$P(\mathcal{C}_k \mid cluster_j)$ as a naive approach to $P(\mathcal{C}_k \mid x)$, the *a posteriori* probability that the current period corresponds to target class $\mathcal{C}_k$ when x has been observed.

$$P(\mathcal{C}_k \mid cluster_j) = \frac{count(\mathcal{C}_k, cluster_j)}{\sum_{i=1}^{J} count(\mathcal{C}_k, cluster_i)}$$

where J is the number of clusters, i.e., the number of mean vectors in the codebook.