Algorithm 1: Democratic Co-Learning - fit

Input: Labelled data L, unlabelled U and learning algorithms A_1,...,
$\quad\quad\quad A_n$

1 **for** $i = 1,...,n$
2 $\quad L_i = L$
3 $\quad e_i = 0$
4 **endfor**
5 **repeat**
6 $\quad$ **for** $i = 1,...,n$
7 $\quad\quad$ Calculate H_i by training A_i with L_i
8 $\quad$ **endfor**
9 $\quad$ **for** *each unlabelled instance* $x \in U$
10 $\quad\quad$ **for** *each posible label* $j = 1,...,n$
11 $\quad\quad\quad c_j = |\{H_i|H_i(x) = j\}|$
12 $\quad\quad$ **endfor**
13 $\quad\quad k = arg\ max_j\{c_j\}$
14 $\quad$ **endfor**
15 $\quad$ /* Proposed instances to label*/
16 $\quad$ **for** $i = 1,...,n$
17 $\quad\quad$ Use L to calculate the 95% confidence interval $[l_i, h_i]$ of H_i
18 $\quad\quad w_i = (l_i + h_i)/2$
19 $\quad$ **endfor**
20 $\quad$ **for** $i = 1,...,n$
21 $\quad\quad L_i' = \emptyset$
22 $\quad$ **endfor**
23 $\quad$ **if** $\sum_{H_j(x)=c_k} w_j > max_{c_k' \neq c_k} \sum_{H_j(x)=c_k' w_j}$
24 $\quad\quad L_i' = L_i' \cup \{(x,c_k)\}, \forall i$ such that $H_i(x) \neq c_k$
25 $\quad$ **end**
26 $\quad$ /* Estimate whether adding L_i' to L_i improves accuracy*/
27 $\quad$ **for** $i = 1,...,n$
28 $\quad\quad$ Use L to calculate the 95% confidence interval $[l_i, h_i]$ of H_i
29 $\quad\quad q_i = |L_i|(1 - 2(\frac{e_i}{|L_i|})^2)$ /*Error rate*/
30 $\quad\quad e_i' = (1 - \frac{\sum_{i=1}^{d} l_i}{d})|L_i'|$ /*New error rate*/
31 $\quad\quad q_i' = |L_i \cup L_i'|(1 - \frac{2(e_i + e_i')}{|L_i \cup L_i'|})^2$
32 $\quad\quad$ **if** $q_i' > q_i$
33 $\quad\quad\quad L_i = L_i \cup L_i'$
34 $\quad\quad\quad e_i = e_i + e_i'$
35 $\quad\quad$ **end**
36 $\quad$ **endfor**
37 **until** L_1,..., L_n *do not change*
38 **return** $Combine(H_1, H_2, ..., H_n)$