$$\mu_k = \frac{1}{N_k} \sum_n r_{nk} x_n$$

$$\Sigma_k = \frac{1}{N_k} \sum_n r_{nk} (x_n - \mu_k)(x_n - \mu_k)^T$$

$$\left[\underbrace{r_{nk} x_n x_n^T}_{\text{suffstats computation}} - 2 \underbrace{r_{nk} x_n}\mu_k^T + \underbrace{r_{nk}} \mu_k \mu_k^T \right]$$

$$\left[\sum_n r_{nk} x_n x_n^T , \sum_n r_{nk} x_n , \sum_n r_{nk} \right]$$

for diagonal, $\mathrm{diag}(\Sigma_k) = \frac{1}{N_k}$

$$\Sigma_k^{ii} = \frac{1}{N_k} \underbrace{\sum_n r_{nk}(x_{ni} - \mu_{ki})^2}_{} \Rightarrow d \text{ vals}$$

$$\Sigma_k^{ii} = \frac{1}{N_k} \sum_n \underbrace{r_{nk} x_{ni}^2}_{} - 2 r_{nk} \underbrace{x_{ni}\mu_{ki}}_{}$$

$$+ \underbrace{r_{nk}\mu_{ki}^2}_{}$$

same, but of outer prod wrt μ_k.

for spherical,

$$\Sigma_k^{ii} = \frac{1}{d N_k} \sum_n r_{nk} \underbrace{\sum_{d'} (x_{nd'} - \mu_{kd'})^2}_{}$$

taking diag(.) of outer products should do the trick.

diag of outer prod, sum, and divide by d should do.