Basics of Machine Learning

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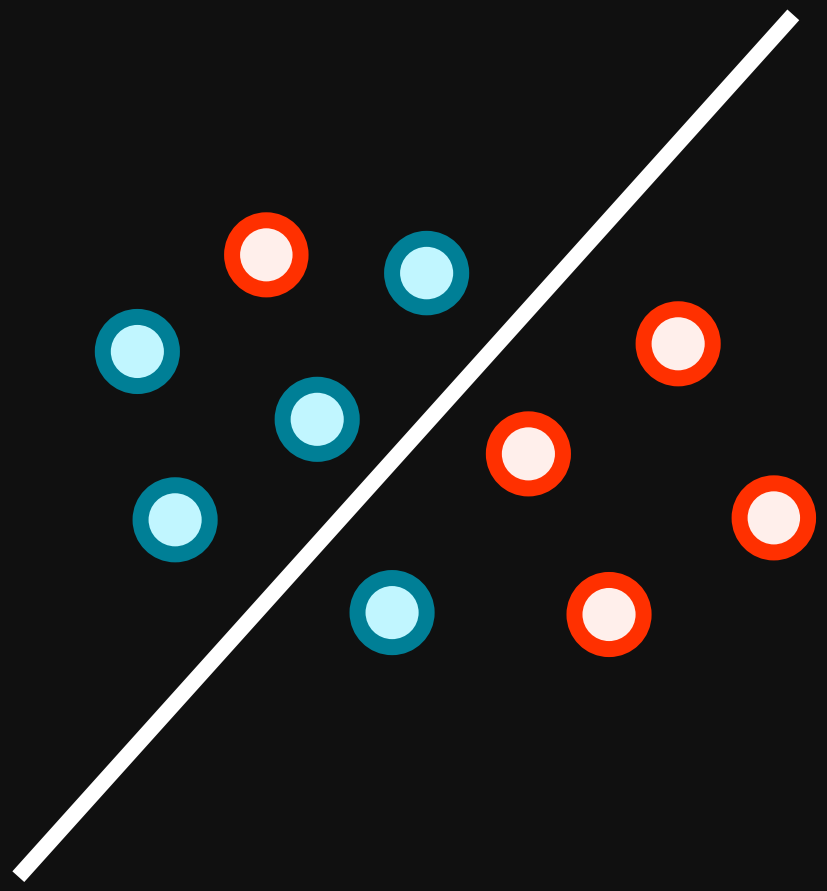


Lesson 12
Unsupervised Learning

Supervised Learning

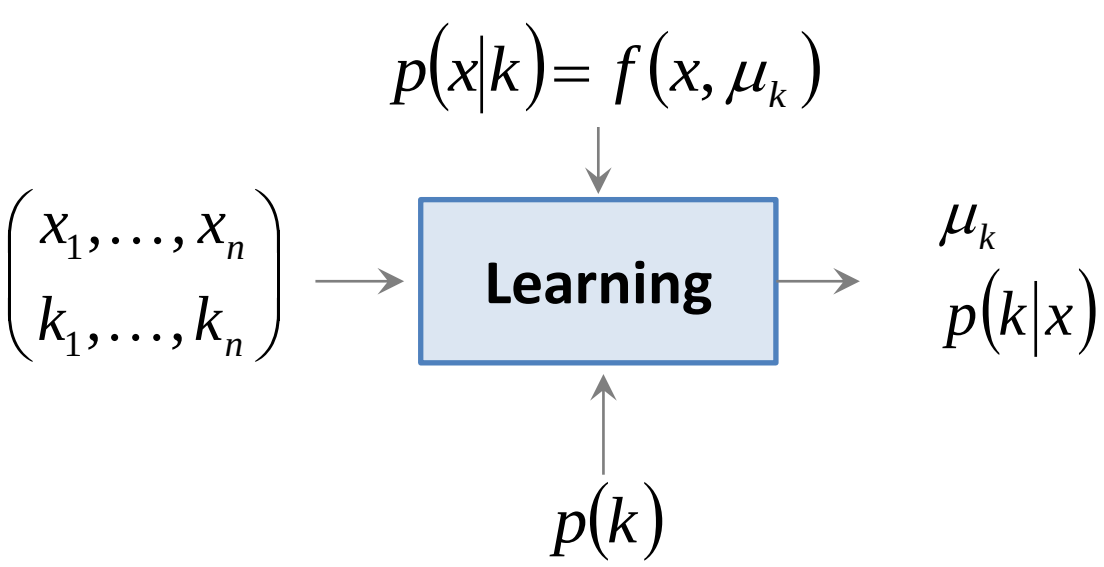
Summary

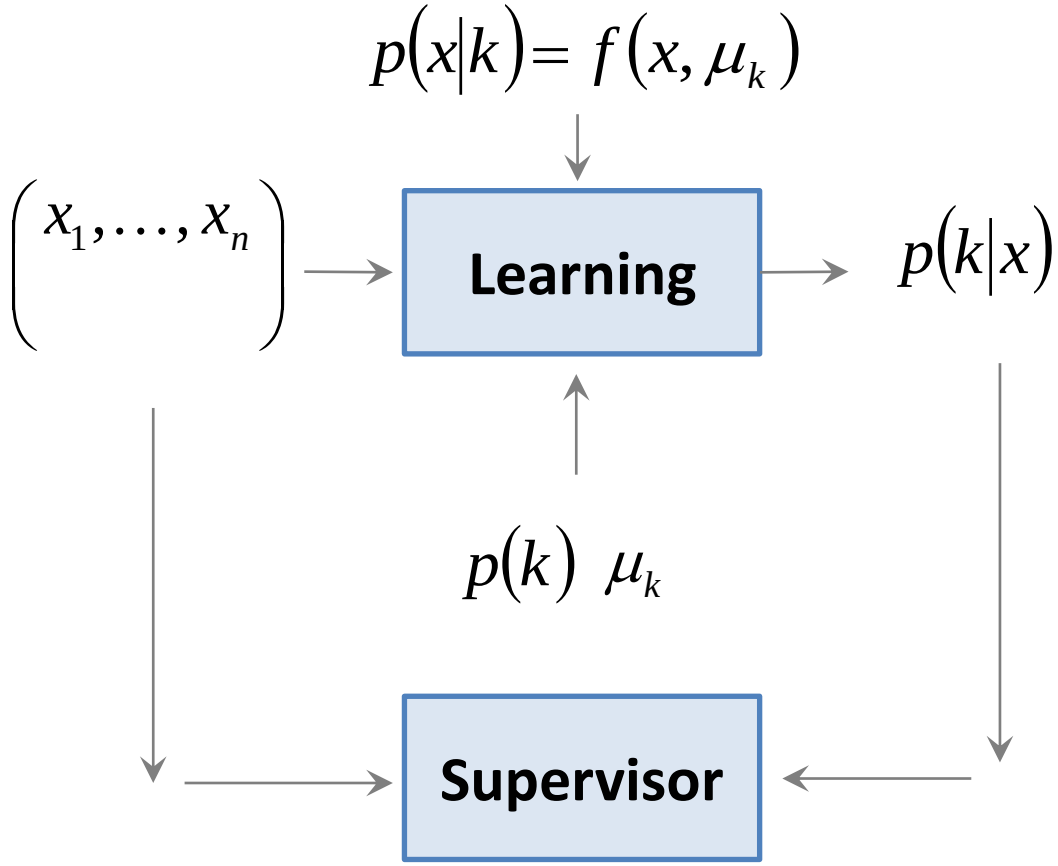
- EM Algorithm
- K-means

EM algorithm

Unsupervised learning

EM algorithm





Unsupervised learning

EM algorithm

EM algorithm

Unsupervised learning

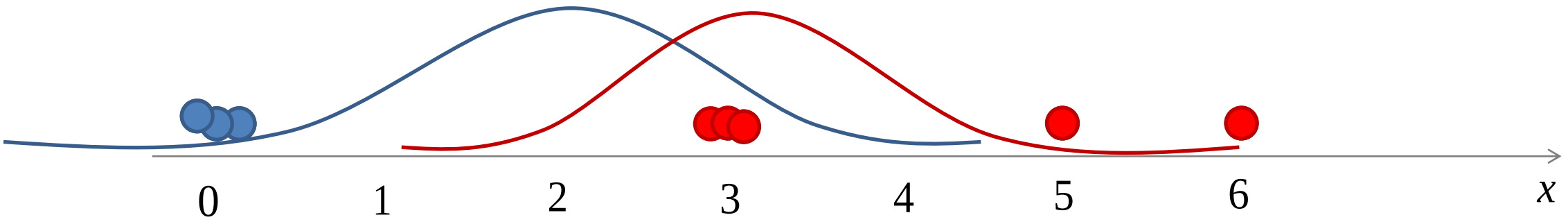
EM algorithm

$$\mu_{\bullet} = \tfrac{1}{4}(0+0+3+5) = 2 \qquad \mu_{\bullet} = \tfrac{1}{4}(0+3+3+6) = 3$$

$$\sigma_{\bullet} = \tfrac{1}{4}\left(2^2+2^2+1^2+3^2\right) = 4.5 \qquad \sigma_{\bullet} = \tfrac{1}{4}\left(3^2+0^2+0^2+3^2\right) = 4.5$$

Unsupervised learning

EM algorithm

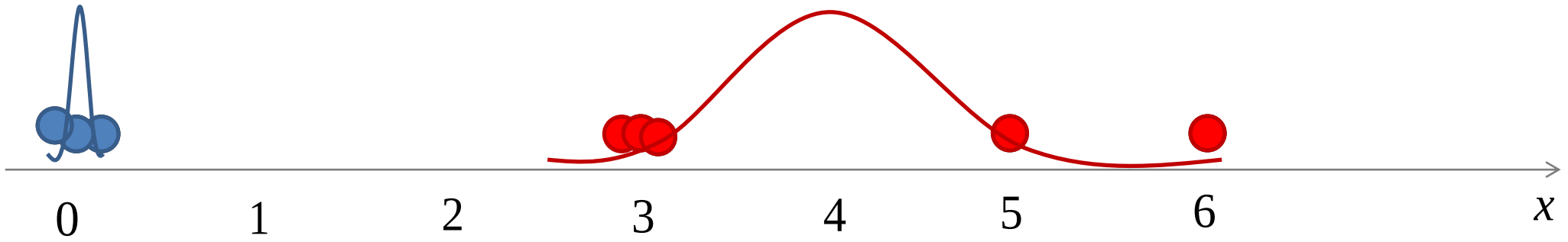


$$\mu_{\bullet} = \tfrac{1}{4}(0+0+3+5) = 2 \qquad \mu_{\bullet} = \tfrac{1}{4}(0+3+3+6) = 3$$

$$\sigma_{\bullet} = \tfrac{1}{4}\left(2^2+2^2+1^2+3^2\right) = 4.5 \qquad \sigma_{\bullet} = \tfrac{1}{4}\left(3^2+0^2+0^2+3^2\right) = 4.5$$

Unsupervised learning

EM algorithm



$$\mu_{\bullet} = \tfrac{1}{3}(0+0+0) = 0 \qquad \mu_{\bullet} = \tfrac{1}{2}(3+3+3+5+6) = 4$$

$$\sigma_{\bullet} = \tfrac{1}{3}\left(0^2+0^2+0^2\right) = 0 \qquad \sigma_{\bullet} = \tfrac{1}{5}\left(1^2+1^2+1^2+1^2+2^2\right) = 1.6$$

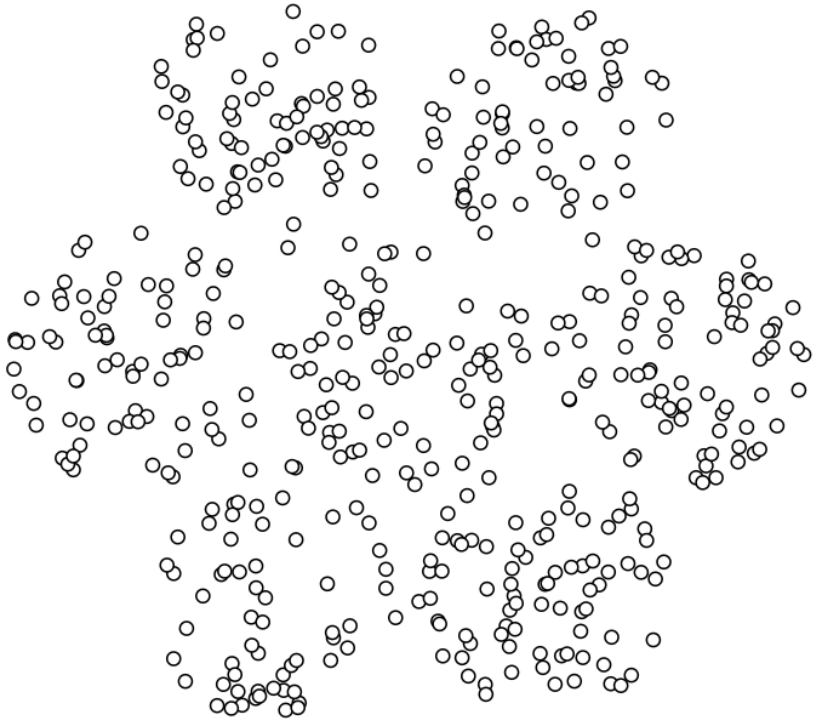
K-Means

Unsupervised learning

K-means

K-means is an unsupervised clustering algorithm

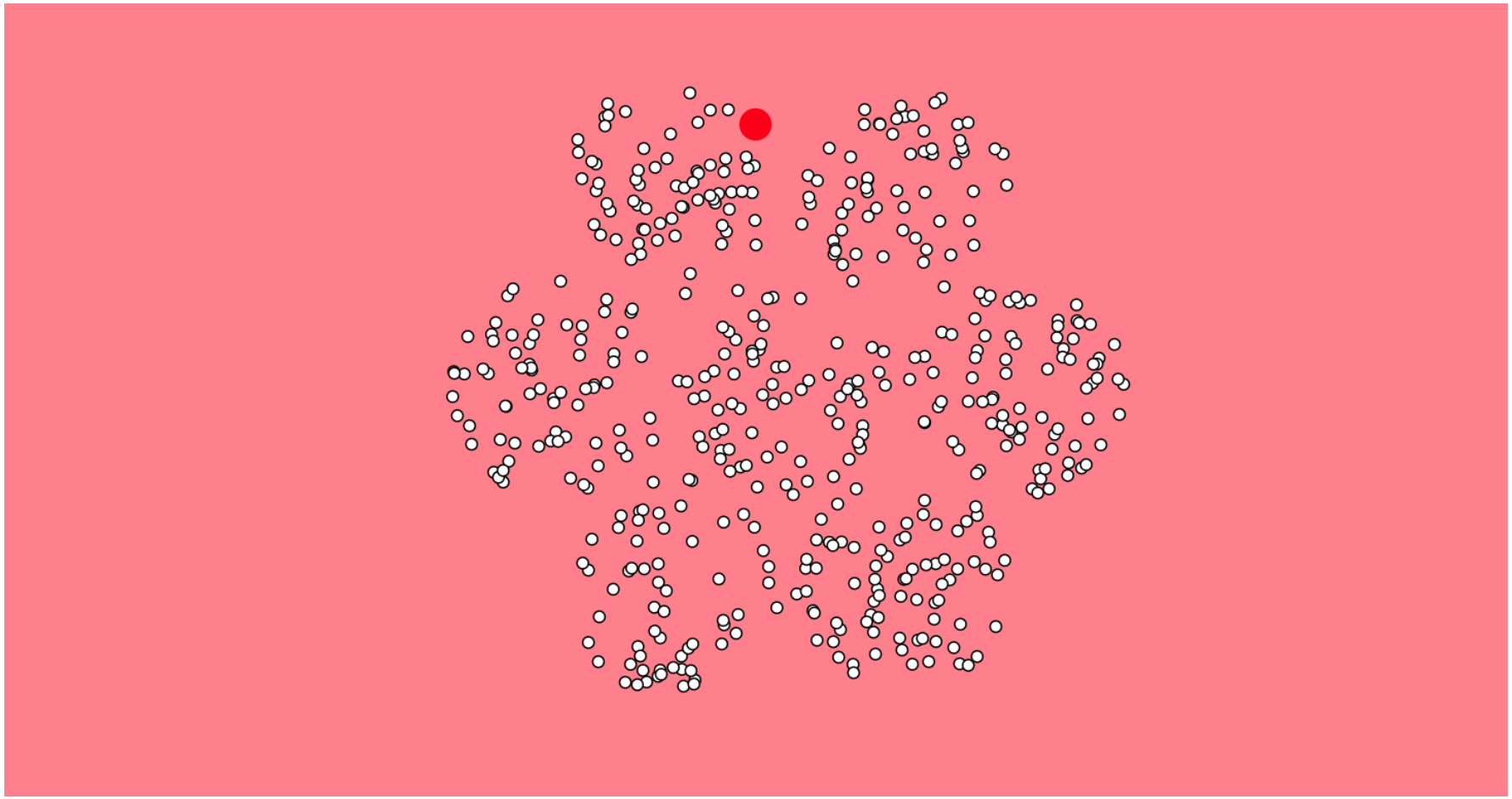
Do not confuse with KNN **classification** (or regression) algorithm which classifies an unlabeled observation based on its k surrounding neighbors.



https://www.naftaliharris.com/blog/visualizing-k-means-clustering/
http://stanford.edu/class/ee103/visualizations/kmeans/kmeans.html

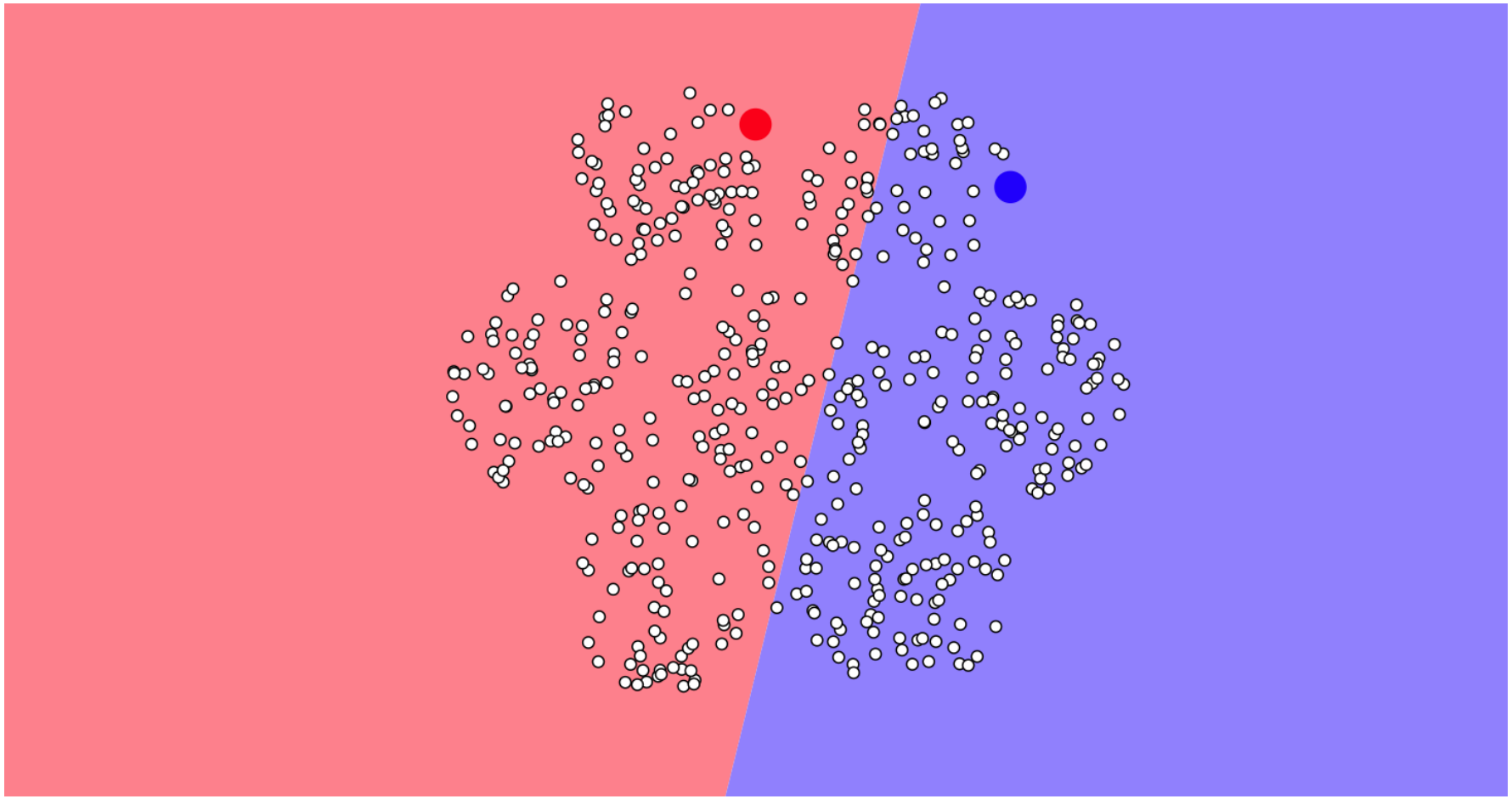
Unsupervised learning

K-means



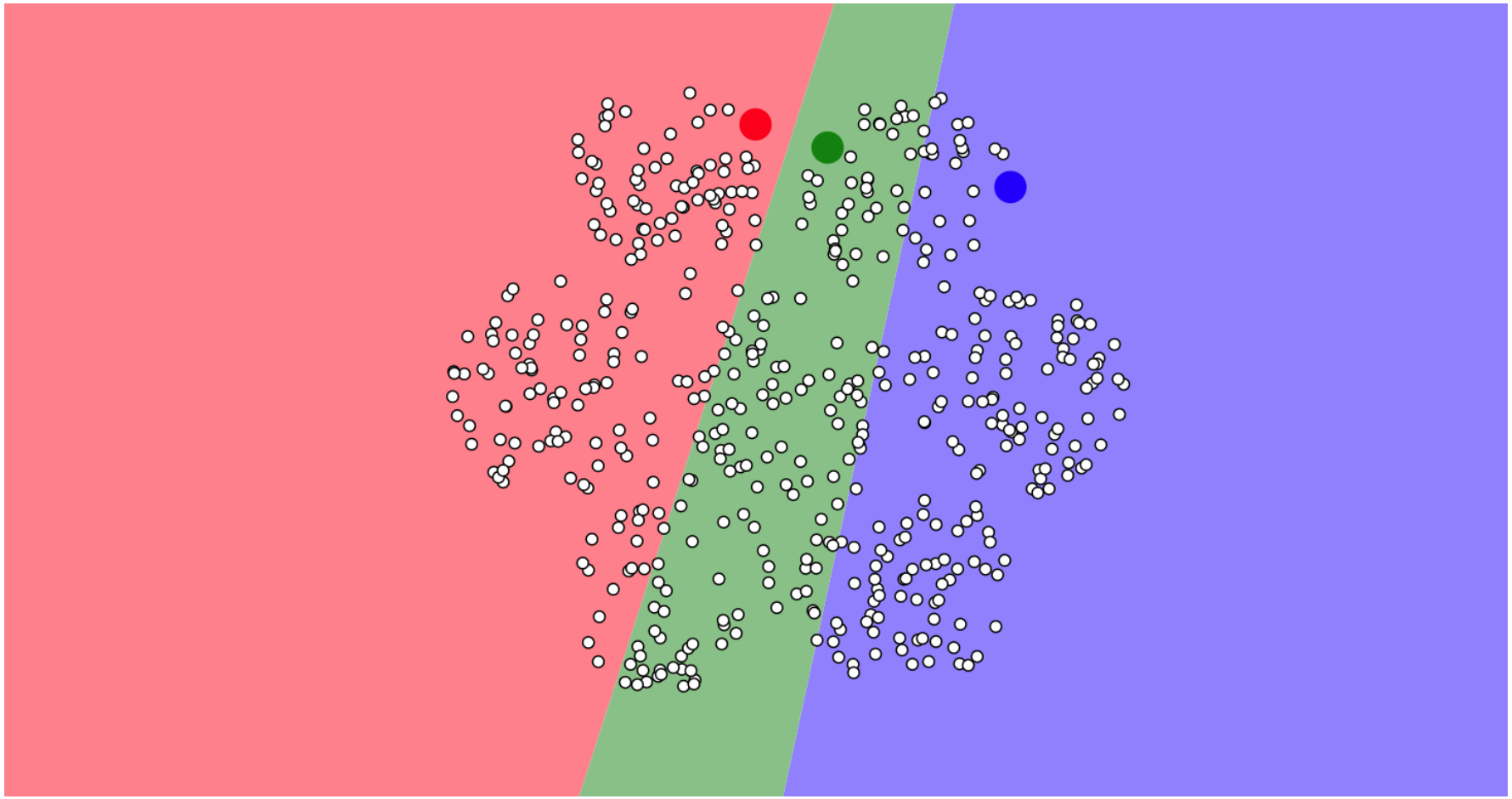
Unsupervised learning

K-means



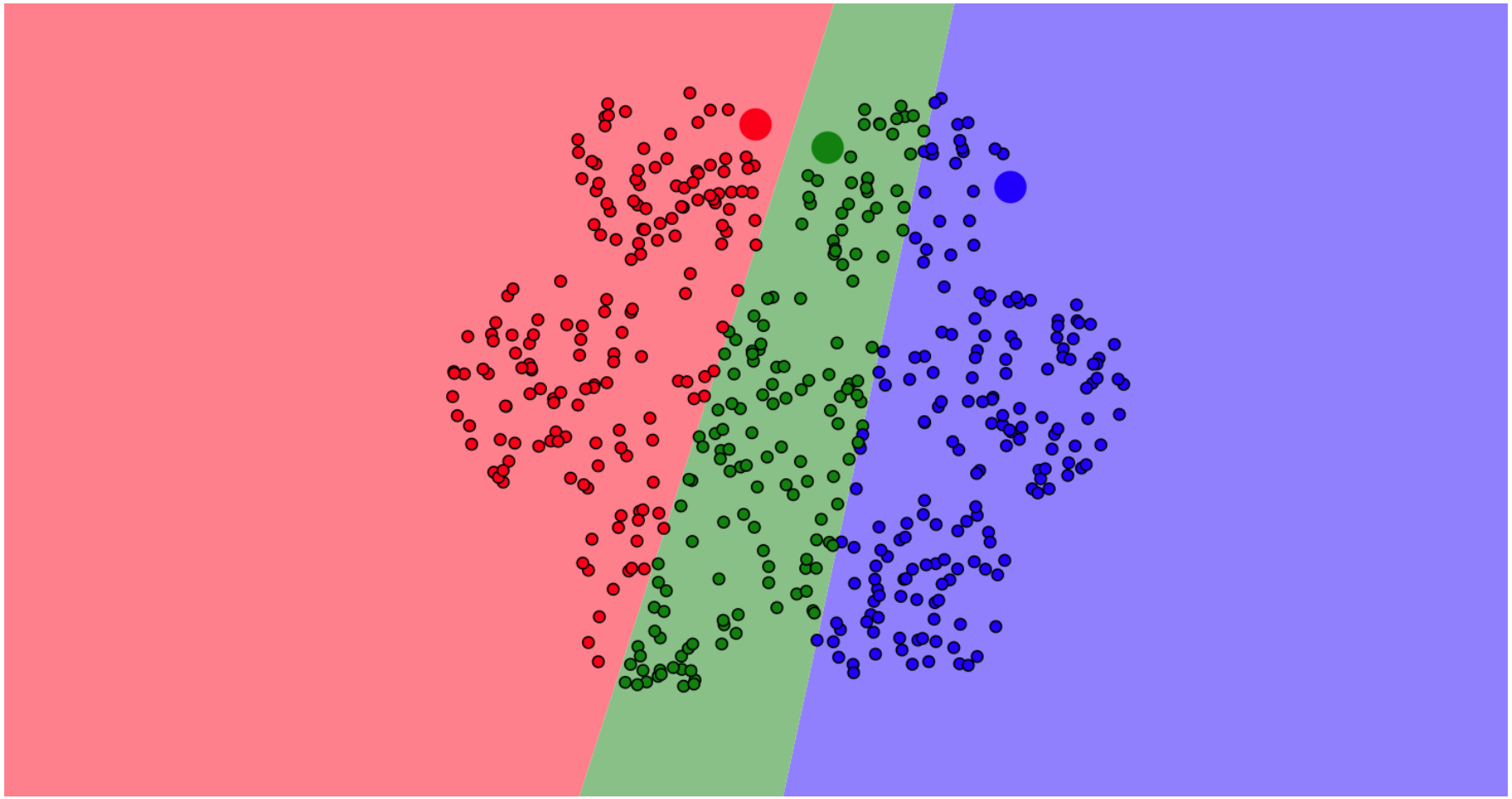
Unsupervised learning

K-means



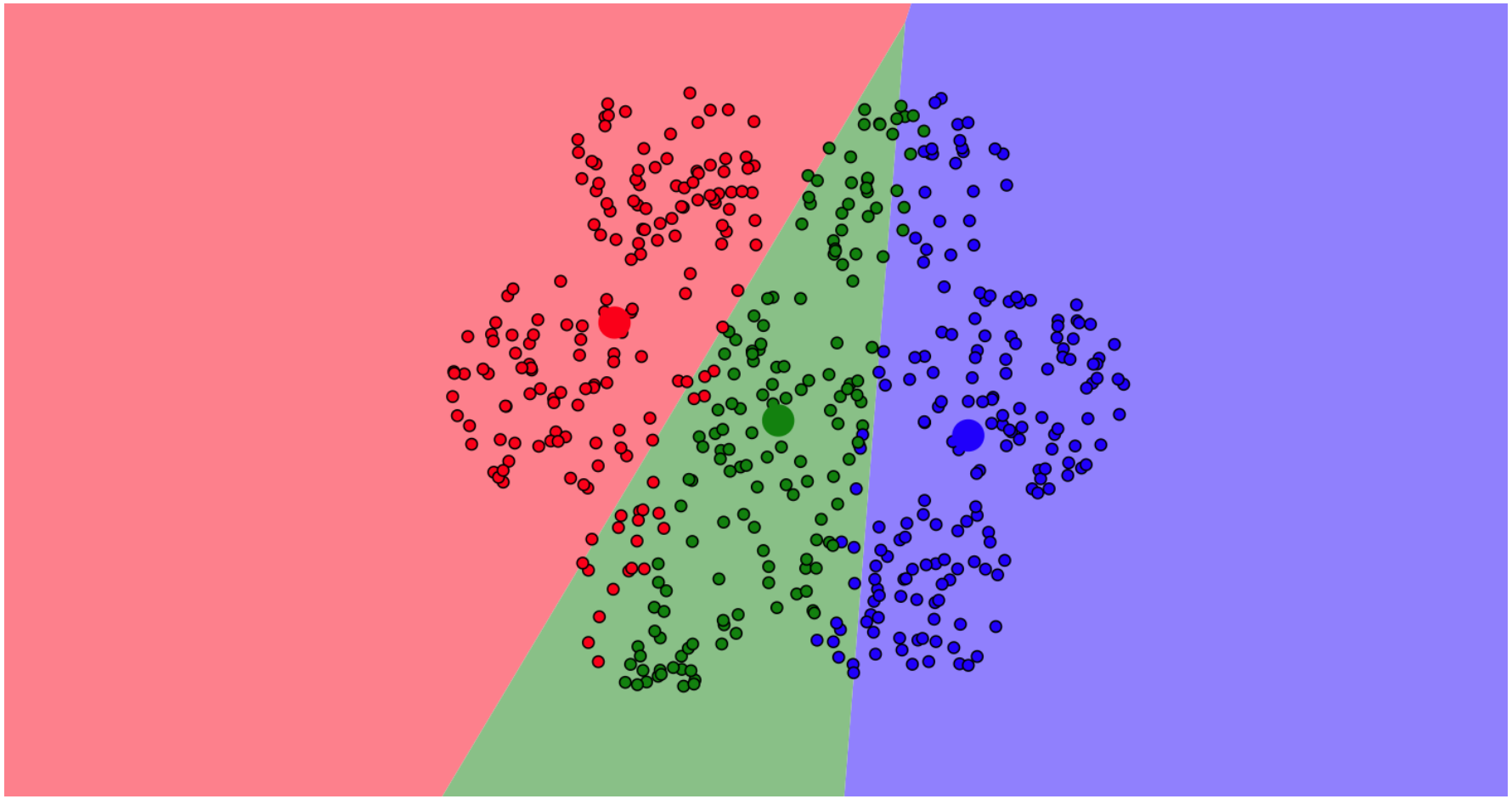
Unsupervised learning

K-means



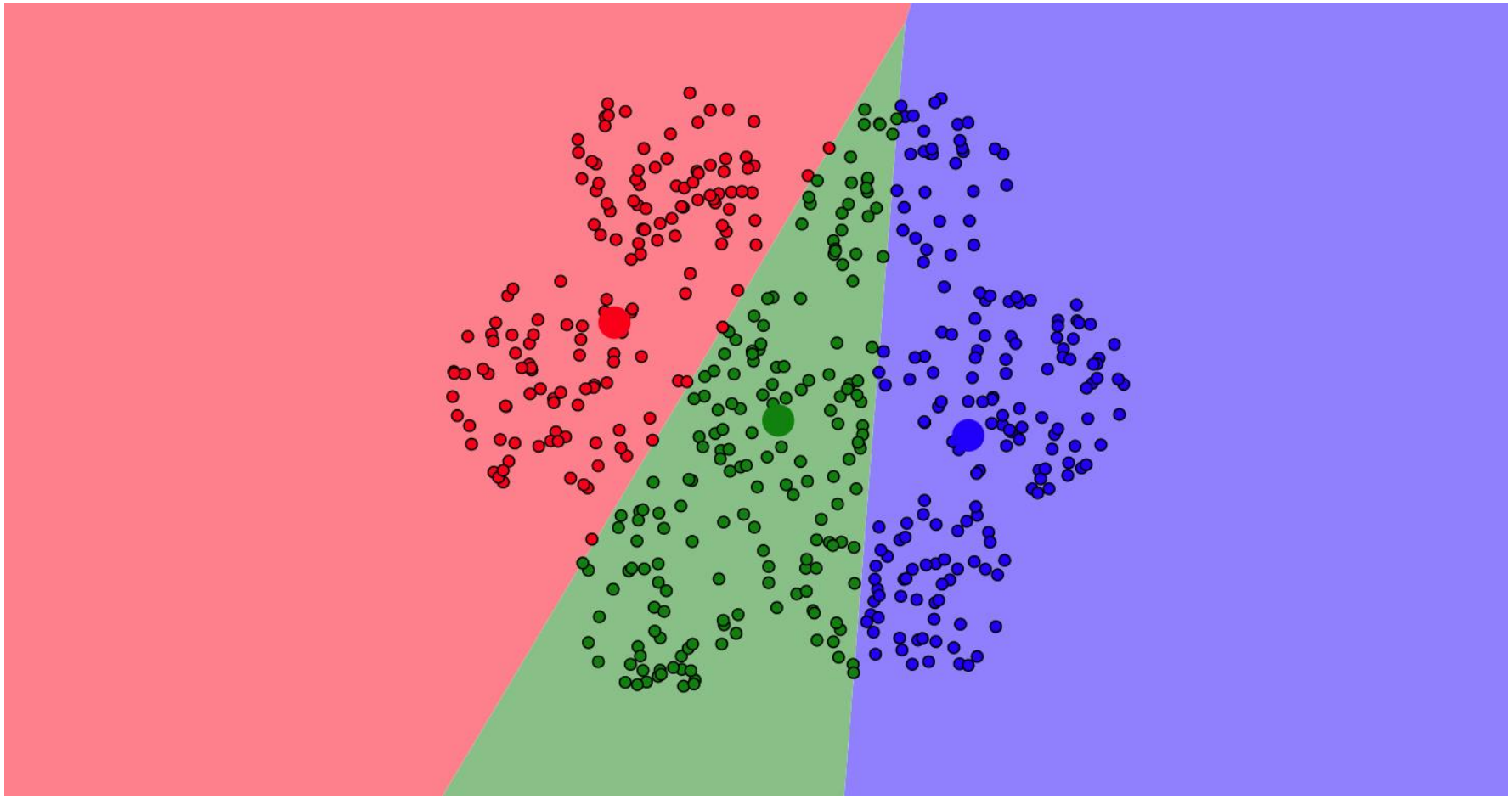
Unsupervised learning

K-means



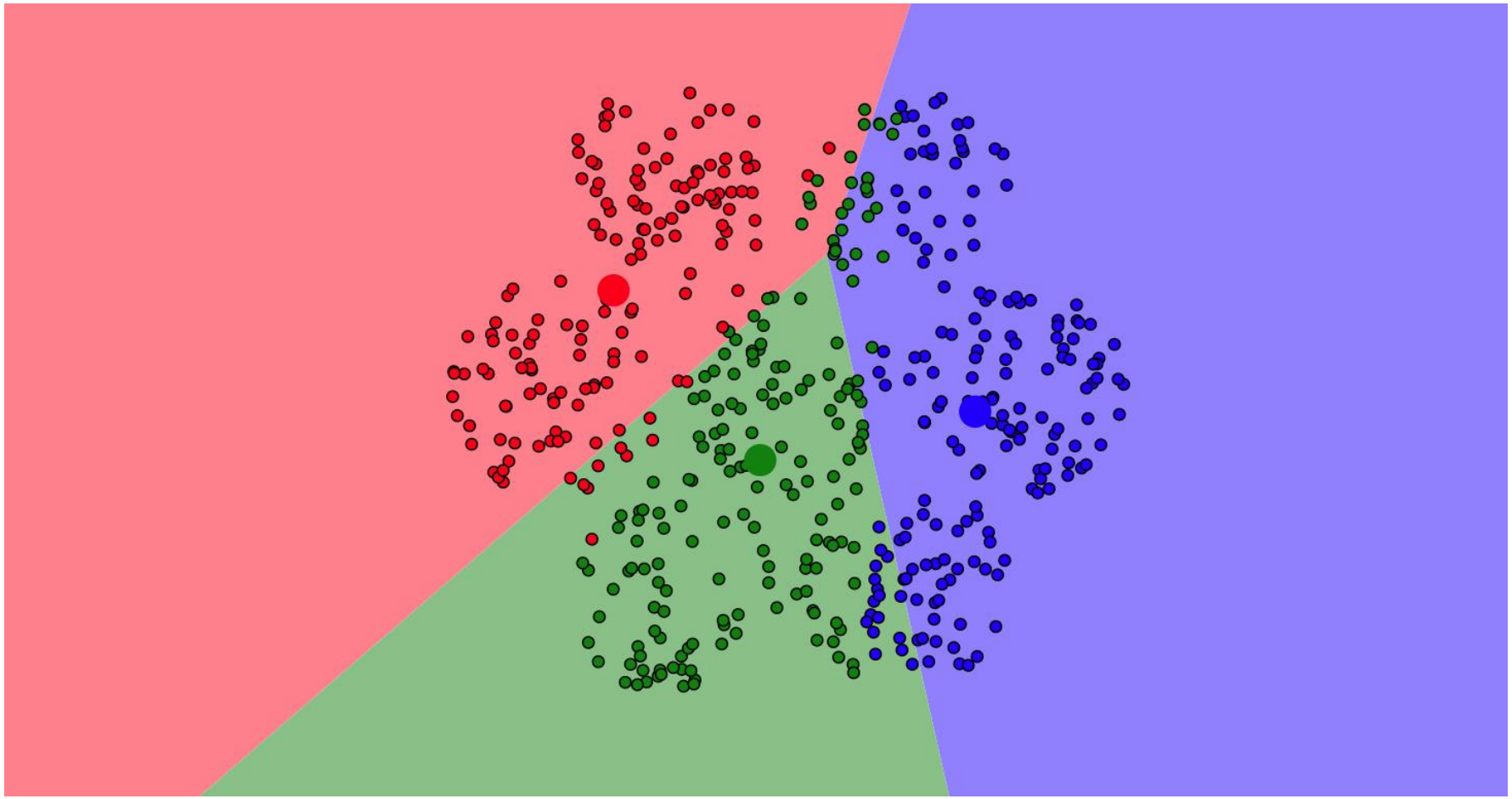
Unsupervised learning

K-means



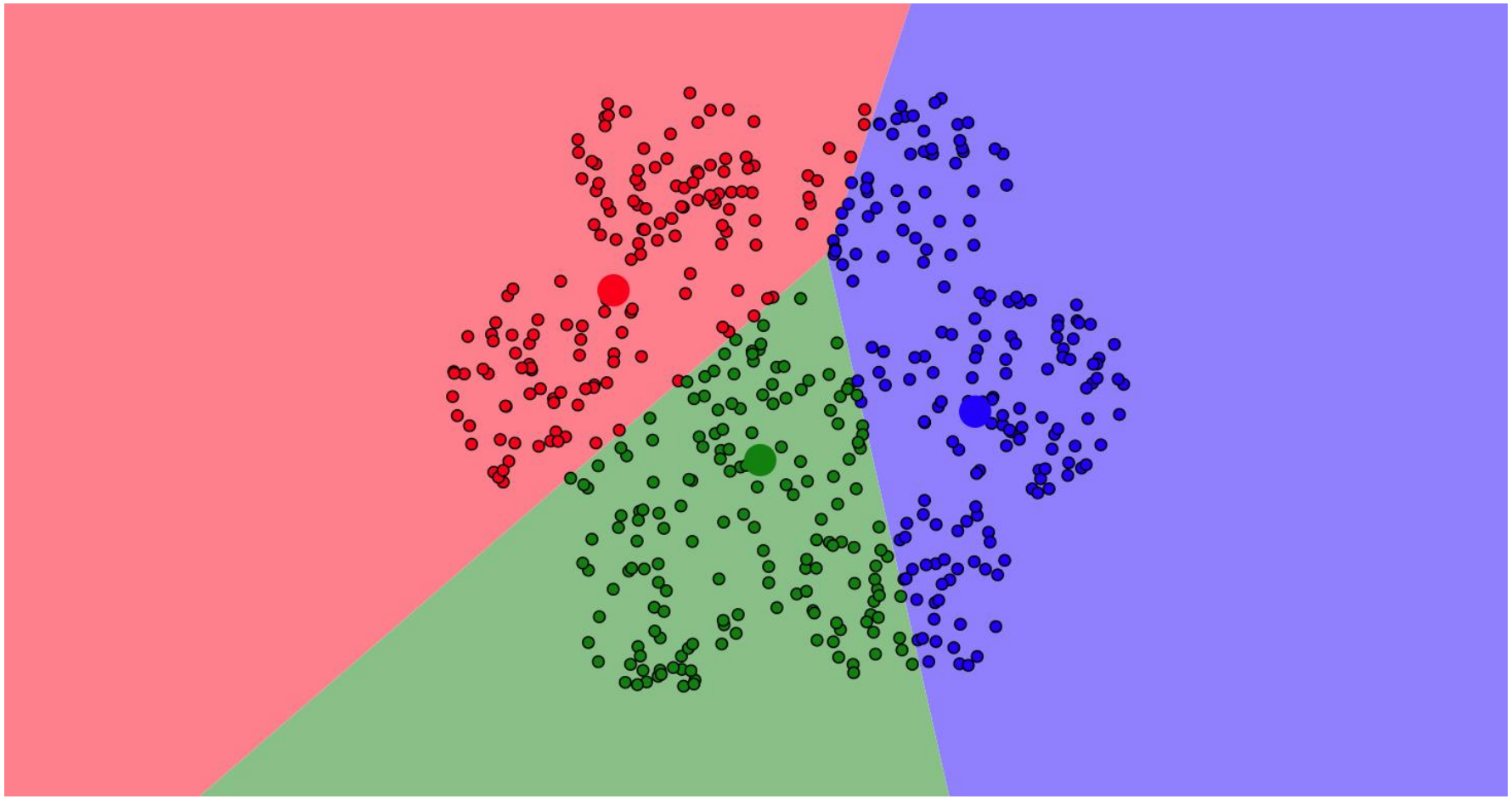
Unsupervised learning

K-means



Unsupervised learning

K-means



Unsupervised learning

K-means