Algorithm 1 Minimax Active Learning (MAL)

Input: Labeled pool $\mathcal{L}$, Unlabeled pool $\mathcal{U}$, Initialized models for $\theta_F, \theta_C, \theta_D$

Input: Hyperparameters: epochs, M, α_1, α_2, α_3

for $e = 1$ to epochs **do**
  sample $(x_L, y_L) \sim \mathcal{L}$
  sample $x_U \sim \mathcal{U}$
  Compute $\mathcal{L}_{\text{CE}}$ by using Eq. 1
  $\theta'_F \leftarrow \theta_F - \alpha_1 \nabla \mathcal{L}_{\text{CE}}$
  $\theta'_C \leftarrow \theta_C - \alpha_2 \nabla \mathcal{L}_{\text{CE}}$
  Compute $\mathcal{L}_{Ent}$ by using Eq. 2
  $\theta'_F \leftarrow \theta_F + \alpha_1 \nabla \mathcal{L}_{\text{Ent}}$
  $\theta'_C \leftarrow \theta_C - \alpha_2 \nabla \mathcal{L}_{\text{Ent}}$
  Compute $\mathcal{L}_{\text{D}}$ by using Eq. 3
  $\theta'_D \leftarrow \theta_D - \alpha_3 \nabla \mathcal{L}_{\text{D}}$
end for
return Trained $\theta_F, \theta_C, \theta_D$

Algorithm 2 Sampling Strategy in MAL

Input: b, X_L, X_U

Output: X_L, X_U

Select samples (X_s) with $\min_b\{\theta_D(F(x))\}$ and $\max_b\{\theta_C(F(x))\}$
$Y_o \leftarrow \mathcal{ORACLE}(X_s)$
$(X_L, Y_L) \leftarrow (X_L, Y_L) \cup (X_s, Y_o)$
$X_U \leftarrow X_U - X_s$
return X_L, X_U