CS 747, Autumn 2020: Week 1, Q&A

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Question 1

- Why did we define algorithms as mappings from the set of histories to the set of (probability distributions over) actions? What if decisions had to take other details (apart from history) into consideration?

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Sufficient to:

achieve optimal regret,

describe many existing algorithms.

Question 2

- What is the number of histories of length T?

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Say algorithm assigns "a" arms non-zero probability for each history, and rewards can take "b" possible values.

Answer: $(ab)^T$.

Question 3

- In our definitions of algorithms and regret, why does the index stop at $T-1$ (rather than T)?

  Here is what an algorithm does—

  For $t = 0, 1, 2, \ldots, T-1$:

  - Given the history $h^t = (a^0, r^0, a^1, r^1, a^2, r^2, \ldots, a^{t-1}, r^{t-1})$,
  - Pick an arm a^t to sample (or "pull"), and
  - Obtain a reward r^t drawn from the distribution corresponding to arm a^t.

  $R_T = Tp^* - \sum_{t=0}^{T-1} \mathbb{E}[r^t]$.

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T pulls, rewards counted in horizon T.
Matter of convention.

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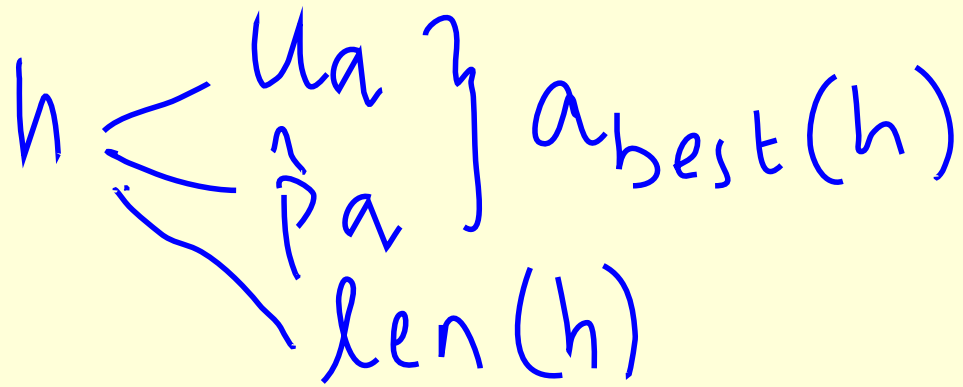

Say 3 arms

$\epsilon/2$

if $len(h) \le \epsilon$ [1/3, 1/3, 1/3]

else 1 to $a_{best}(h)$, 0 to other arms.

$\epsilon/3$

$\left[\frac{\epsilon}{3}, 1-\epsilon+\frac{\epsilon}{3}, \frac{\epsilon}{3}\right]$

$a_{best}(h)$

Question 5

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In practice, maybe.

In theory, NO! Will have linear regret.

Question 6

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