27/5/25

Date / /
Page

Lab-9

Boosting ensemble method

AdaBoost Algorithm

Input
- Training dataset $D = \{(x_i, y_i)\}_{i=1}^{N}$ where x_i is a feature vector and $y_i \in \{-1, +1\}$
- No of weak learners
- weak learner algorithm

output
- a weighted ensemble of T weak learners for classification

Steps:

1. Initialize weights:
→ assign equal weights to each training sample: $w_i = \frac{1}{N}$ for $i = 1, 2, N$
2. For $t = 1$ to T
- Train a weak learner
→ train a weak learner $h_t(x)$ on the dataset D
→ The weak learner minimizes the weighted

Date / /
Page

- Compute weak learner weight

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

- Update sample weights:

$$w_i \leftarrow w_i * \exp(-\alpha_t \cdot y_i \cdot h_t(x_i))$$

$$w_i \leftarrow \frac{w_i}{\sum_{j=1}^{N} w_j}$$

3 Prediction

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

output the class label: -1 or +1