Procedure 1 Generative process of MBCC.

Input: the confusion matrices $\mathbf{\Pi}$ and the category proportions $\mathbf{\Lambda}$

for each document $i \in \{1, \cdots, I\}$ **do**
  for each sample $n \in \{1, \cdots, N\}$ **do**
    Sample $z_{i,n} \sim \text{Cat}(\mathbf{\Lambda}_i)$
    for each worker $k \in \{1, \cdots, K\}$ **do**
      Sample $c_{i,n}^{(k)} \sim \text{Cat}\left(\boldsymbol{\pi}_{z_{i,n}}^{(k)}\right)$
    end for
  end for

  for each worker $k \in \{1, \cdots, K\}$ **do**
    for each category $j \in \{1, \cdots, J\}$ **do**
      $\Phi_{i,j}^{(k)} = \beta_{i,j}^{(k)} \sum_{n=1}^{N} \delta\left(c_{i,n}^{(k)} - j\right)$
      where $\beta_{i,j}^{(k)}$ is a normalising constant.
    end for
  end for
end for

return $\mathbf{\Phi}$