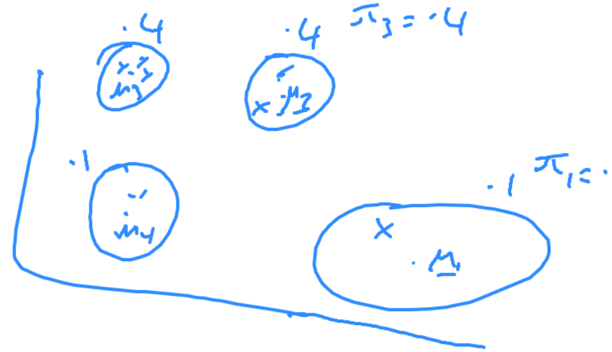
$$P(\underline{u}; \theta) = \sum_i \pi_i \, N(\underline{u}; \underline{\mu}_i, \Sigma_i)$$



$$\sum \pi_i = 1$$

K-means

Expectation

Maximization

$P(G_1 | \underline{u}') \sim 1$ $\quad \rho_1'$

$P(G_2 | \underline{u}') \sim 0$ $\quad \rho_2'$

$P(\underline{u} | G_1) \sim P(\underline{u} | G_2)$

$$P(G_1 | \underline{u}) \propto \frac{P(\underline{u} | G_1)}{\sum P(\underline{u} | G_i)}$$

○ ○ $\underline{v}$

$\downarrow G$

○ ○ ○ ○ ○ ○ $\underline{y}$

$\underline{v} \sim N(0, \underline{I})$

generation

$\underline{y} \sim N(G\underline{v}, \Sigma)$

0.1
0.4
0.4
0.1

$\sum \pi_i \, \underline{N(\underline{\mu}_i, \Sigma_i)} \rightsquigarrow P(\underline{y}; G) = \int_{\underline{v}} P(\underline{v}; G) \, N(G\underline{v}, \Sigma) \, d\underline{v}$

E: $P(G_i \mid \underline{y}^j)$ ← inverse

π^r

E: $P(\underline{v} \mid \underline{y}; G)$ ← inverse — recognition

M:

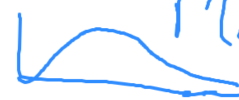
M: $\hat{\underline{\mu}}_i = \dfrac{\sum_j \underline{y}^j \cdot p_i^j}{\sum_h p_i^{h}}$

$\underline{y}^j$ $\quad$ $\underline{v}^j$

$\boxed{\underline{y}^j \approx G \underline{v}^j}$

$\infty\infty\ \underline{v}$ $\qquad \underline{v} \sim N(0, I)$

$0\ 0\omega 0\ \underline{u}$ $\qquad \underline{u} \sim N(G\underline{v}, \Sigma)$

$0\ v \sim$  $\Gamma(\alpha, \beta)$ $\quad \propto x^{\alpha-1} \cdot e^{-\beta x}$

$0600\ \underline{u}$ $\qquad \underline{u} \sim N($

$\underline{u} \mid v \sim N(\underline{\mu} \cdot v, \cancel{\Sigma}\ \Sigma^2)$

$v \sim 1 \quad N(\underline{\mu}, \Sigma^2)$

$v \sim 2 \quad N(2\underline{\mu}, \Sigma^2)$

$v = 3 \quad N(3\underline{\mu}, \Sigma^2)$

$$P(\underline{u} \mid G) = \int_v P(v) \cdot N(v\underline{\mu}, \Sigma^2)\, dv$$

$u \sim N(1, \sigma^2)$ $\qquad v \sim \Gamma\_$ $\qquad P(u$

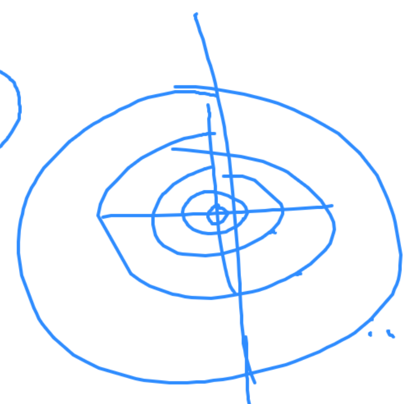
$v \sim \Gamma(\alpha, \beta)$

$\underline{w} \sim N(0, \sigma^2)$

$\Sigma_{j,i}$

$\underline{u} = v\,\underline{w} \sim N(0,1)$

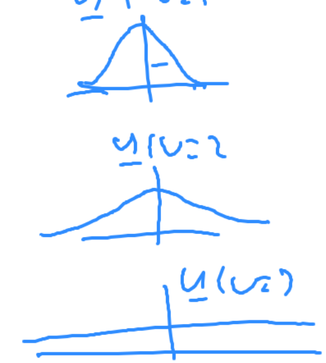
$P(\underline{u} \mid \alpha, \underline{v}) = \alpha(G\underline{v}' + \varepsilon)$



$\underline{u} \mid v=1$

$\underline{u} \mid v=2$

$\underline{u} \mid v=?$



$P(\underline{u})$