

Relative Mistake Bound for Weighted-Majority

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1 Theorem

$$\frac{-k \log_2(\beta) + \log_2(n)}{1 - \log_2(1 + \beta)} \quad (1)$$

2 Proof

The weight for a given prediction algorithm after making k mistakes is given by Equation 2.

$$\beta^k \quad (2)$$

Let w_0 be the initial sum of the weights for all n algorithms given by Equation 3.

$$\sum_{i=1}^n w_i = n = w_0 \quad (3)$$

In the worst case, all n prediction algorithms make a mistake and the total weight sum is given by Equation 4.

$$\sum_{i=1}^n \beta w_i = \beta \sum_{i=1}^n w_i = \beta n \quad (4)$$

References

- [1] Tom M. Mitchell, *Machine Learning*, WCB McGraw-Hill, Boston, 1997.