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January 12, 2026
Due: January 19, 2026 at 10:00 p.m.

Algorithms and Uncertainty

Winter Term 2025/26

Exercise Set 12

If you would like to present one of your solutions in class, please use the following link to book a presentation slot by Monday evening:
https://terminplaner6.dfn.de/b/6a94a167f192388c8cd6d50a3cfe09cc-1552907
A short meeting to discuss your solution is mandatory before presenting it in class. To book a time slot for this meeting, please use the following link by Monday evening as well:
https://terminplaner6.dfn.de/b/519004eccf7fb04f5aa59abf5b30b36a-1552903

Exercise 1: (5 Points)
We consider a different form of feedback in the experts setting. After step t, the algorithm does not get to know $\ell_i^{(t)}$ for all i but a noisy version. More precisely, an adversary first fixes the sequence $\ell^{(1)}, \ldots, \ell^{(T)}$, where all costs are in $[0,1]$. Afterwards, from this sequence $\bar{\ell}^{(1)}, \ldots, \bar{\ell}^{(T)}$ is computed, where $\bar{\ell}_i^{(t)} = \ell_i^{(t)} + \nu_i^{(t)}$ and $\nu_i^{(t)}$ is an independent random variable on $[-\epsilon, \epsilon]$ with $\mathbf{E}[\nu_i^{(t)}] = 0$.
State a no-regret algorithm and a bound for the regret. You can make use of last weeks exercise.

Exercise 2: (3 Points)
Let each $\ell_i^{(t)} \in \{0,1\}$. We consider the following Greedy algorithm for the experts setting. In each step t, the algorithm selects I_t which satisfies $I_t = \arg\min_{i\in[n]} L_i^{(t-1)}$, i.e. the expert with the best cumulative cost so far (ties are broken adversarially).
Show that $L_{\text{Alg}}^{(T)} \leq n \cdot \min_i L_i^{(T)} + (n-1)$