DSC 291: Online Learning - Homework 1

Winter 2025

Due: January 21, 2025

Problem Statement

We observe a bit sequence $Y_1, Y_2, \ldots \in \{0, 1\}$. We generate a sequence of predictions $p_1, p_2, \ldots \in [0, 1]$ and would like to minimize the cumulative loss

$$L_T = \sum_{t=1}^{T} |p_t - Y_t|.$$

We consider two scenarios:

1. We assume that the sequence is generated by i.i.d. coin flips where

$$P(Y_t = 1) = q, \quad \text{with } q \text{ unknown.}$$

2. We do not assume anything about how the sequence is generated. We want the cumulative loss to not be much larger than the cumulative loss of the best (in hindsight) fixed prediction $h \in [0, 1]$.

Submission

Please submit a single compiled PDF with your solutions to Gradescope on or before **January 21**.