Accelerating your Python Code
With PyCuda for GMMs

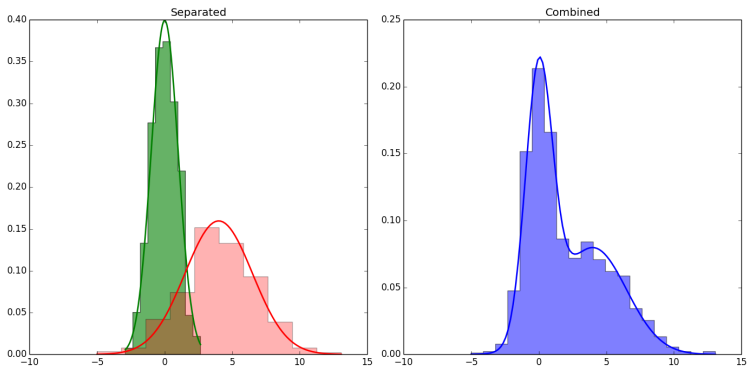Varun Nayyar

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Gaussian Mixture Models (GMMs)

Mathematical Notation

Gaussian Mixture Models are a class of models that assume the data points are generated by a finite number of gaussian (or normal) distributions

$$f(\mathbf{x}|\boldsymbol{\pi}, \boldsymbol{\mu}, \boldsymbol{\Sigma}) = \sum_{k=1}^{K} \pi_k \mathcal{N}(\mathbf{x}|\mu_k, \Sigma_k)$$

$$l(\mu, \Sigma, \mathbf{x}) = \sum_{i=1}^{N} \ln\left(\sum_{k=1}^{K} \pi_k \mathcal{N}(x_i|\mu_k, \Sigma_k)\right)$$

with K mixtures and the weights π_k giving the prior probability of mixture component k (and sum to 1).

GMMs d=1, K=2

Need for speed

- GMM formula doesn't decompose well - each mixture needs to be calculated for different μ, Σ K times.
- Speech dataset used was large   3.5 GB and dimensionality was high(ish) = 13
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