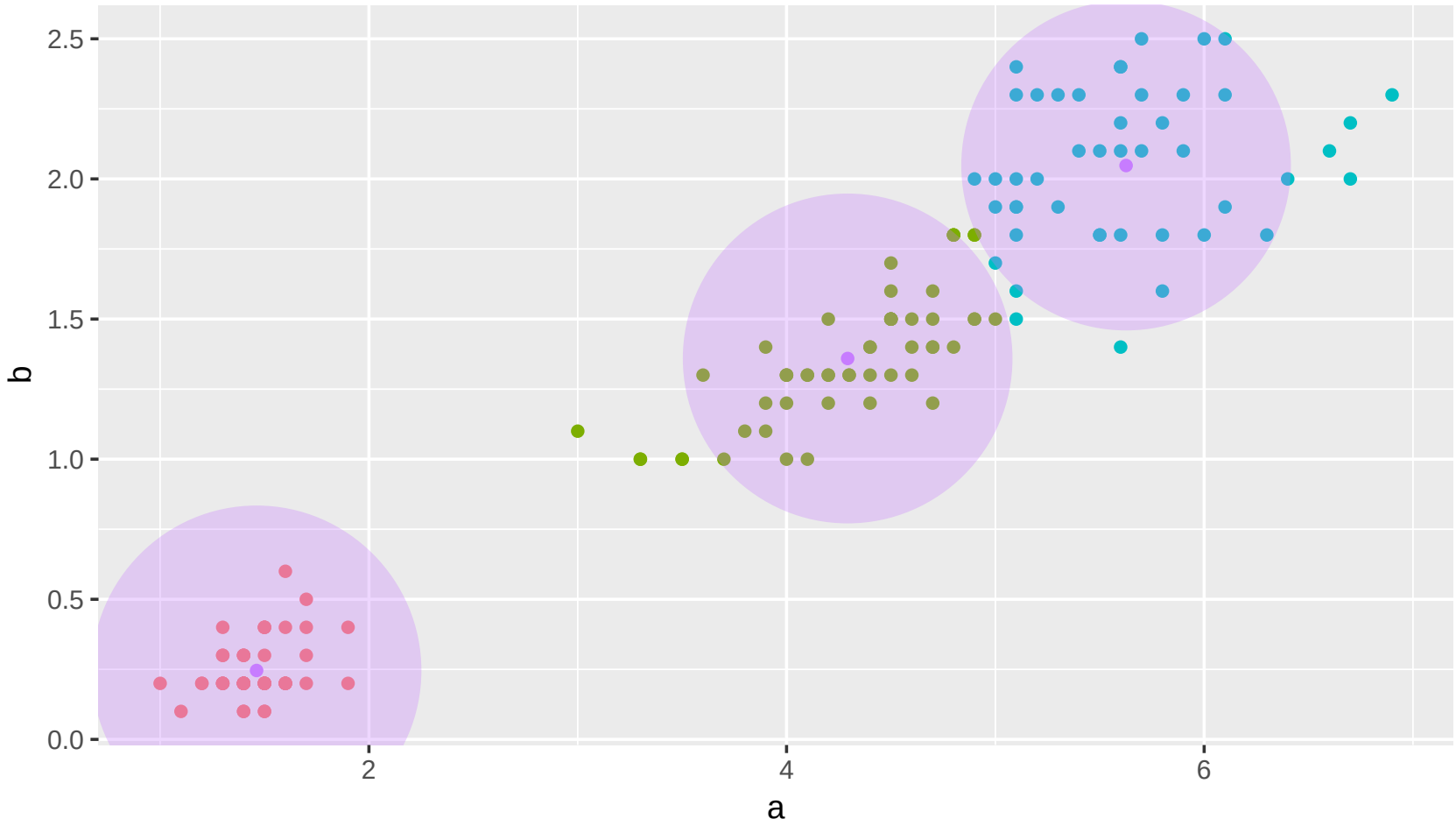
[1] with slides from Bernd Bischl and Michel Lang
[2] slides available at http://www.cs.uwyo.edu/~larsko/ml-fac

Unsupervised Clustering



Goal: Group data by similarity, or estimate membership probabilities

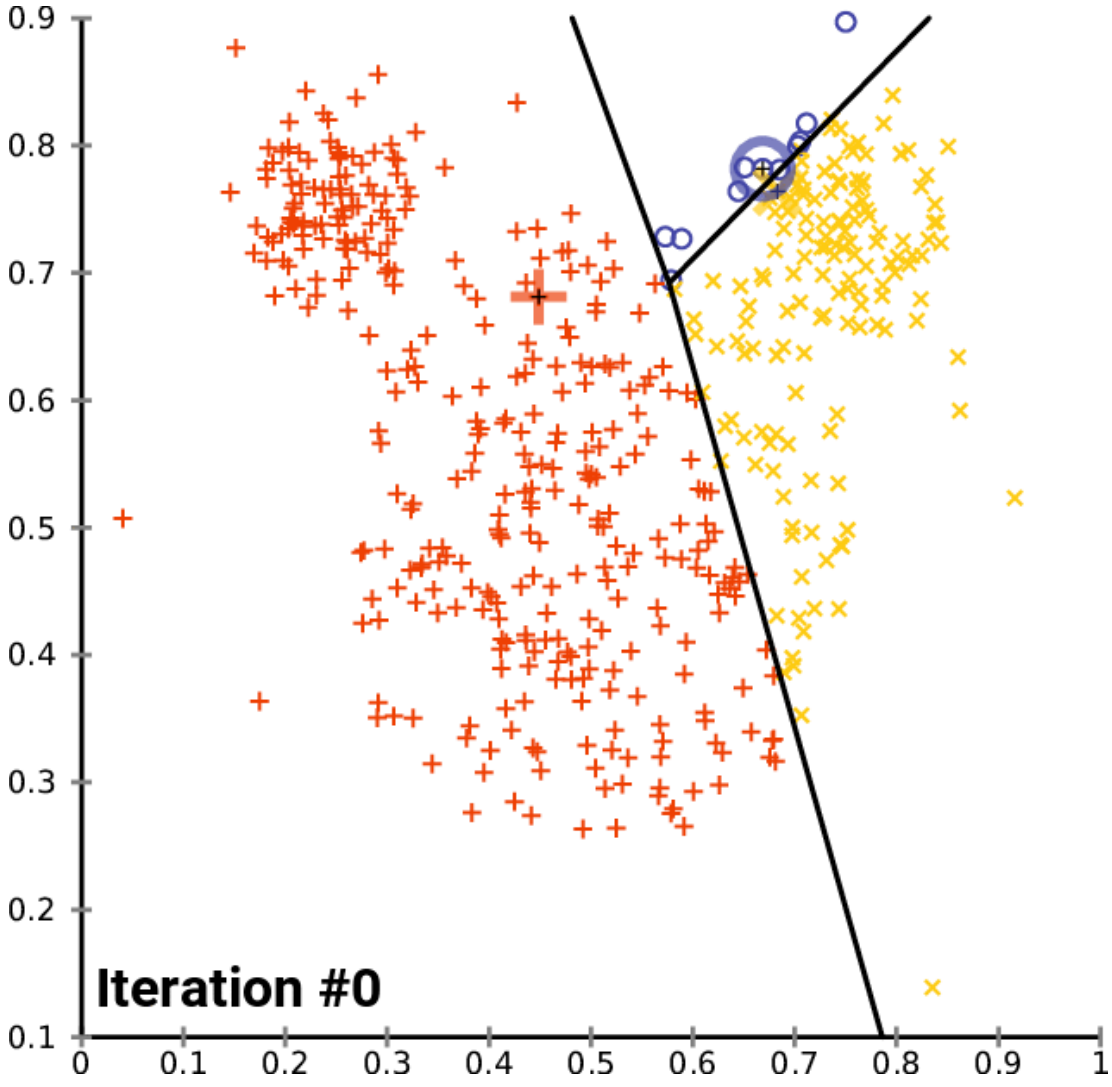
k-means clustering

- pick k cluster centers randomly
- assign each data point to a cluster by shortest mean distance
- centroid (point with smallest mean distance to all points) of each cluster becomes new center
- repeat until convergence

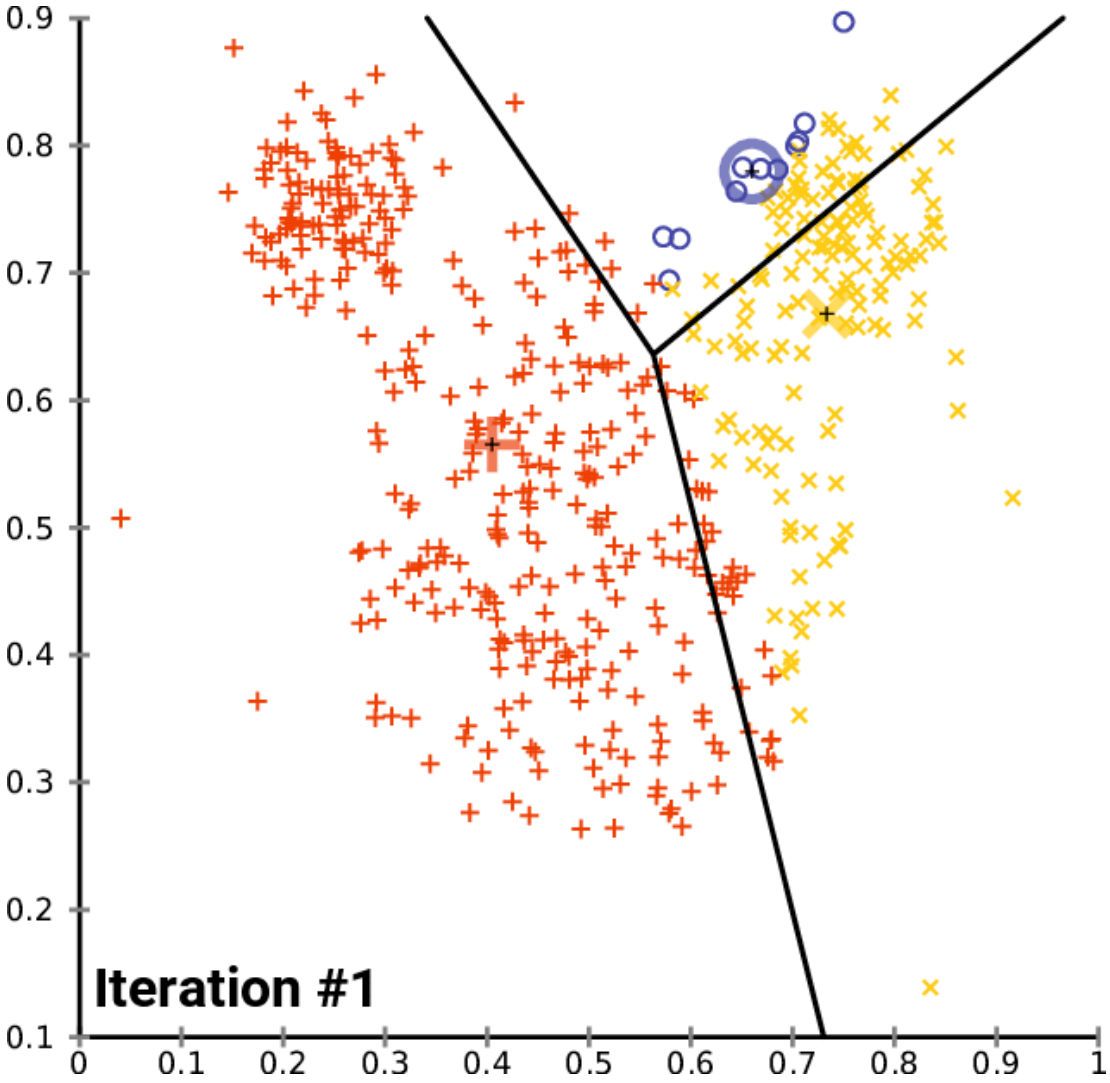
k-means clustering

- easy to understand, runs quickly
- need to specify number of clusters
- clusters are spherical

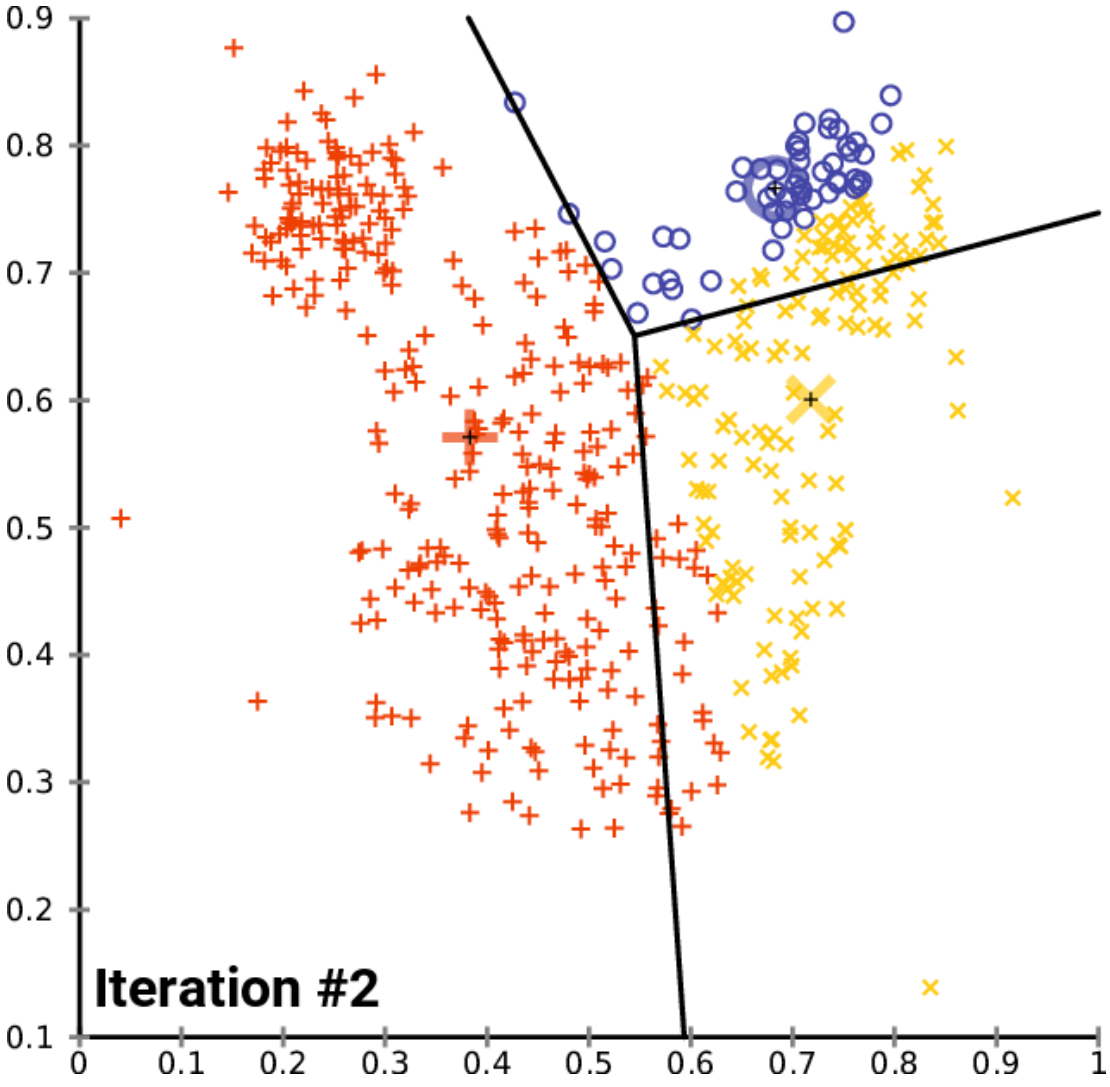
k-means clustering



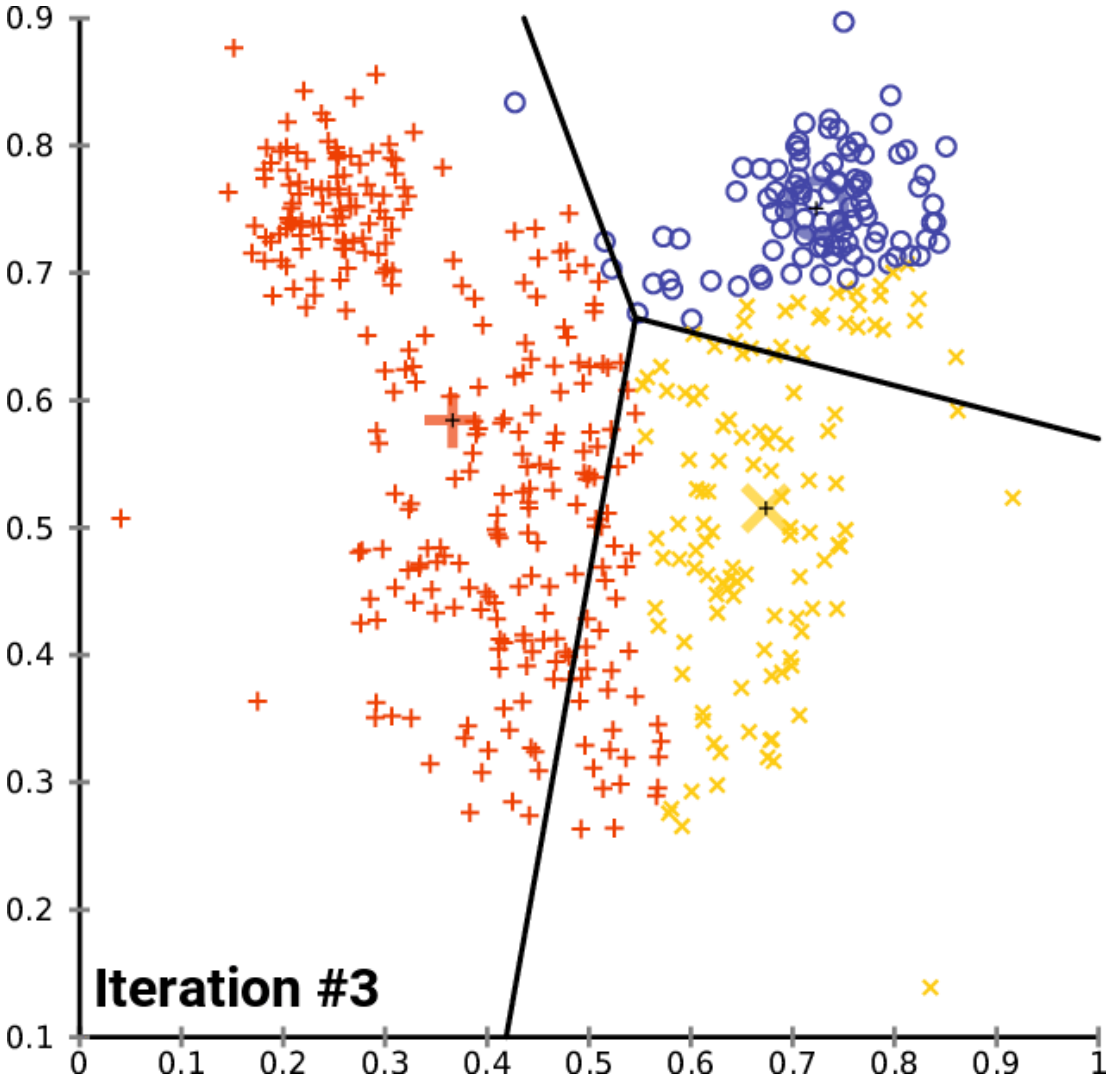
k-means clustering



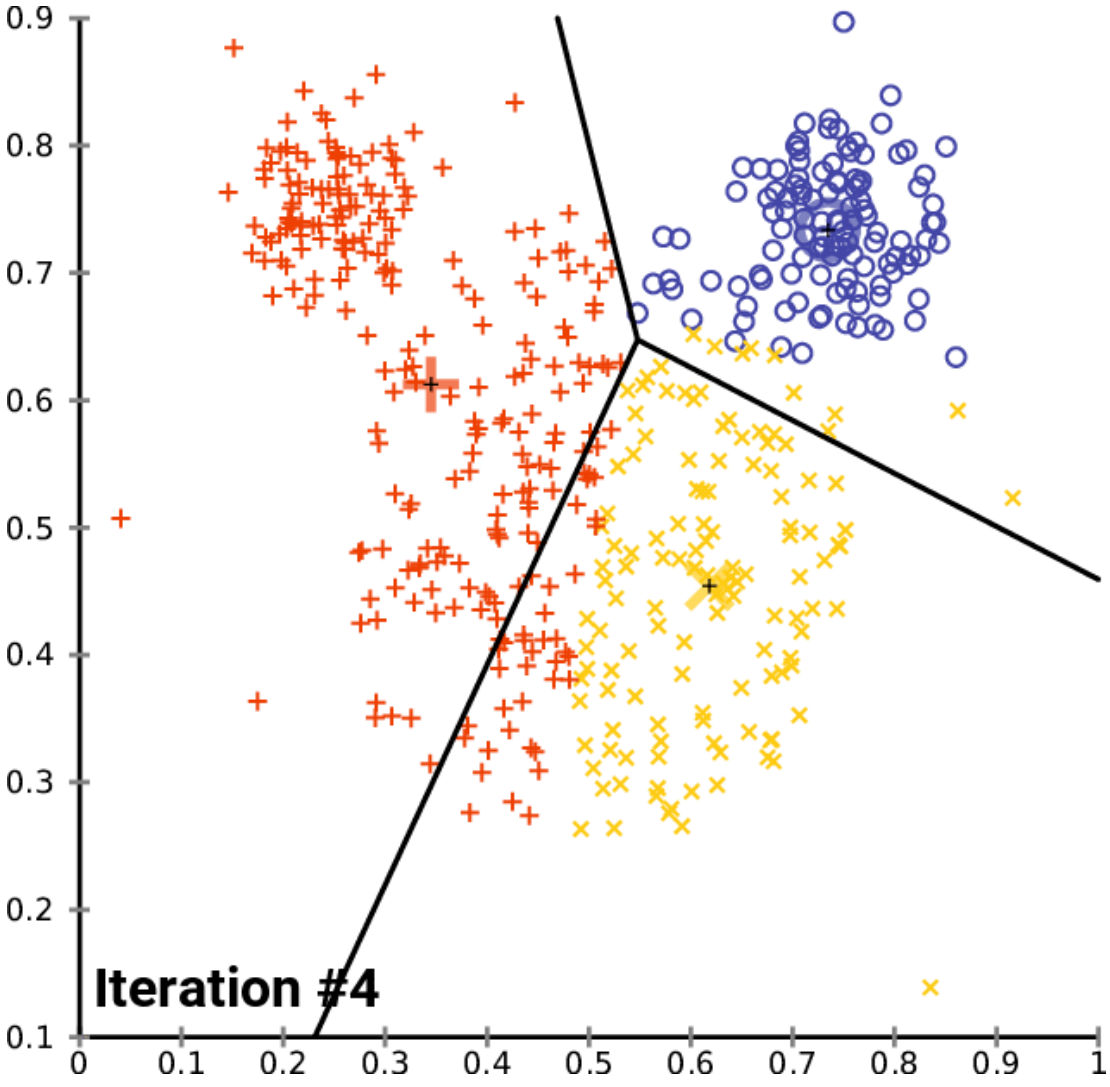
k-means clustering



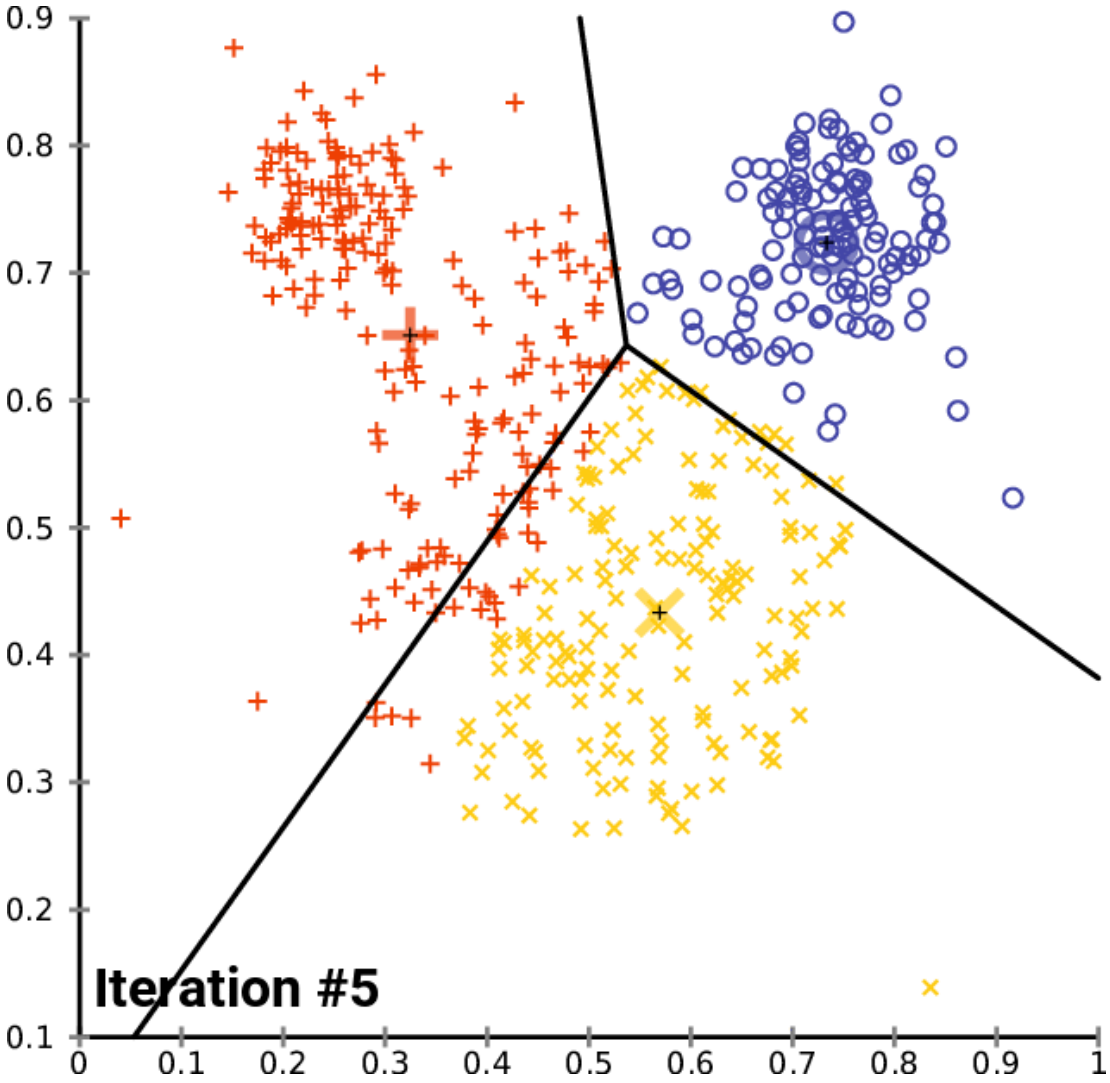
k-means clustering



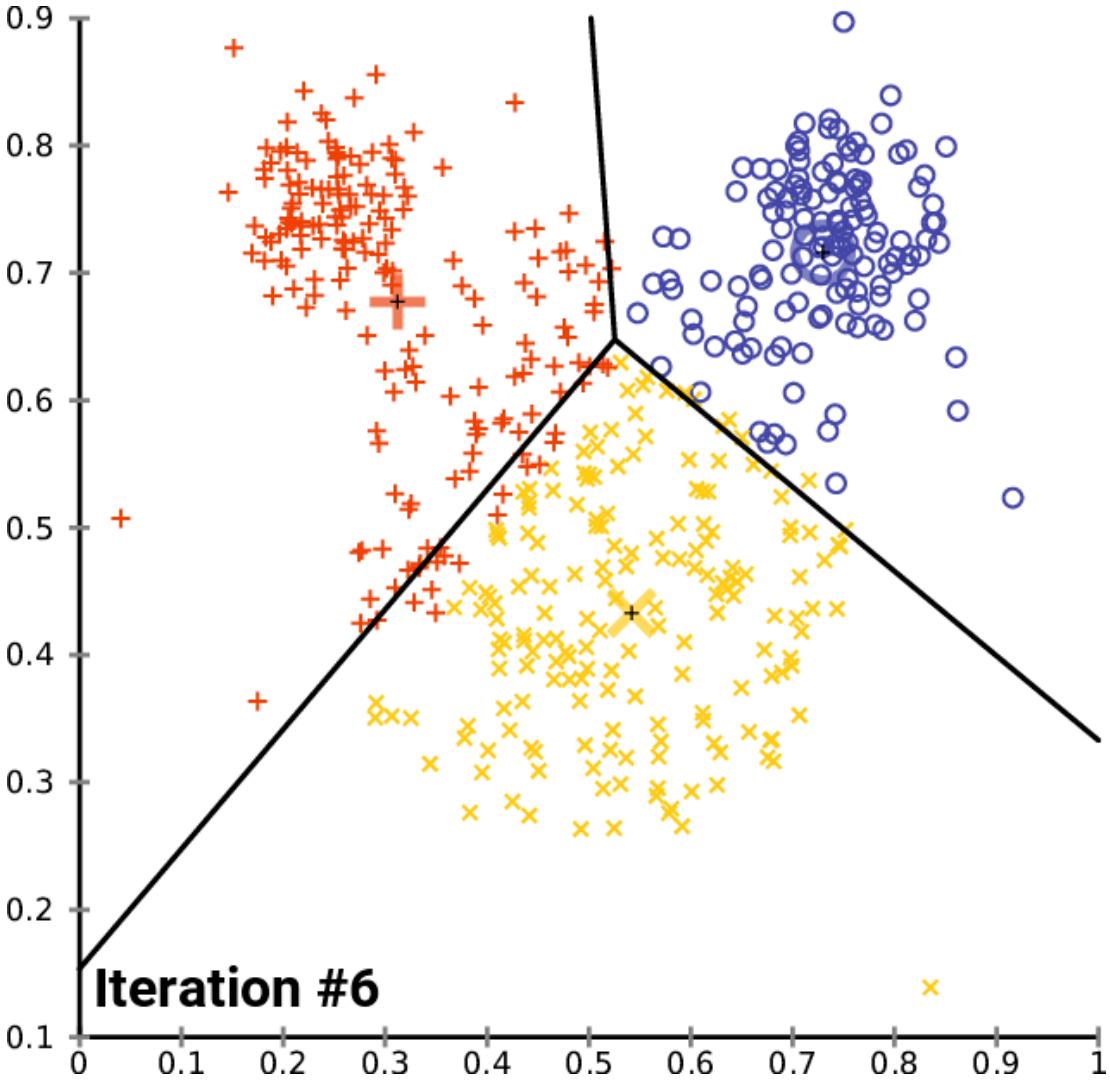
k-means clustering



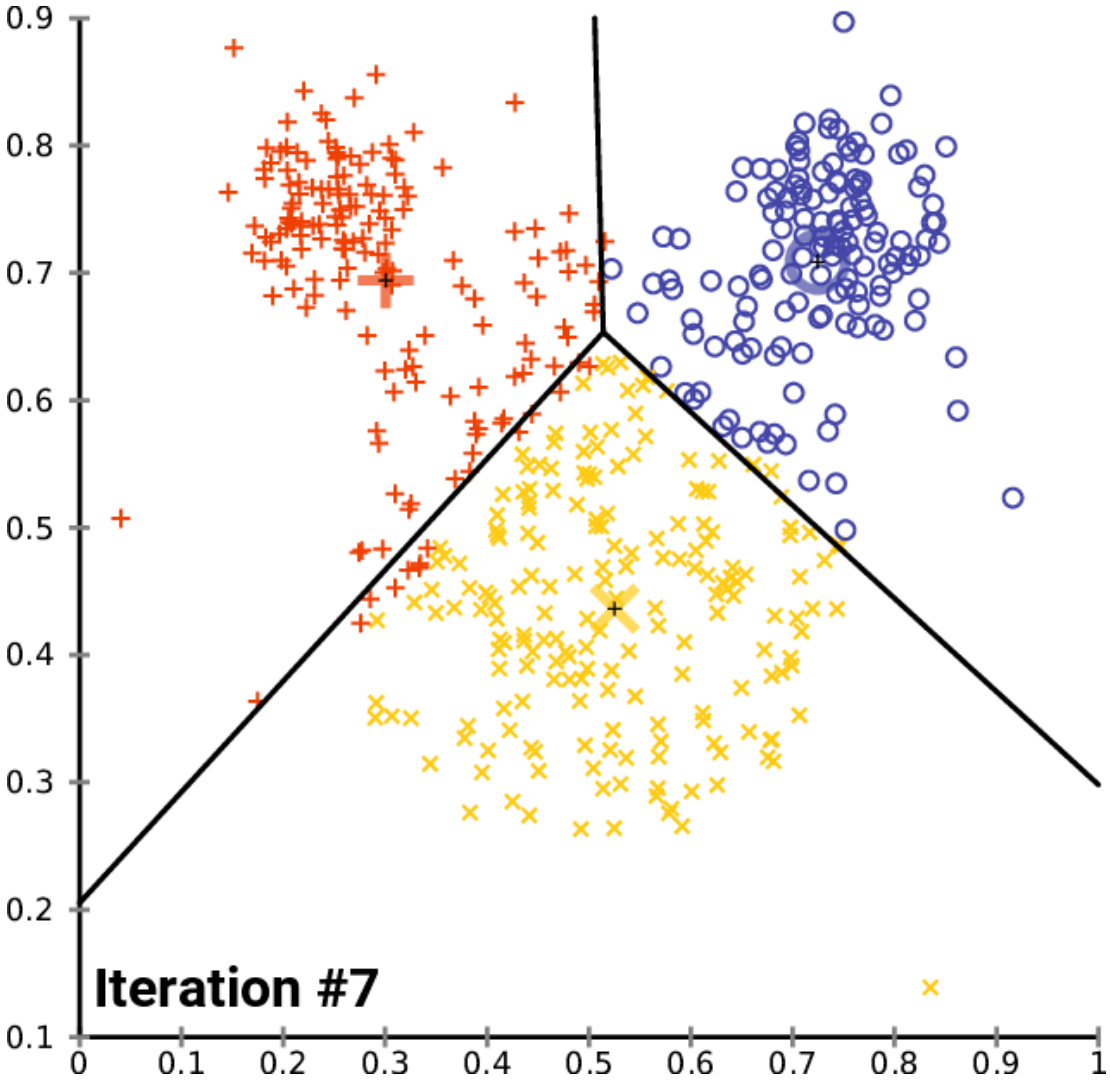
k-means clustering



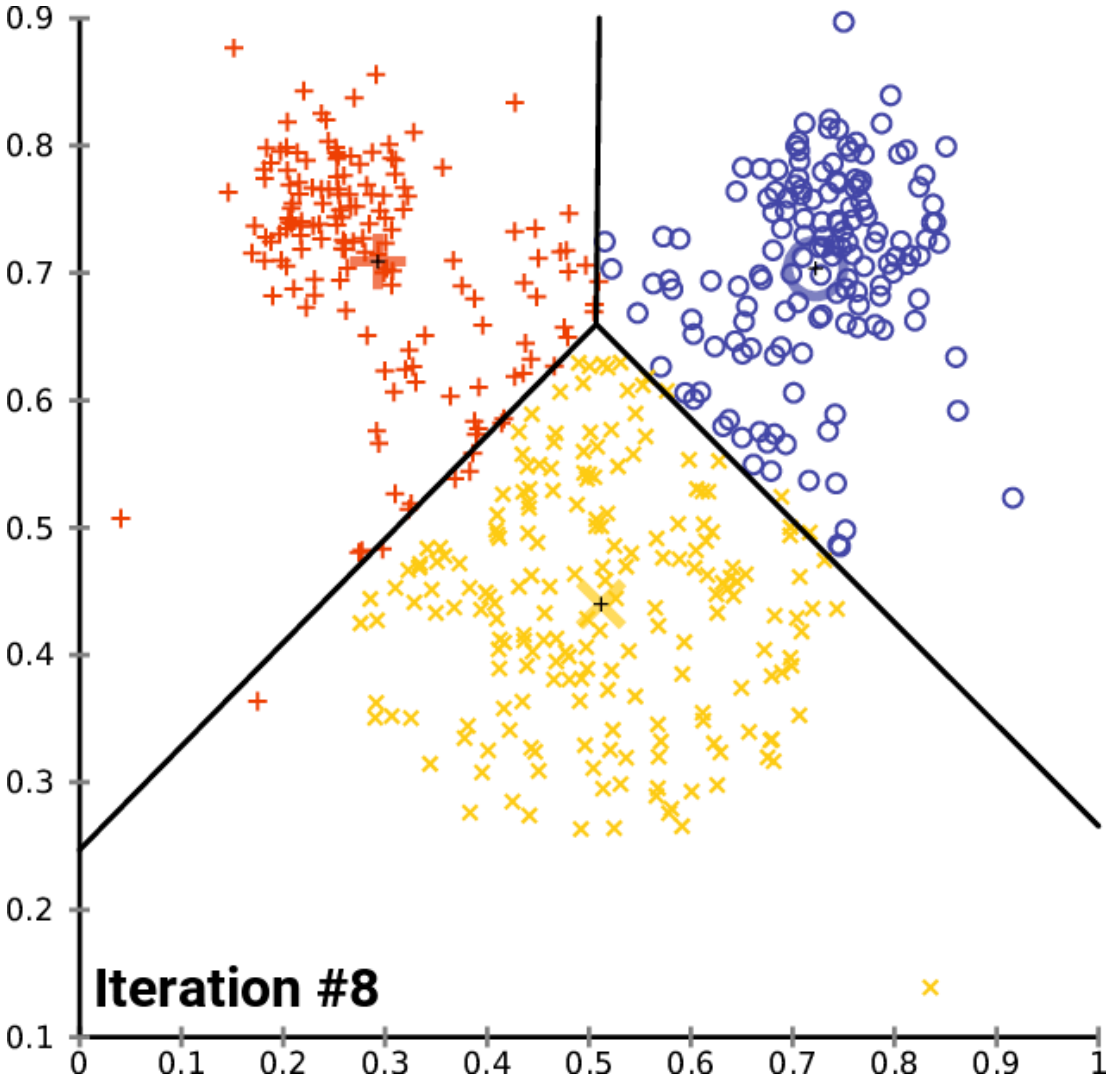
k-means clustering



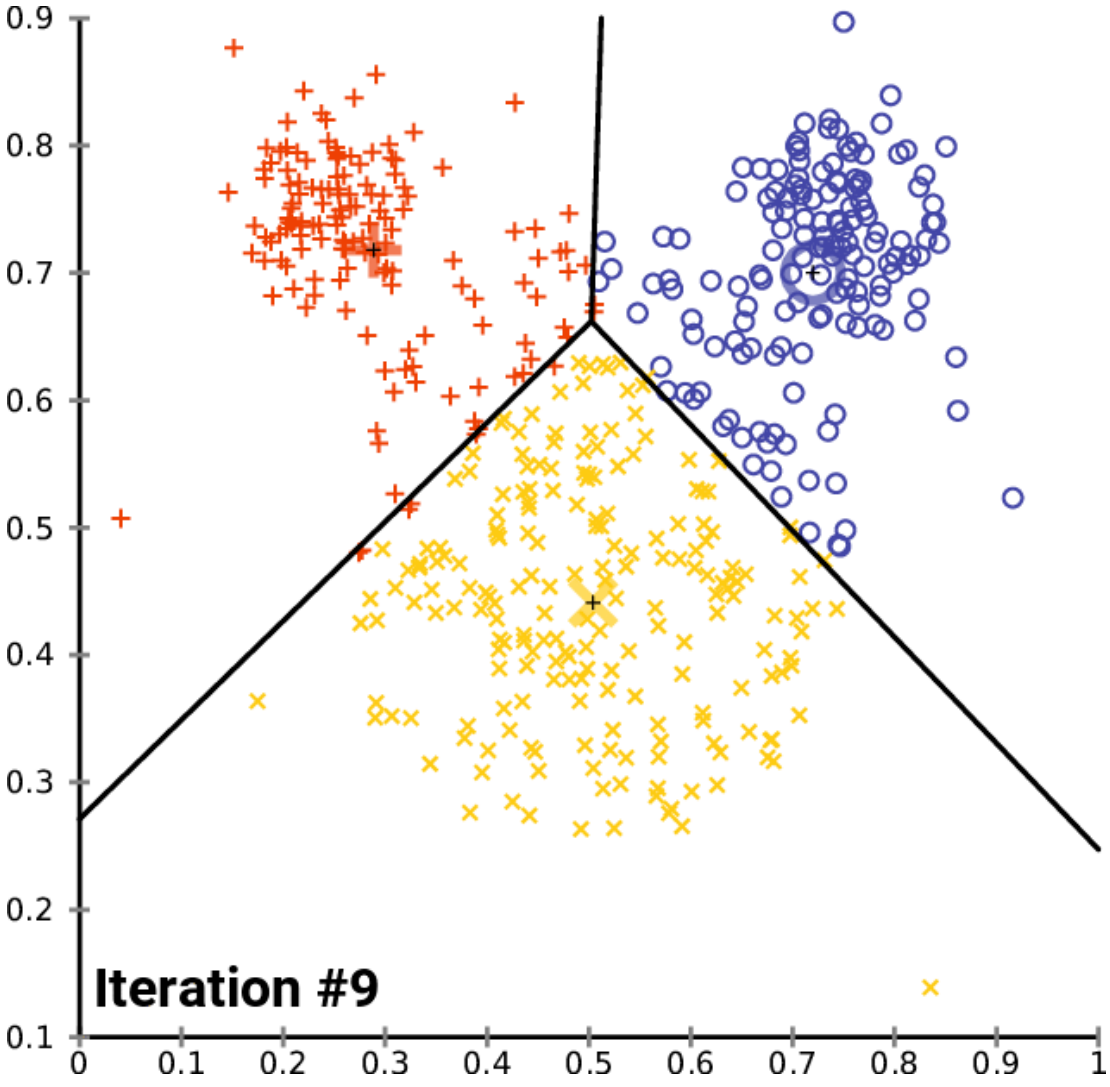
k-means clustering



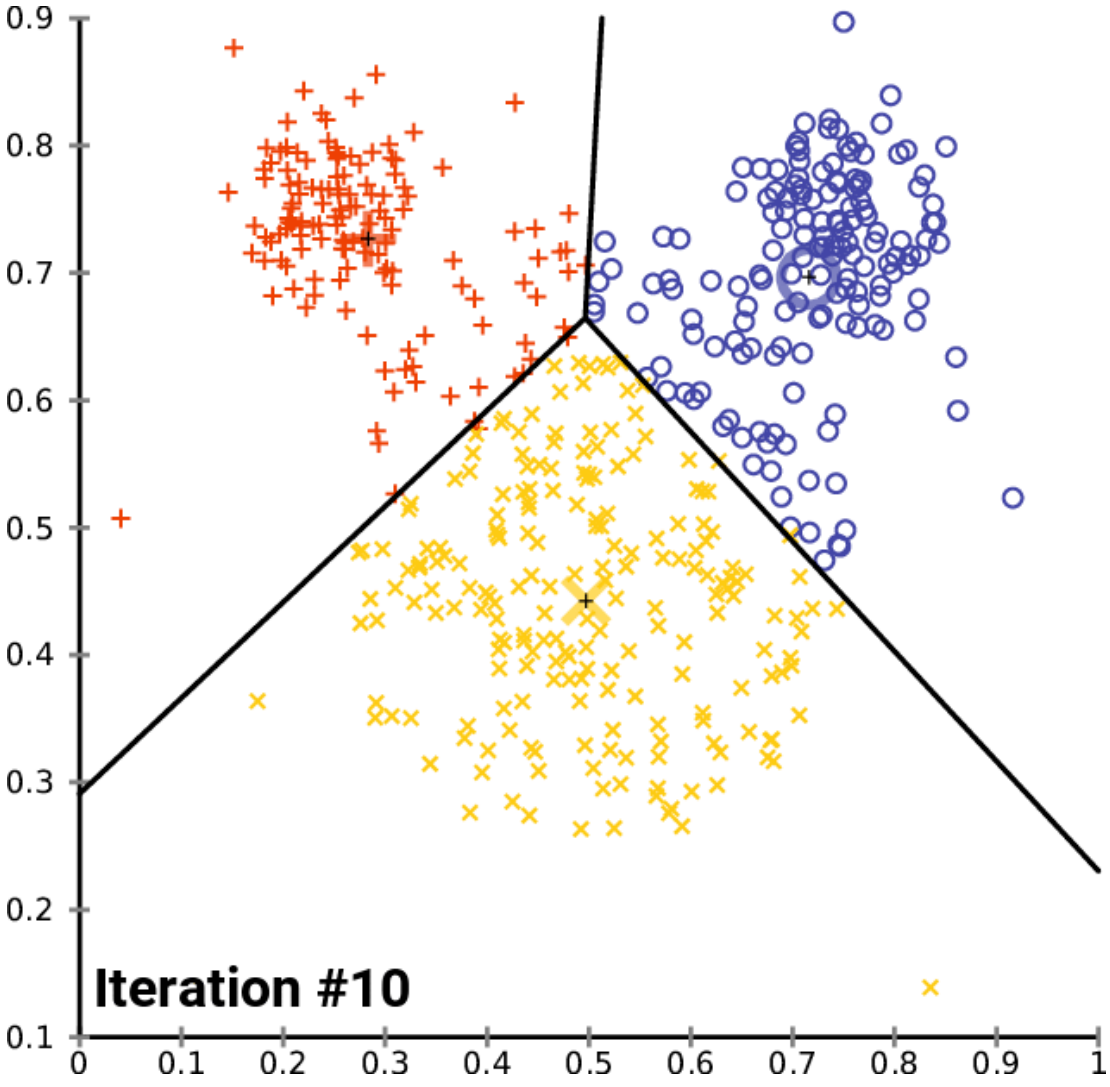
k-means clustering



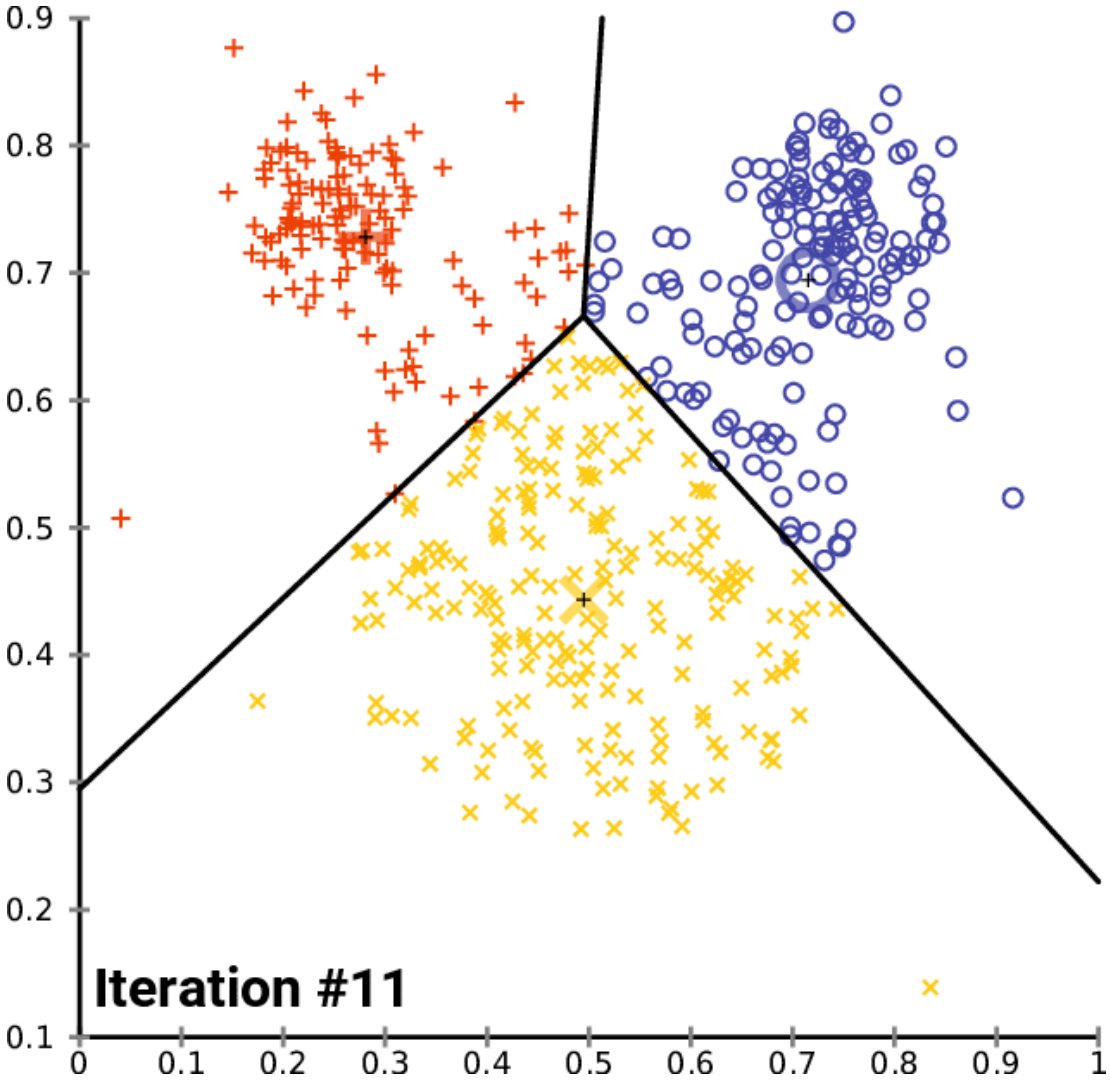
k-means clustering



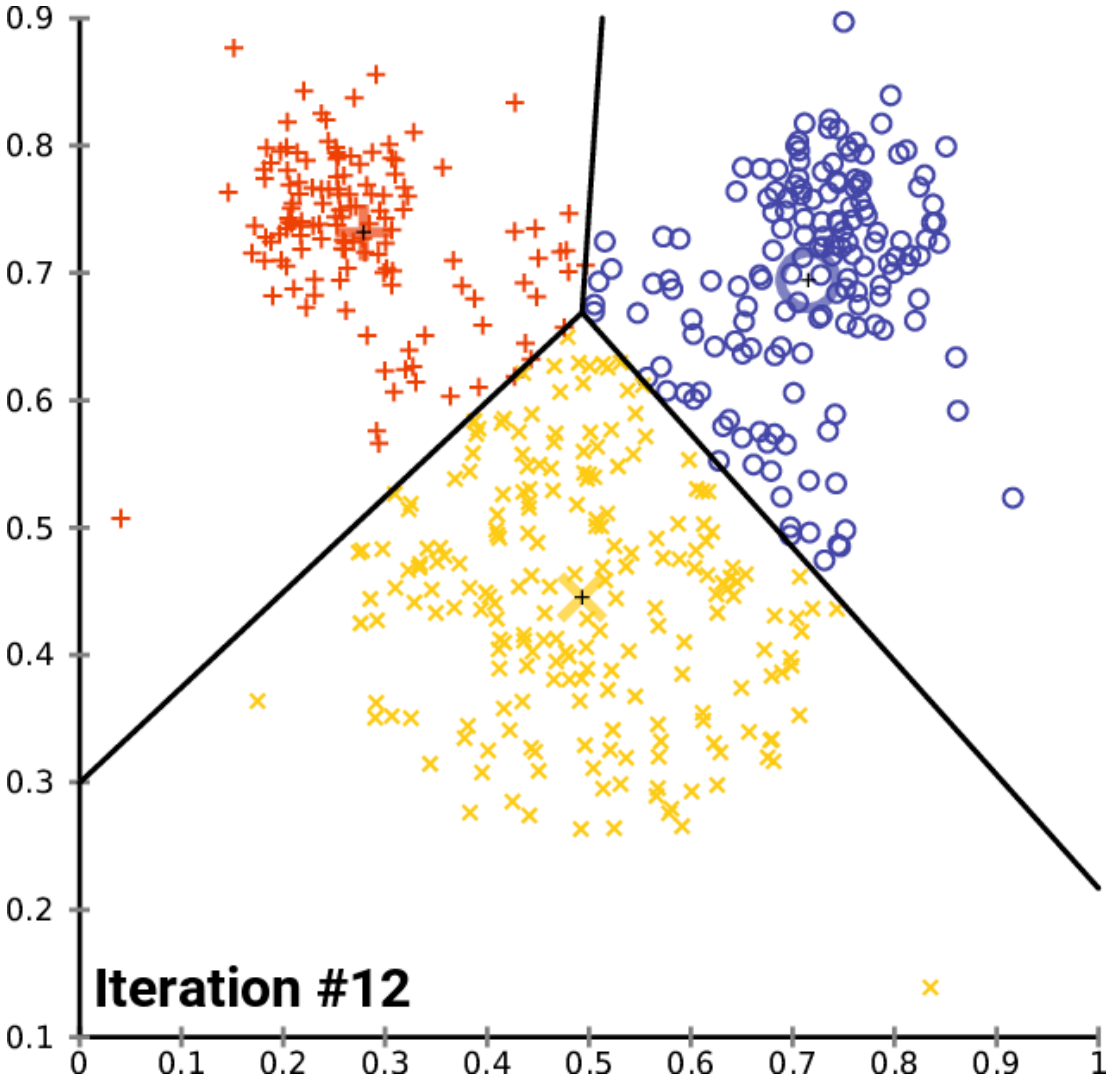
k-means clustering



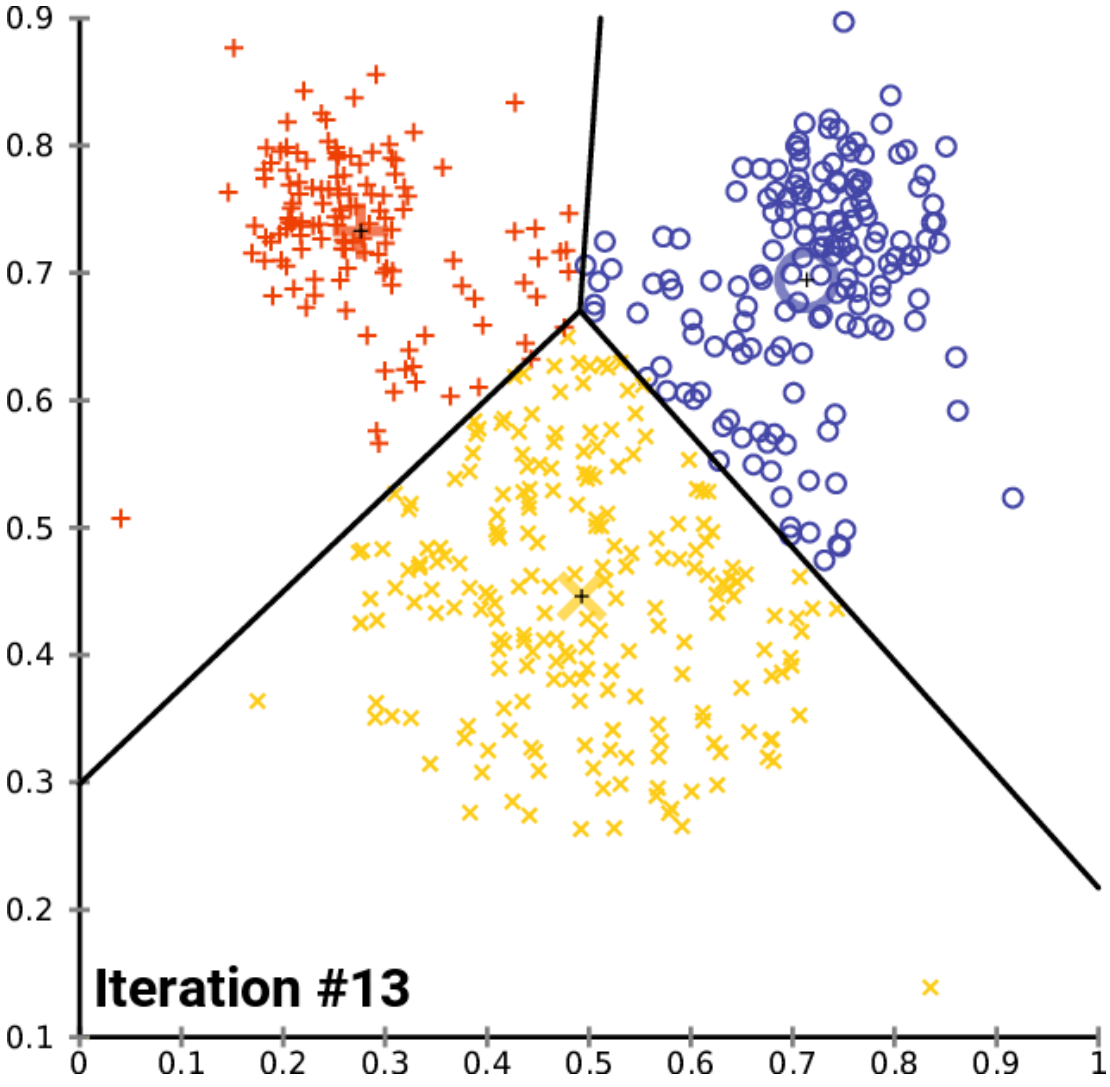
k-means clustering



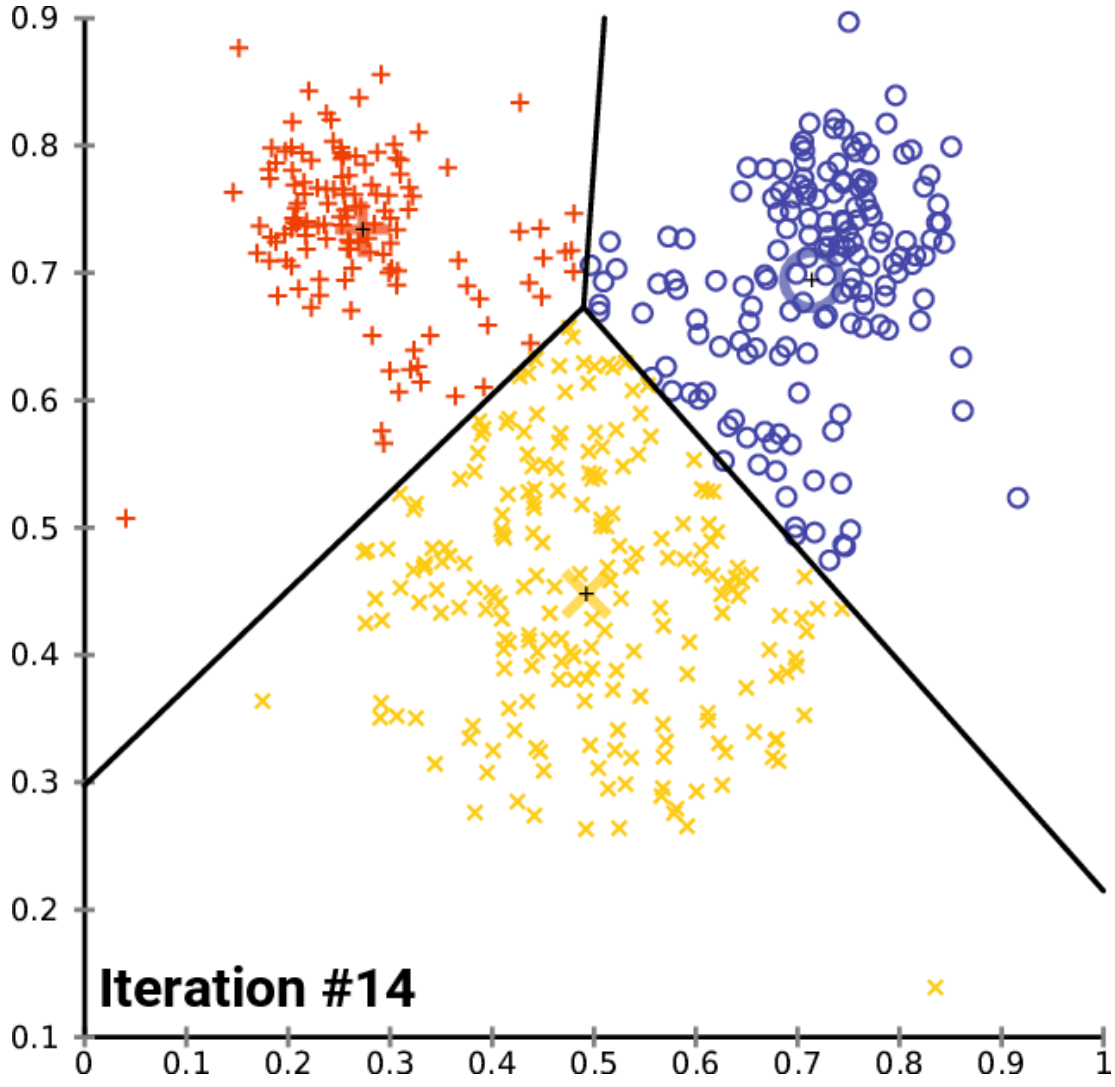
k-means clustering



k-means clustering



k-means clustering

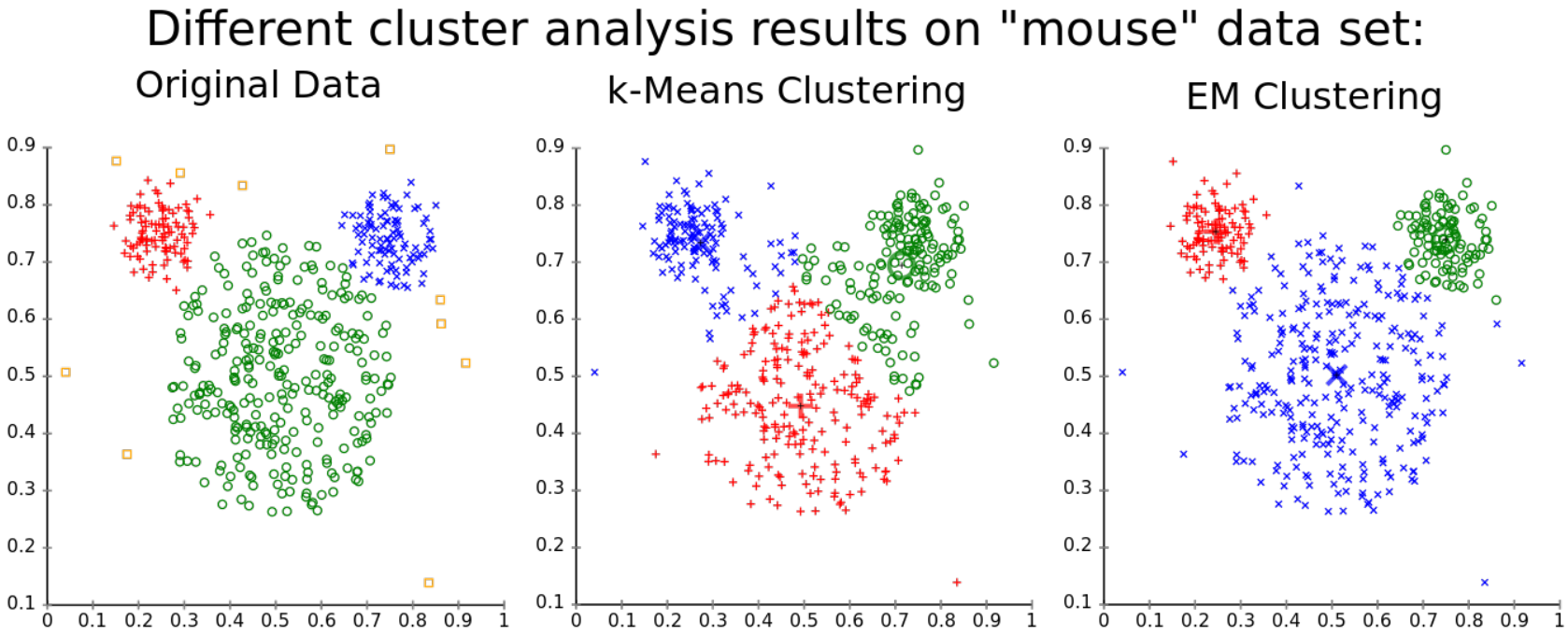


By Chire - Own work, GFDL, https://commons.wikimedia.org/w/index.php?curid=59409335

EM – Expectation Maximization

- maximize likelihood of clusters, given data
- estimate distribution of data as mixture of distributions
- compute *expectation* of clusters for fixed model
- determine model parameters that *maximize* fixed clusters
  - repeat until convergence
- can determine number of clusters automatically

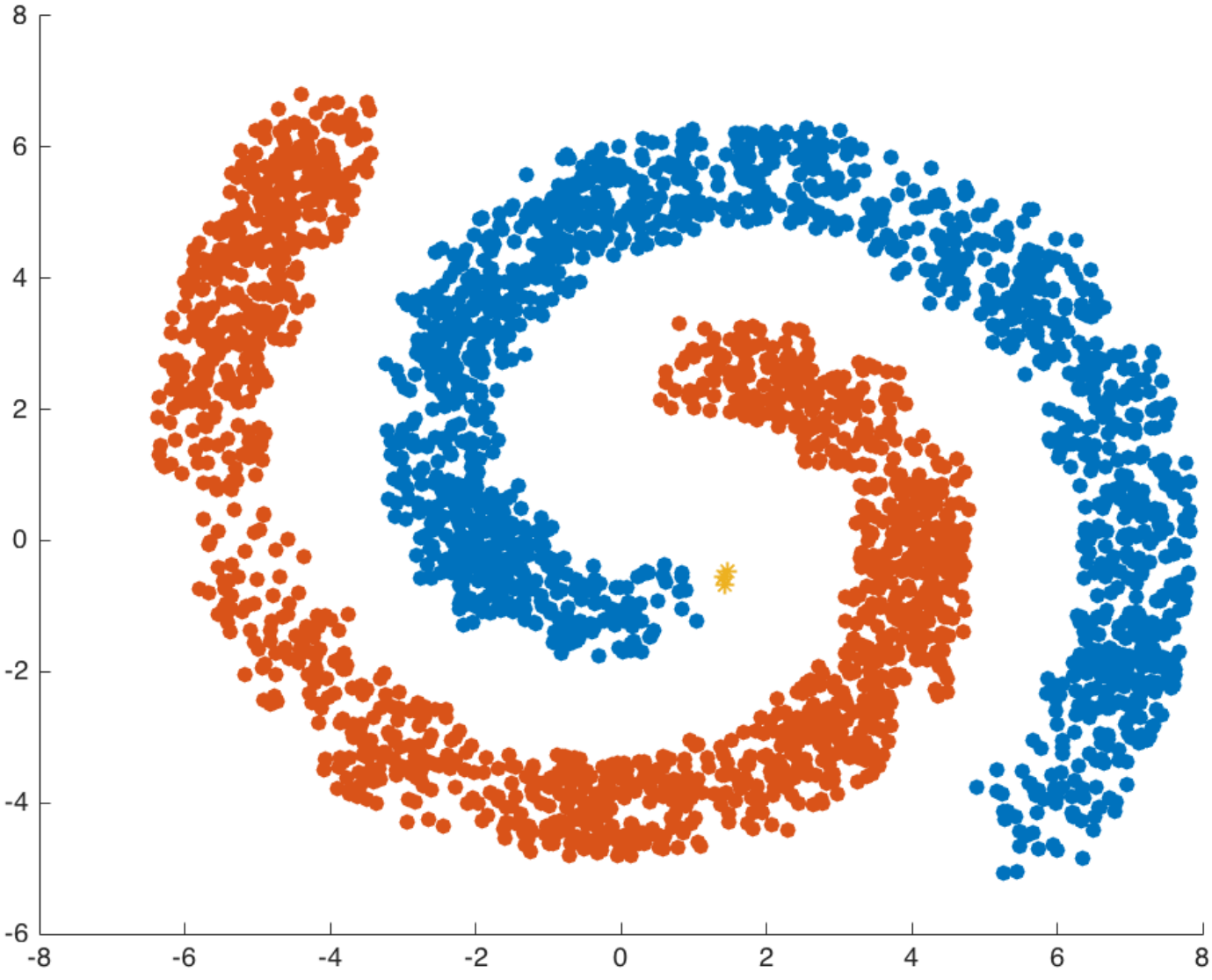
EM – Expectation Maximization



DBScan

- density-based clustering
- find core points (with a large number of neighbors)
- find connected core points, and which core points other points are assigned to
- number of clusters and shape determined automatically
- need to specify minimum number of points in a cluster and density threshold

DBScan



Exercises

http://www.cs.uwyo.edu/~larsko/ml-fac/03-clustering-exercises.Rmd