

高级算法作业 1

TRY 计算机科学与技术

1. Exercise 1.7(P18)

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解: (a) $P(X=x_1) = P(X=x_2) = P(X=x_3) = P(X=x_4) = \frac{1}{4}$

The expected payoffs for the three possible actions are

$$\pi(a_1) = 3 \times \frac{1}{4} + \frac{1}{4} \times 3 = 1.5$$

$$\pi(a_3) = 1 \times \frac{1}{4} \times 4 = 1$$

$$\pi(a_2) = 3 \times \frac{1}{4} + 3 \times \frac{1}{4} = 1.5$$

So the optimal actions are a_1 and a_2

(b) $P(X=x_1) = P(X=x_3) = \frac{1}{8}$, $P(X=x_2) = P(X=x_4) = \frac{3}{8}$

The expected payoffs for the three possible actions are

$$\pi(a_1) = \frac{1}{8} \times 3 + \frac{1}{8} \times 3 = \frac{3}{4}$$

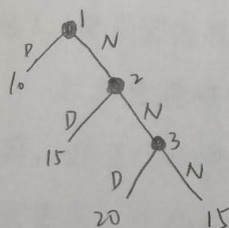
$$\pi(a_3) = 1 \times \frac{1}{8} + 1 \times \frac{3}{8} + 1 \times \frac{1}{8} + 1 \times \frac{3}{8} = 1$$

$$\pi(a_2) = \frac{3}{8} \times 3 + \frac{3}{8} \times 3 = \frac{9}{4}$$

So the optimal action is a_2 .

2. Exercise 2.1(P34)

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(a) pure-strategy set:

$$S = \{DNN, DND, DDD, DDN, NDD, NDP, NND, NNN\}$$

optimal strategy: NND

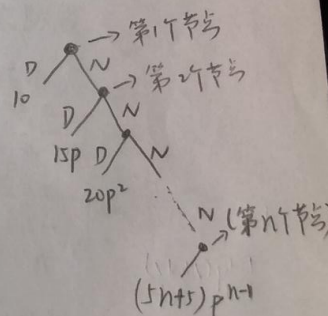
(b) the optimal strategy is $\underbrace{NN \dots ND}_{(n-1) \text{ times}}$

(c) 若在第2轮停止 (意味着第3轮没必要进行), 则 $15p > 10$, 即 $p > \frac{2}{3}$

若在第3轮停止, 则 $20p^2 > 15p$, 即 $p > \frac{3}{4}$; 第4轮停止, 则 $p > \frac{4}{5}$

... 在第n轮停止, 则 $p > \frac{n}{n+1}$, 目标: 找到最大的n满足 $\begin{cases} p > \frac{n}{n+1} \\ p < \frac{n+1}{n+2} \end{cases}$

则 $n = \lfloor \frac{p}{1-p} \rfloor$, optimal solution is $\underbrace{NN \dots ND}_{n \text{ times}}$



3. Exercise 2.4(P42)

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"C" for "Care"
 "D" for "Don't care"

"H" for "High" — Male 1
 "M" for "Medium" — Male 2
 "L" for "Low" — Male 3

由决策树及题中条件 " $V_H > V_M > V_L$ " 可知, 不需考虑 Low 分支对应的策略, 只用比较 $\frac{1}{2}V_H$ 和 V_M 的相对大小。

当 $\frac{1}{2}V_H \geq V_M$ 即 $V_H \geq 2V_M$ 时, 最优策略为 HCCC

当 $\frac{1}{2}V_H < V_M$ 即 $V_H < 2V_M$ 时, 最优策略为 MCCC