Algorithm 2 `URef-cVote`

Function $\bar{\mathbf{U}} = \texttt{URef-cVote}(\mathcal{U})$

Randomly select a partition from $\mathcal{U}$ as a reference $\mathbf{U}^0$

$\grave{\mathbf{U}} = 0$, $\bar{\mathbf{U}} = 0$ {Initialize two $k_0 \times n$ matrices $\grave{\mathbf{U}}$ and $\bar{\mathbf{U}}$}.

for $i = 1$ to b **do**

  $\mathbf{W}^i = \mathbf{U}^{i^T}\mathbf{U}^0$.

  $\grave{\mathbf{V}}^i = \mathbf{U}^i\mathbf{W}^i$

end for

$N = \sum_{i=1}^{b}\sum_{j=1}^{n}\sum_{q=1}^{k_0} \grave{v}_{jq}^i$

$\grave{\mathbf{U}} = \frac{1}{N}\sum_{i=1}^{b}\grave{\mathbf{V}}^i$ {$\grave{\mathbf{U}}$ represents the empirical joint distribution $p(c^0, x)$}

for $j = 1$ to n **do**

  $P_{x_j} = \sum_{q=1}^{k_0} \grave{u}_{qj}$.

  $\bar{\mathbf{u}}_j = \grave{\mathbf{u}}_j / P_{x_j}$ {each row vector $\bar{\mathbf{u}}_j$ of $\bar{\mathbf{U}}$ represents the distribution $p(c^0|x_j)$}

end for

the thesis is focused on the normalized scheme. In [39], empirical results for the un-normalized cumulative voting scheme are presented.

4.1.3 Preserving Class Distribution

Consider the random variables $\{C^i\}_{i=1}^b$, defined over the cluster labels of each ensemble partition $\{\mathbf{U}^i\}_{i=1}^b$, with probability distribution $p(c_l^i) = n_l^i/n$ (assuming hard ensemble partitions). The optimally relabeled partition $\mathbf{V}^i$ computed with respect to a given reference partition $\mathbf{U}^0$, using the cumulative voting scheme described in Ch. 3, is a soft partition that is viewed as representing a conditional probability distribution $p^i(c^0|x)$, where the random variable C^0 is defined over the initial reference clusters $\{c_q^0\}_{q=1}^{k_0}$, and X is defined over the objects $x \in \mathcal{X}$. Suppose that the simplifying assumption that the marginal probabilities $p(x_i) = \frac{1}{n}$, $\forall j$ is made. The joint distribution $p^i(c^0, x)$, based on $p^i(c^0|x)$, can be computed using Bayes rule. Let $p(c^0)$ represent