

Basics of Machine Learning

Dmitry Ryabokon, github.com/dryabokon





Lesson 12

Unsupervised Learning



Supervised Learning

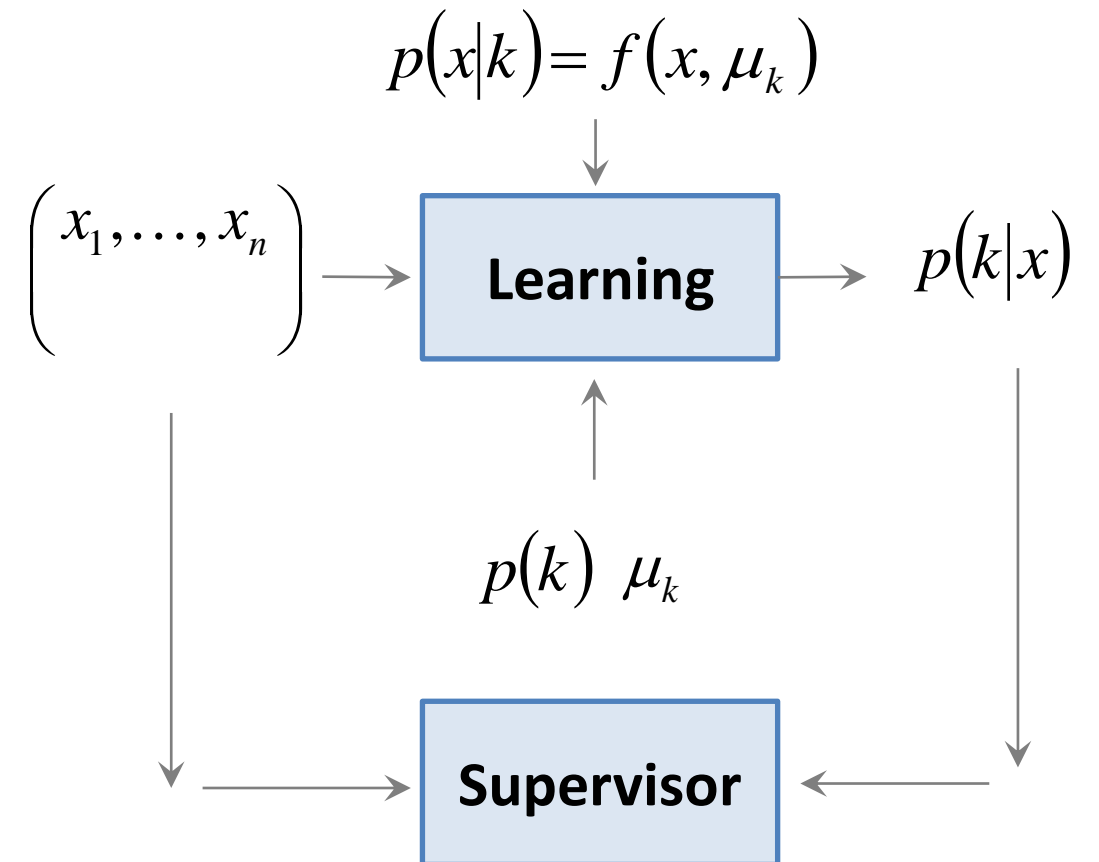
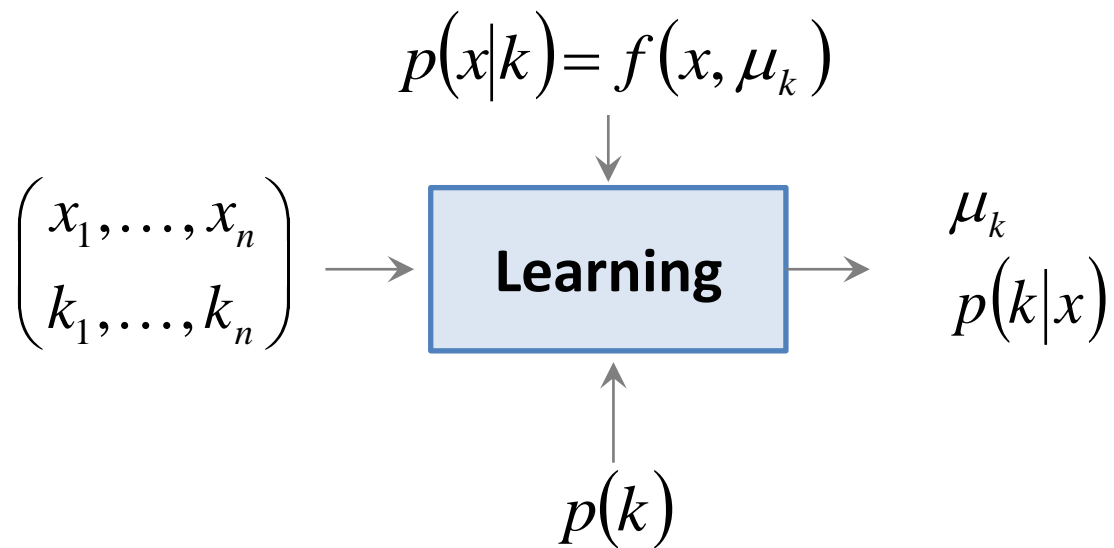
Summary

- EM Algorithm
- K-means

EM algorithm

Unsupervised learning

EM algorithm



Unsupervised learning

EM algorithm



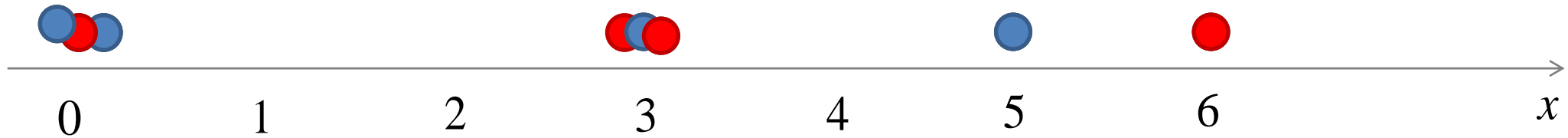
Unsupervised learning

EM algorithm



Unsupervised learning

EM algorithm



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

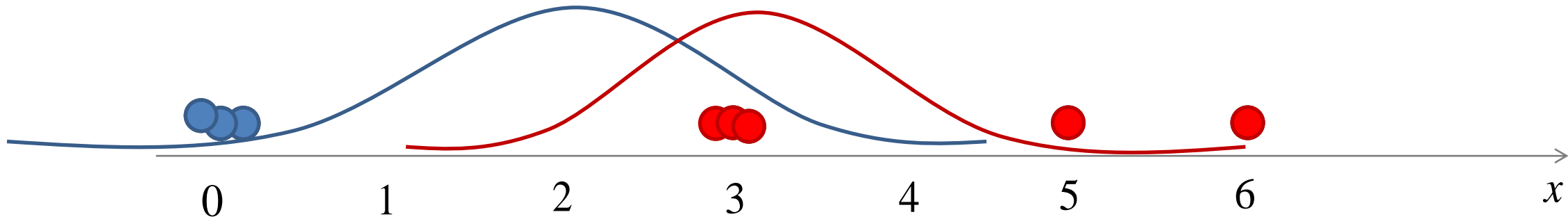
$$\sigma_{\bullet} = \frac{1}{4} (2^2 + 2^2 + 1^2 + 3^2) = 4.5$$

$$\mu_{\bullet} = \frac{1}{4} (0 + 3 + 3 + 6) = 3$$

$$\sigma_{\bullet} = \frac{1}{4} (3^2 + 0^2 + 0^2 + 3^2) = 4.5$$

Unsupervised learning

EM algorithm



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

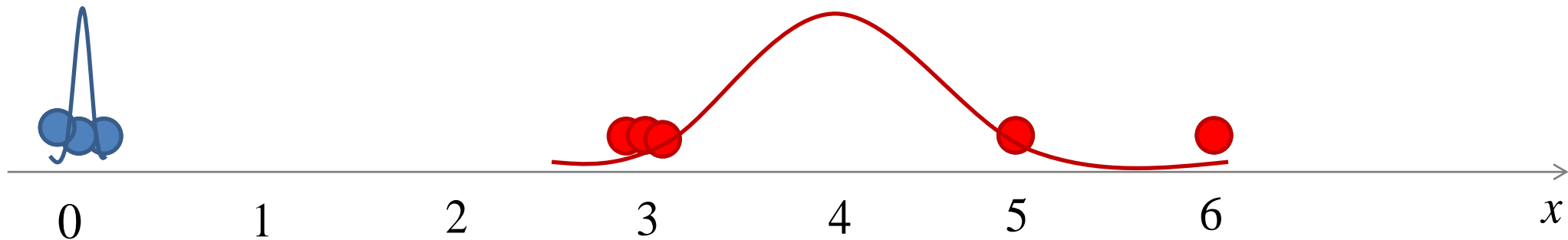
$$\sigma_{\bullet} = \frac{1}{4} (2^2 + 2^2 + 1^2 + 3^2) = 4.5$$

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$$\sigma_{\bullet} = \frac{1}{4} (3^2 + 0^2 + 0^2 + 3^2) = 4.5$$

Unsupervised learning

EM algorithm



$$\mu_{\bullet} = \frac{1}{3} (0 + 0 + 0) = 0$$

$$\sigma_{\bullet} = \frac{1}{3} (0^2 + 0^2 + 0^2) = 0$$

$$\mu_{\bullet} = \frac{1}{5} (3 + 3 + 3 + 5 + 6) = 4$$

$$\sigma_{\bullet} = \frac{1}{5} (1^2 + 1^2 + 1^2 + 1^2 + 2^2) = 1.6$$

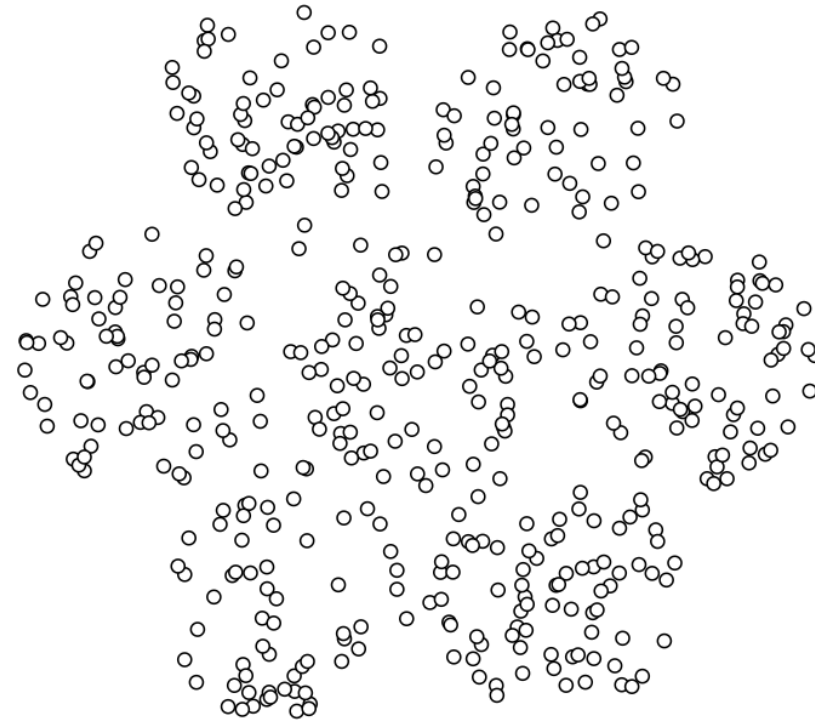
K-Means

Unsupervised learning

K-means

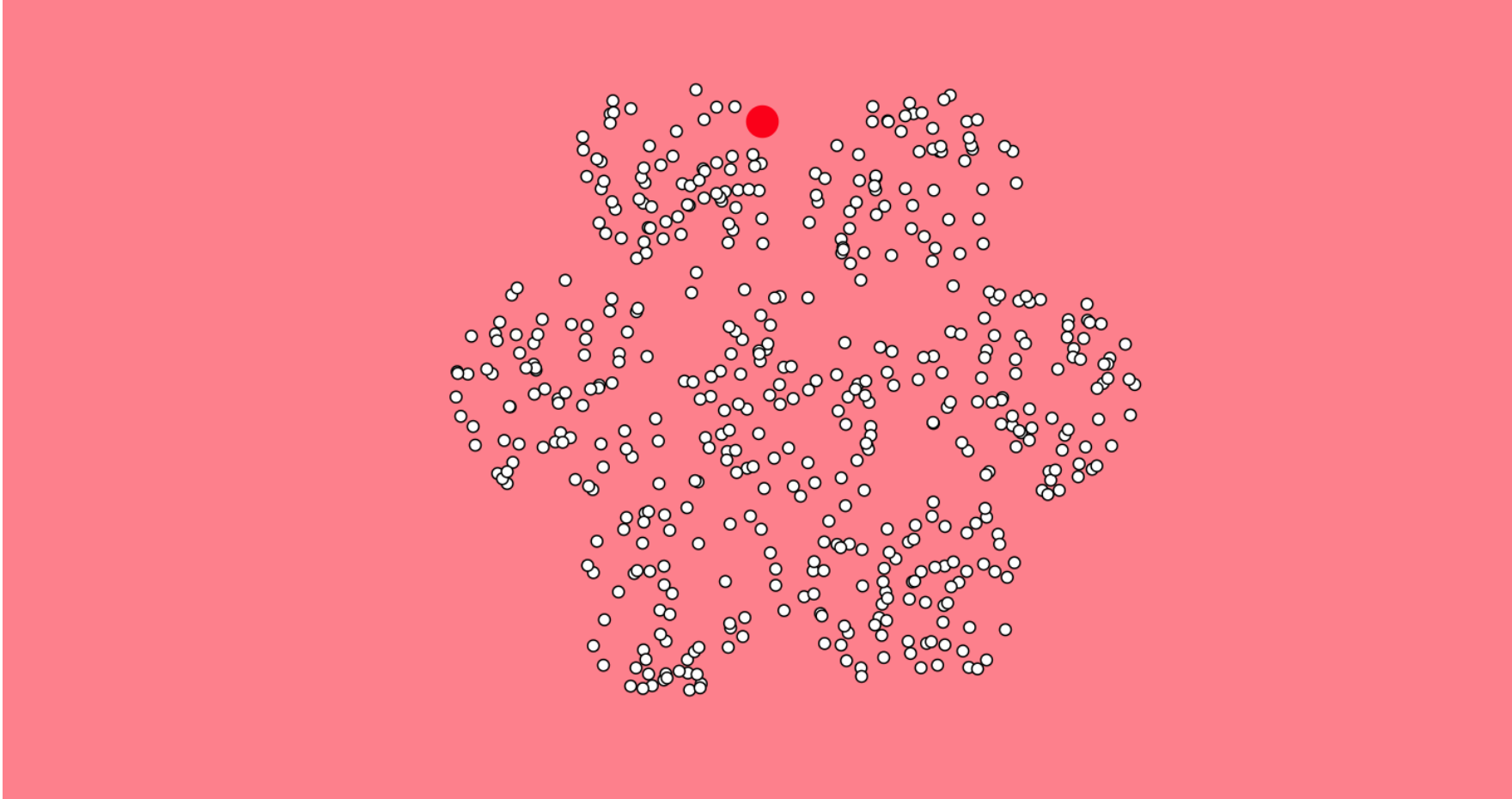
K-means is an unsupervised clustering algorithm

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



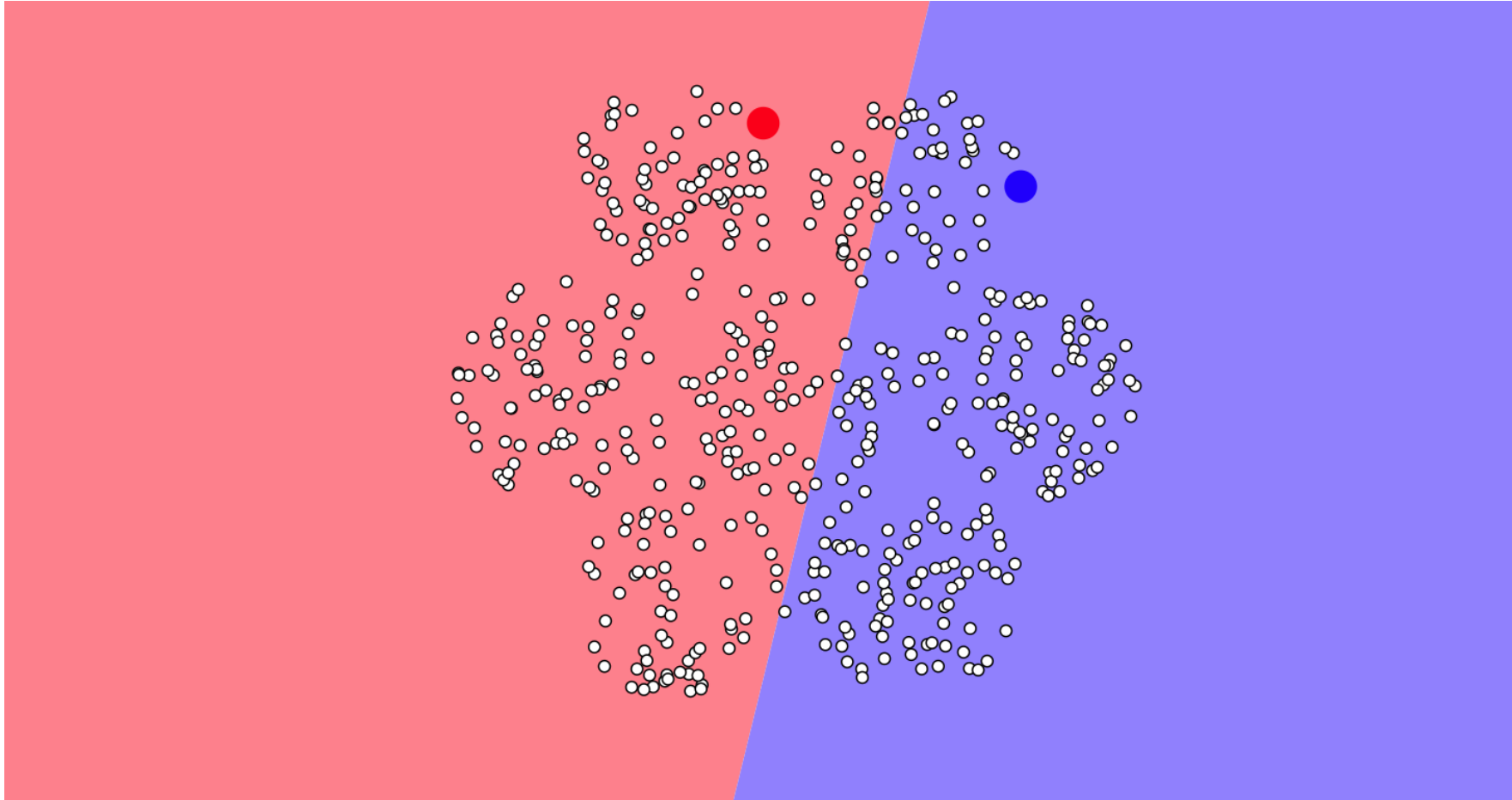
Unsupervised learning

K-means



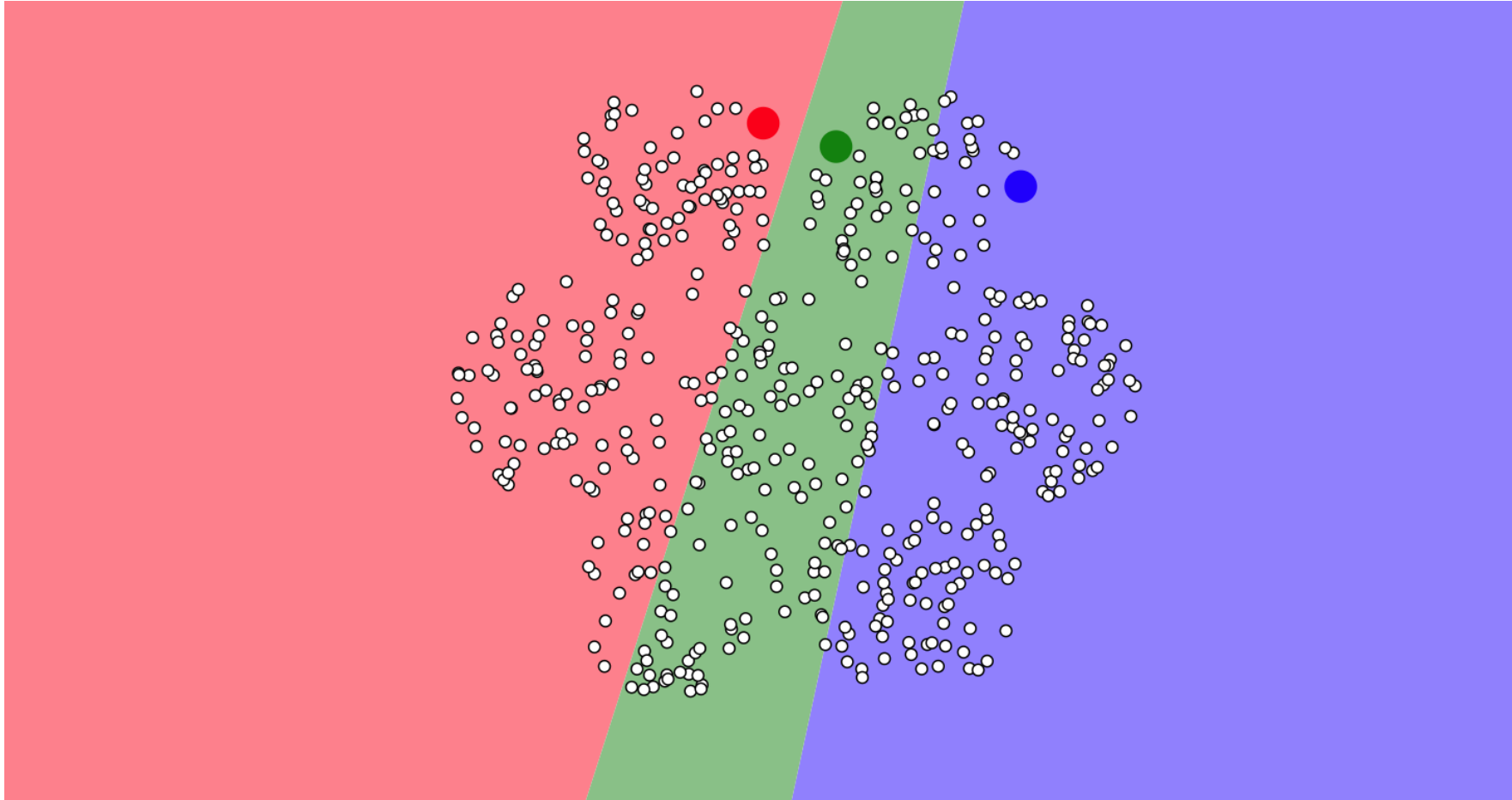
Unsupervised learning

K-means



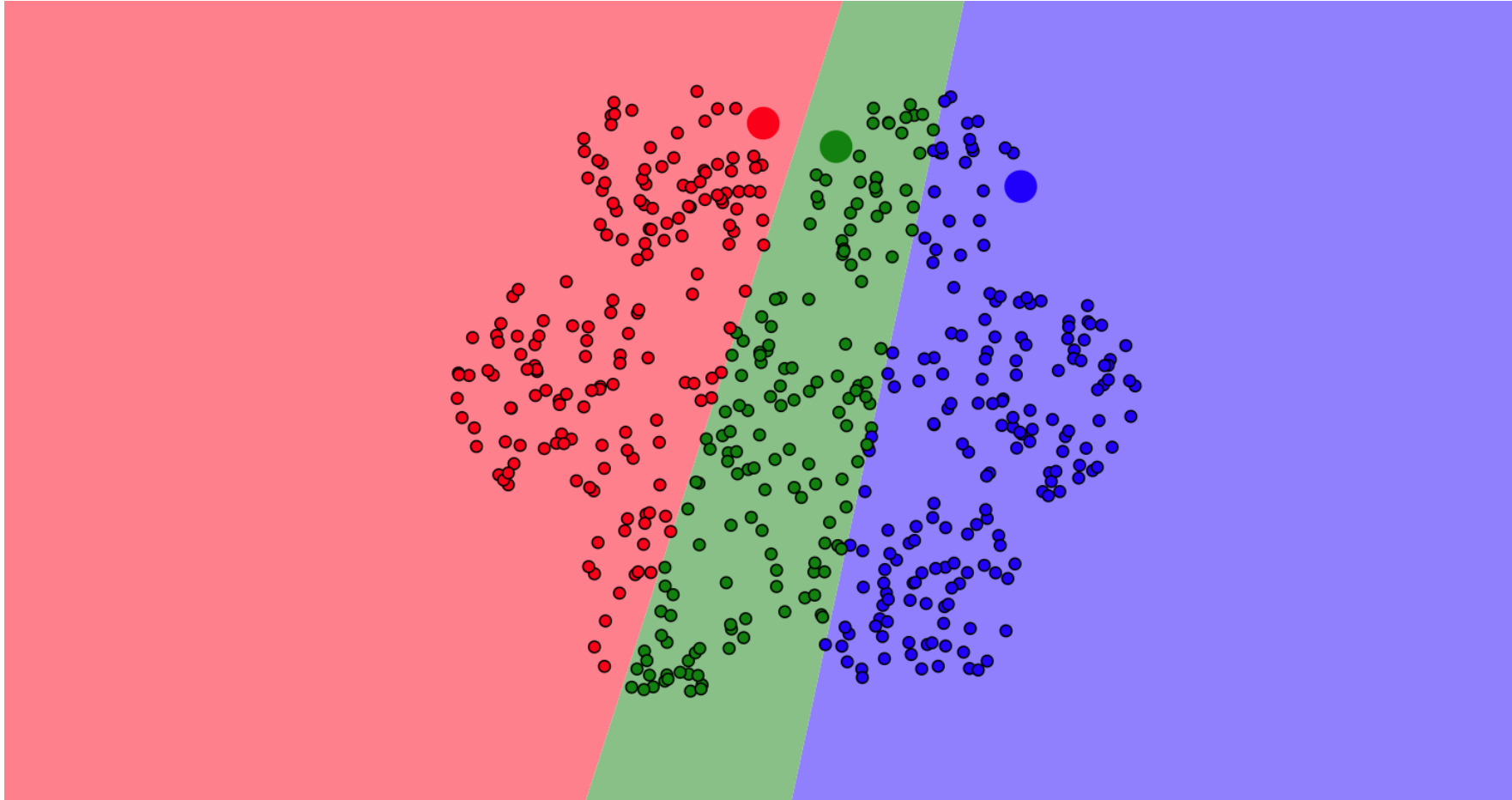
Unsupervised learning

K-means



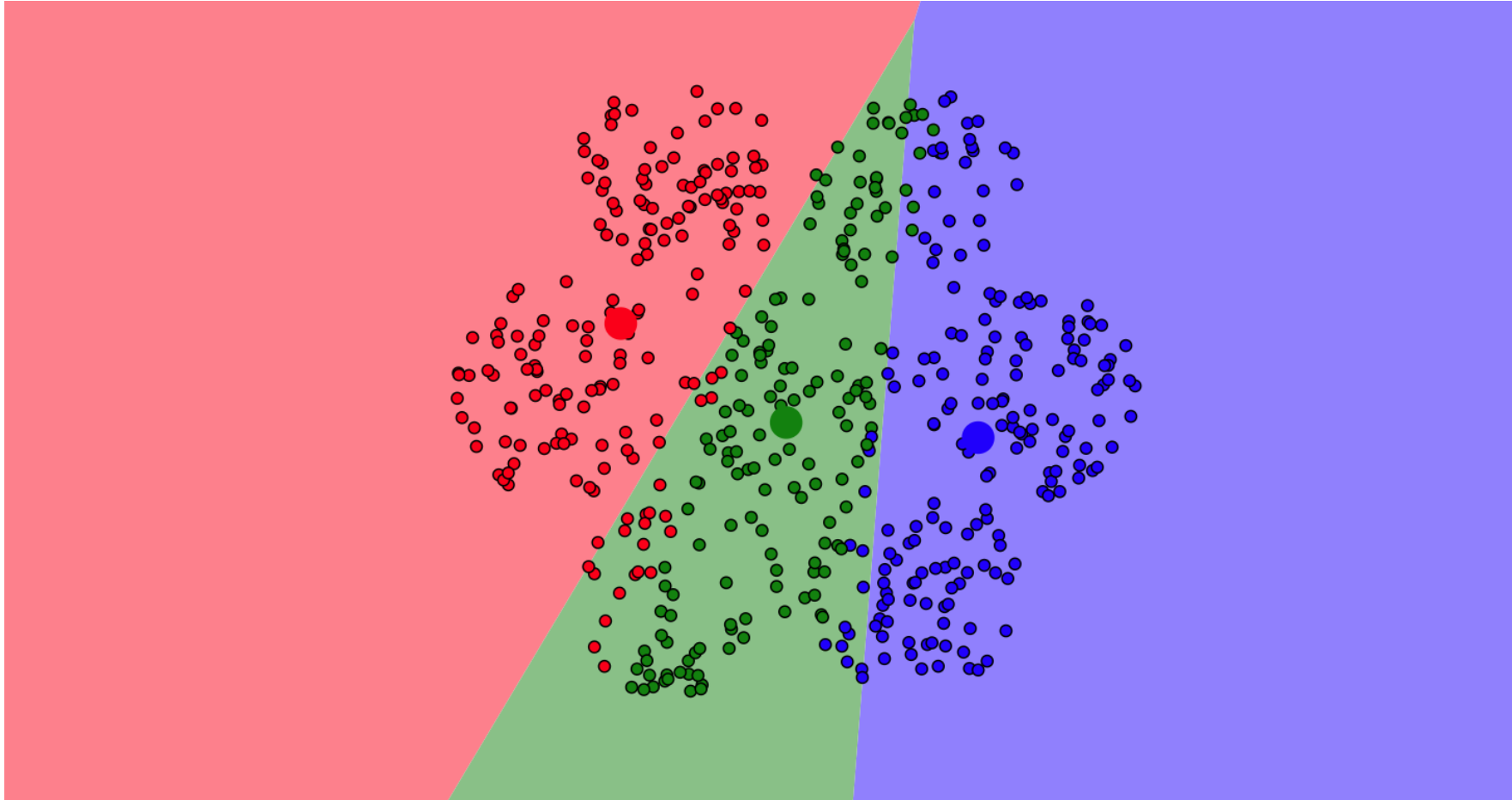
Unsupervised learning

K-means



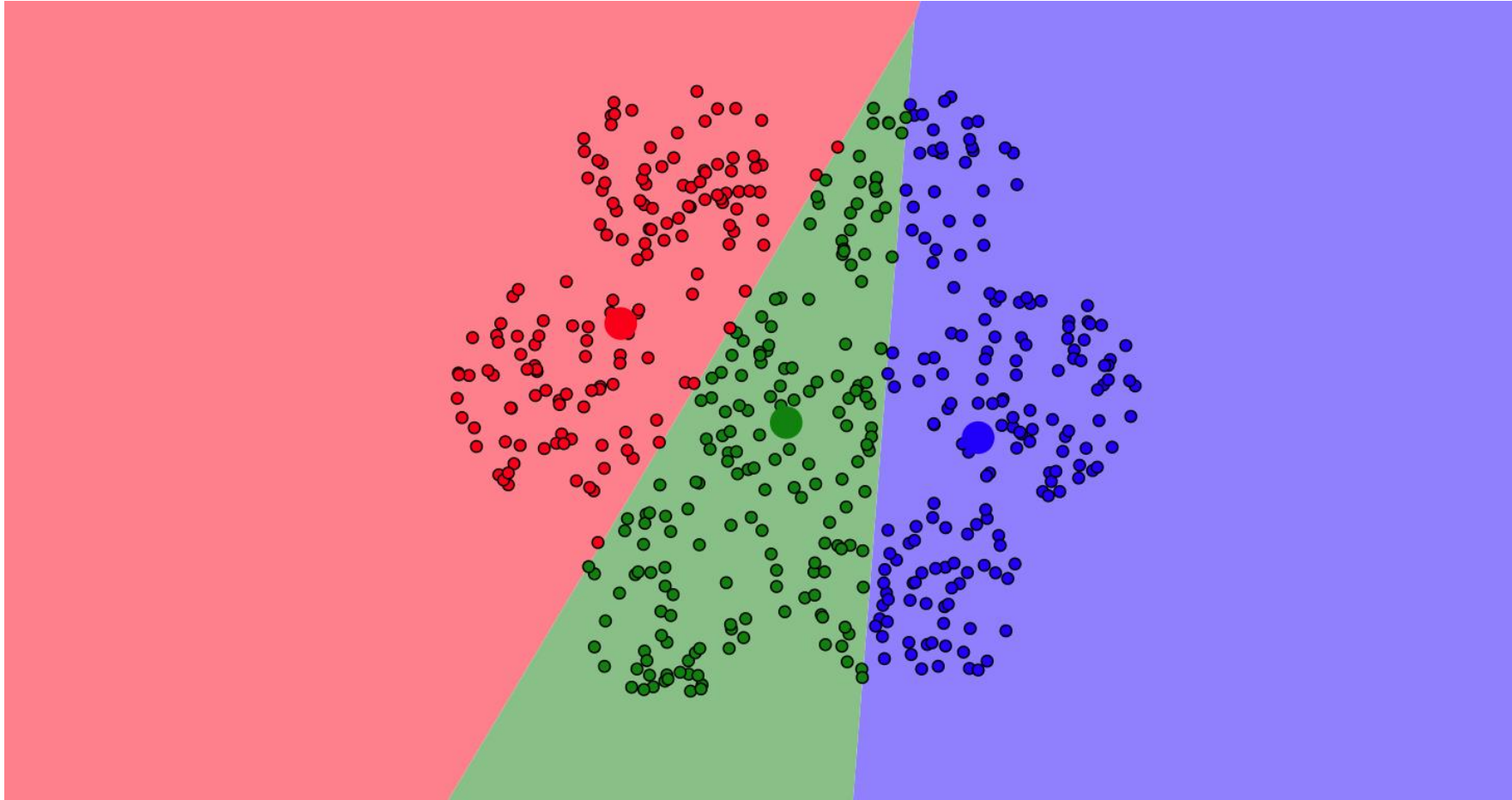
Unsupervised learning

K-means



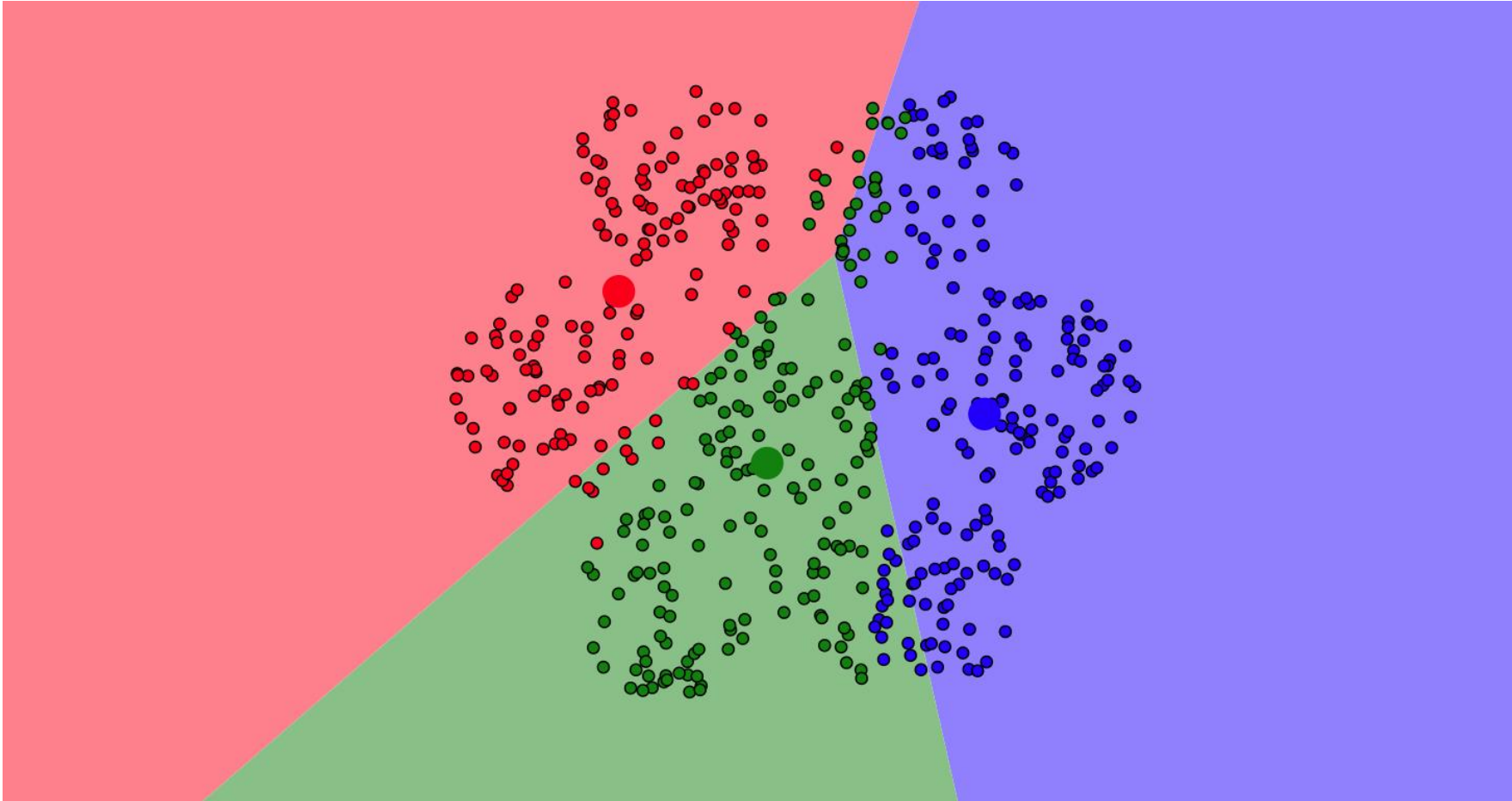
Unsupervised learning

K-means



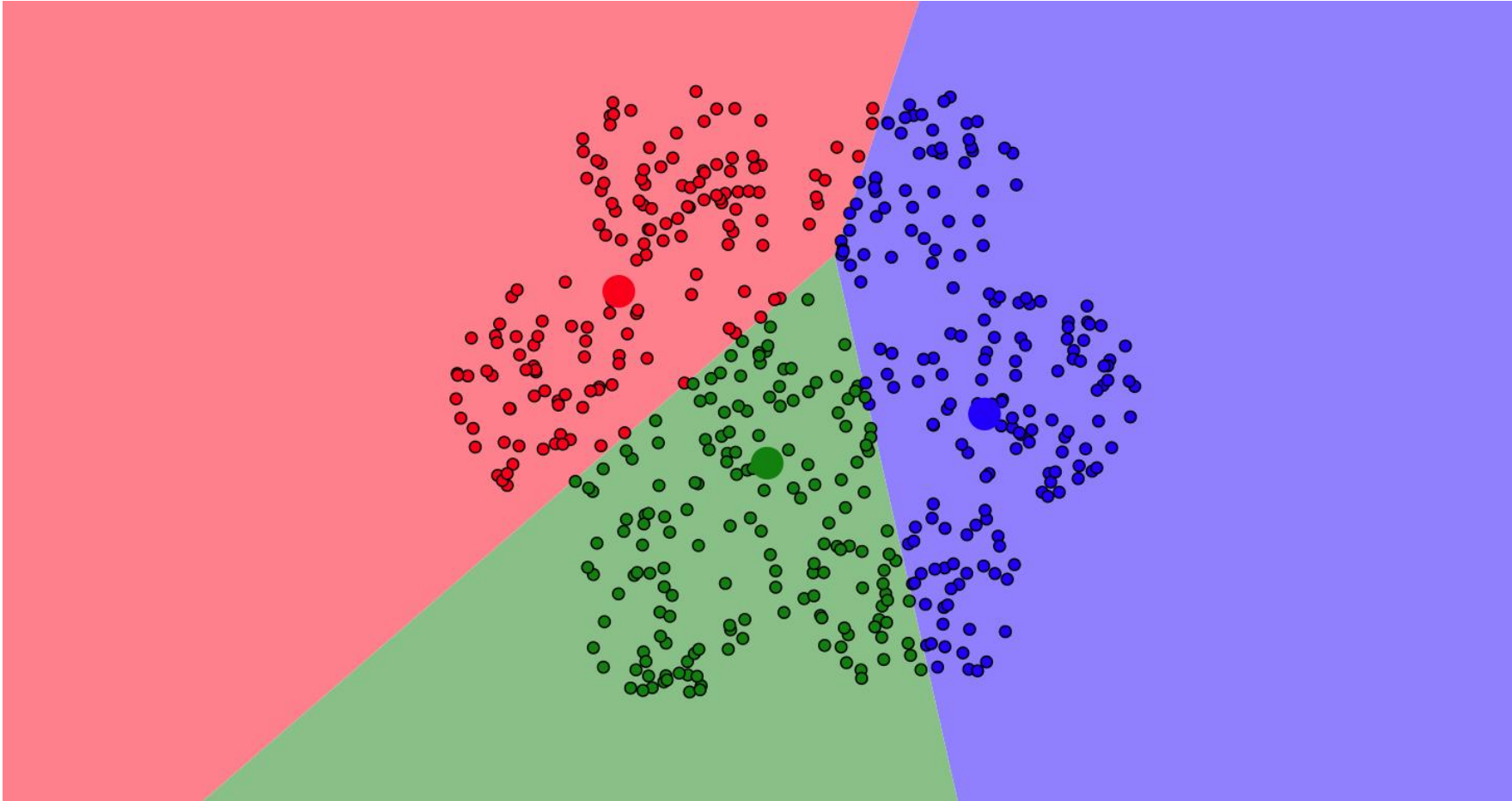
Unsupervised learning

K-means



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K-means

