

$$p_{t+1}(y) = P(o_{t+1}, \dots, o_t, o_{t+1}, i_{t+1} = q_j | \lambda)$$

$$= \sum_{i=1}^N P(o_{t+1}, \dots, o_t, o_{t+1}, i_{t+1} = q_j | \lambda)$$

$$= \sum_{i=1}^N P(o_{t+1} | o_1, \dots, o_t, i_t = q_i, i_{t+1} = q_j, \lambda)$$

$$P(o_{t+1}, \dots, o_t, i_t = q_i, i_{t+1} = q_j | \lambda)$$

$$= \sum_{i=1}^N P(o_{t+1} | o_1, \dots, o_t, i_t = q_i, i_{t+1} = q_j | \lambda)$$

$$= \sum_{i=1}^N P(o_{t+1} | o_1, \dots, o_t, i_t = q_i, i_{t+1} = q_j, \lambda)$$

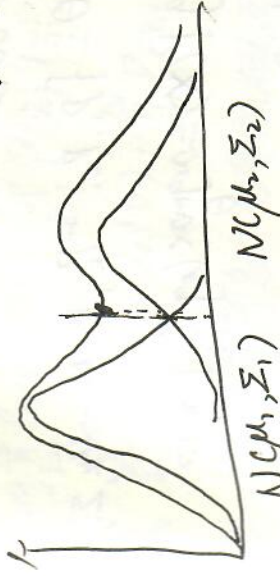
$$P(o_{t+1}, \dots, o_t, i_t = q_i, i_{t+1} = q_j | \lambda)$$

$$= \sum_{i=1}^N P(o_{t+1} | o_1, \dots, o_t, i_t = q_j, \lambda) \cdot \partial_t(i)$$

$$= \sum_{i=1}^N b_j(o_{t+1}) \cdot a_{ij} \cdot \partial_t(i)$$

GMM: Gaussian Mixture Model (高斯混合模型)

从几何角度来看: 加权平均 \rightarrow (多个高斯分布叠加而成)



$$P(x) = \sum_{k=1}^K \alpha_k N(\mu_k, \Sigma_k), \quad \sum_{k=1}^K \alpha_k = 1$$

从混合模型角度来看: (生成模型)

生成样本

x: observed variable

z: latent variable. (对应的样本属于哪一个高斯分布)

潜变量随机变量

$$P(x) = \sum_z P(x, z) = \sum_{k=1}^K P(x, z = C_k) = \sum_{k=1}^K P(z = C_k) \cdot P(x | z = C_k)$$

$$= \sum_{k=1}^K \alpha_k \cdot N(x | \mu_k, \Sigma_k)$$

$$P(x, z) = P(z) \cdot P(x | z) = P_z \cdot N(x | \mu_z, \Sigma_z)$$

$$P(z | x) = \frac{P(x, z)}{P(x)} = \frac{P_z \cdot N(x | \mu_z, \Sigma_z)}{\sum_{k=1}^K \alpha_k \cdot N(x | \mu_k, \Sigma_k)}$$