CSC411 Assignment 2

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November 7, 2017

1 Gaussian

1.1 P(y)

$P(\boldsymbol{x}|\ mu, \sigma) = \sum_{k=1}^{K} P(\boldsymbol{x}|y=k,\ mu, \sigma) P(y=k|\mu, \sigma)$
$= \sum_{k=1}^{K} \alpha_k P(\boldsymbol{x}|y=k,\ mu, \sigma)$
$= \sum_{k=1}^{K} \alpha_k (\prod_{i=1}^{D} 2\pi\sigma_i)^{\frac{1}{2}}$

$P(y|\boldsymbol{x},\ mu, \sigma) = \frac{P(\boldsymbol{x}, y=k|\mu, \sigma)}{P(\boldsymbol{x}|\mu, \sigma)}$
$= \frac{P(\boldsymbol{x}|y=k,\ mu, \sigma) P(y=k|\mu, \sigma)}{P(\boldsymbol{x}|\mu, \sigma)}$
$= \frac{\alpha_k (\prod_{i=1}^{D} 2\pi\sigma_i^2)^{-\frac{1}{2}} exp\{-\sum_{i=1}^{D} \frac{1}{2\sigma_i} (x_i - \mu_{ki})^2\}}{k}$

1.2 visualization

1.2.1 Feature weights