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On-Line Learning · Randomized weighted majority algorithm

$A = \{1, \dots, N\}$: available actions. At each round $t \in [T]$, an on-line algorithm A selects a distribution $\vec{p}_t$ over the set of actions, receives a loss vector $\vec{\ell}_t$, whose i^{th} component $\ell_{t,i} \in [0,1]$ ⊕ is the loss associated with action i, and incurs the expected loss $L_t = \sum_{i=1}^{N} p_{t,i}\, \ell_{t,i}$. The total loss incurred by the algorithm over T rounds is $L_T = \sum_{t=1}^{T} L_t$. The total loss associated to action i is $L_{T,i} = \sum_{t=1}^{T} \ell_{t,i}$.

RANDOMIZED-WEIGHTED-MAJORITY(N)

1. for $i \leftarrow 1$ to N do
2. $\quad w_{1,i} \leftarrow 1$
3. $\quad p_{1,i} \leftarrow 1/N$.
4. for $t \leftarrow 1$ to T do
5. $\quad$ RECEIVE($\vec{\ell}_t$)
6. $\quad$ for $i \leftarrow 1$ to N do
7. $\quad\quad$ if ($\ell_{t,i} = 1$) then
8. $\quad\quad\quad w_{t+1,i} \leftarrow \beta w_{t,i}$
9. $\quad\quad$ else $w_{t+1,i} \leftarrow w_{t,i}$
10. $\quad W_{t+1} \leftarrow \sum_{i=1}^{N} w_{t+1,i}$
11. $\quad$ for $i \leftarrow 1$ to N do
12. $\quad\quad p_{t+1,i} \leftarrow w_{t+1,i} / W_{t+1}$

⊕ $\ell_{t,i} \in \{0,1\}$ in our cases

10 5 πιθανές δράσεις ($N=5$) με κωδικό 0 ως 4.

$c_1 \neq 0$ για τις ενέργειες $184 \bmod 5 = 4$, $-45 \bmod 5 = 0$

$x = 9 - k = 9 - 4 \Rightarrow x = 5$, οπότε $\beta = 0.5$

Ισχύει $w_{1,i} = 1, \forall i = 0, \dots, 4$ και $P_{1,i} = 0.2$, $\vec{c}_1 = [1, 0, 0, 0, 1]$

Άρα $$w_{2,i} = \begin{cases} 1, & \text{αν } i = 1, 2, 3 \\ 0.5, & \text{αν } i = 0, 4 \end{cases}$$, οπότε $W_2 = 1 + 1 + 1 + 0.5 + 0.5 = 4$

Συνεπώς $$P_{2,i} = \begin{cases} \frac{1}{4}, & \text{αν } i = 1, 2, 3 \\ 1/8, & \text{αν } i = 0, 4 \end{cases}$$