

Given:  $(x_1, y_1), \dots, (x_m, y_m)$  where  
 $x_i \in X, y_i \in Y = \{-1, +1\}$

Initialize  $D_1(i) = 1/m$ .

For  $t = 1, \dots, T$ :

- Train weak learner using distribution  $D_t$ .
- Get weak classifier  $h_t: X \rightarrow \mathbb{R}$ .
- Choose  $\alpha_t \in \mathbb{R}$ .
- Update:

$$D_{t+1}(i) = \frac{D_t(i) \exp(-\alpha_t y_i h_t(x_i))}{Z_t}$$

Where  $Z_t$  is a normalization factor

$$Z_t = \sum_{i=1}^m D_t(i) \exp(-\alpha_t y_i h_t(x_i))$$

Output the final classifier:

$$H(x) = \text{sign} \left( \sum_{t=1}^T \alpha_t h_t(x) \right).$$

Choose  $\alpha_t$  to minimize training error

$$\alpha_t = \frac{1}{2} \ln \left( \frac{1 - \epsilon_t}{\epsilon_t} \right)$$

where

$$\epsilon_t = \sum_{i=1}^m D_t(i) \delta(h_t(x_i) \neq y_i)$$