Algorithm 1 `Vote`

Function $\bar{\mathbf{U}} = \texttt{Vote}(\mathcal{U})$

1: Randomly select a partition $\mathbf{U}^i \in \mathcal{U}$ and assign to $\mathbf{U}^0$
2: **for** $i = 1$ to b **do**
3: For `cVote`, compute $\mathbf{W}^i$ as given by Eq. 3.5.
For `bVote`, compute $\mathbf{W}^i$ by finding the bipartite matching solution to Eq. 3.7.
4: $\mathbf{V}^i = \mathbf{U}^i\mathbf{W}^i$
5: $\mathbf{U}^0 = \frac{i-1}{i}\mathbf{U}^0 + \frac{1}{i}\mathbf{V}^i$
6: **end for**
7: $\bar{\mathbf{U}} = \mathbf{U}^0$.

3.3 Simulation-Based Analysis

The simulation presented in this section illustrates some basic theoretical results and provides a preliminary analysis of the aggregated partition based on each voting scheme, using several partition generation models. The generation models are described in Sec. 3.3.1, and simulation results are presented in Sec. 3.3.2.

3.3.1 Partition Generation Models

As pointed out earlier, a stochastic model for partition generation was considered in [43] for proving the convergence properties of partition ensembles based on the bipartite matching scheme, in conjunction with plurality voting. In this model, ensemble members $\{\mathbf{y}^i\}_{i=1}^b$ are generated as noisy permutations of an underlying labeling $\mathbf{y}^\alpha$ that is considered to represent the true clustering. The model reflects a relatively uniform ensemble where each labeling vector $\mathbf{y}^i$ contains random errors, with probability $p_e^i = p_e \ \forall i$, whereas $\mathbf{y}^i$ is otherwise identical to $\mathbf{y}^\alpha$, modulo cluster label permutation, with $k_i = k_\alpha, \forall i$. When applying the bipartite matching scheme in conjunction with plurality voting, the aggregated partition $\bar{\mathbf{U}}$ was shown to converge to $\mathbf{y}^\alpha$, as the ensemble size increases, and assuming that each ensemble partition gives a better than random clustering result