The Normal Density

The discriminant function for Bayes classifier can be written as

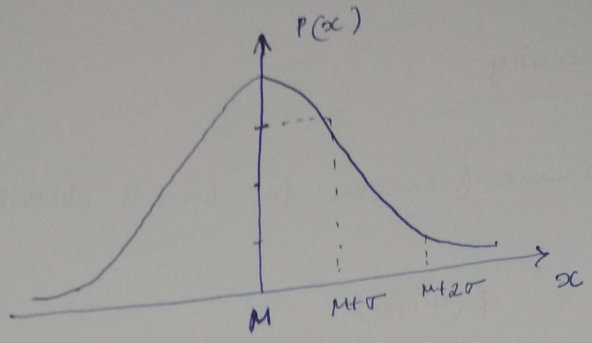
$$g_i(x) = P(w_i/x)$$
$$= \ln P(w_i/x)$$
$$= \underbrace{\ln P(x/w_i)}_{\text{Conditional PDF}} + \underbrace{\ln P(w_i)}_{\text{PDF}}$$

Note:

(1) The structure of Bayes classifier is determined by the conditional densities $P(x/w_i)$ as well as by the prior probabilities $P(w_i)$.

(2) We can have various types of probability density like i) Normal density ii) Laplacian density iii) exponential iv) poisson and so on..

(3) Out of these, the most common PDF which is in use is Normal / Gaussian density.



Univariate Density:

For a single variable, the normal / Gaussian density is

$$P(x) = \frac{1}{\sqrt{2\pi}\,\sigma} \exp\left[\frac{-1}{2}\left(\frac{x-M}{\sigma}\right)^2\right]$$

$$M = E(x) = \text{Expected value of } x$$

$$= \int_{-\infty}^{\infty} x\, P(x)\, dx.$$

$$\sigma^2 = \text{variance}, \quad \sigma = \text{S.D}$$

$$= E\left[(x-M)^2\right]$$

$$= \int_{-\infty}^{\infty} (x-M)^2\, P(x)\, dx.$$

This particular PDF is specified by two parameters M, σ

In short $\sim N(M, \sigma^2)$ ← variance.

↓ mean