

Similarity between KDE and Mixture models:

Kernel density estimators:

general formula

$$\frac{1}{n} \sum_{i=1}^n \frac{1}{b} g\left(\frac{|x - x_i|}{b}\right)$$

gaussian

$$\frac{1}{n} \sum_{i=1}^n \frac{1}{b} \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2} \left(\frac{x - x_i}{b}\right)^2}$$

$b = \text{bandwidth}$

Mixture models:

general formula

$$\sum_{k=1}^K \hat{w}_k g_k(x | \hat{\theta}_k)$$

gaussian:

$$\sum_{k=1}^K \hat{w}_k \frac{1}{\sqrt{2\pi} \hat{\sigma}_k} e^{-\frac{1}{2\hat{\sigma}_k^2} (x - \hat{\mu}_k)^2}$$

Mixture models can be viewed as model-based KDE (nonparametric).