1 HW3 / 2025

In this homework you will develop an alternative derivation of the BW weights algorithm.

In the Halving algorithm we assume that one of the N experts never makes a mistake.

Here the assumption is that at least one of the experts makes at most k mistakes.

Derive the BW algorithm by reduction to the halving algorithm.

Hints

- Suppose you have an upper bound of M on the number of mistakes of your yet-to-be-born algorithm. Given that assumption, can you reduce the problem to the old problem, where one of the experts makes no mistake.

- You will have to increase the number of experts to do this reduction.

- Once you have the reduction, use the $\log_2 N$ bound on the halving algorithm to get a bound on your algorithm.

- You have the main pieces, and algorithm and a bound. Next you have to work on keeping everything consistent.

- There is a version of this algorithm where everything is planned in advance and you assume that the adversary is playing optimally. There is a more sophisticated algorithm that takes advantage of the mistakes of a suboptimal adversary.