

Question 2 – AdaBoost

AdaBoost (Adaptive Boosting) is another approach to the ensemble method field.

It always uses the entire data and features (unlike before) and aims to create T weighted classifiers (unlike before, where each classifier had same influence). The new classification will be decided by linear combination of all the classifiers, by:

$$g(x) = \text{sign} \left(\sum_{t=1}^T \alpha_t f_t(x) \right), \alpha_t \geq 0$$

Consider the following dataset in \mathbb{R}^2 :

- 1) The first decision stump is already drawn, the arrow points in the positive direction. Calculate the classifier error (ϵ_1) and weight (α_1).
- 2) Calculate the new weights of the samples (and normalize them to get valid distribution).
- 3) Draw the second decision stump. Reminder: the decision stump (our classifiers) are parallel to x/y axis.
- 4) Without calculations, which classifier's weight is larger, α_1 or α_2 ? Explain why.
- 5) In the right image, there is the dataset and the weights for each point, after finding the third decision stump and calculating the new weights. Which of the following (green or blue) is the correct third decision stump?
- 6) Given $\alpha_2 = 1.1$, $\alpha_3 = 0.62$, draw the full classifier, like in slide 13.
What is the train accuracy?

