CIS 419/519: Applied Machine Learning — Spring 2023

Homework 5

Handed Out: April 5 — *Due: April 19, 7:59 p.m.*

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1 Multiple Choice & Written Questions

1. (a) bob loves cookie

   (b) $lnP(w1 = loves, w2 = cookie|w0 = bob) = lnP(w1 = loves|w0 = bob) + lnP(w2 = cookie|w1 = loves, w0 = bob) = ln0.5 + ln0.4 = ln0.2 =$
   $lnP(w1 = hates, w2 = cookie|w0 = bob) = lnP(w1 = hates|w0 = bob) + lnP(w2 = cookie|w1 = hates, w0 = bob) = ln0.4 + ln0.2 = ln0.08$

   (c) no. greedy sampling may be the best for the first word, but it is not the best for the second word. And the combination of this two gram may not be the highest probability among the 2-gram model.

   (d) $lnP(w1 = loves, w2 = Bob|w0 = Bob) = lnP(w1 = loves|w0 = Bob) + lnP(w2 = Bob|w1 = loves, w0 = Bob) = ln0.5 + ln0.25 = ln0.125$
   $lnP(w1 = hates, w2 = cherry|w0 = Bob) = lnP(w1 = hates|w0 = Bob) + lnP(w2 = cherry|w1 = hates, w0 = Bob) = ln0.4 + ln0.7 = ln0.28$
   Compared with answer calculated in (a), we should keep the two sentence with higher probability. So the answer is "Bob loves cherry" and "Bob loves cookie".

2. (a)
   [0.520.370.310.16]

   (b)
   [0.2970.2550.2410.207]

   (c)
   [0.27960.40320.2620.3138]

3. (a)

State s	Condition	i	Vi(s)
P	V(P)>0	2	75
Q	V(Q)>0	2	30
P	V(P) = V*(P)	2	75
Q	V(Q) = V*(Q)	5	75

   (b)

State s	Condition	i	Vi(s)
P	V(P) = V*(P)	2	48

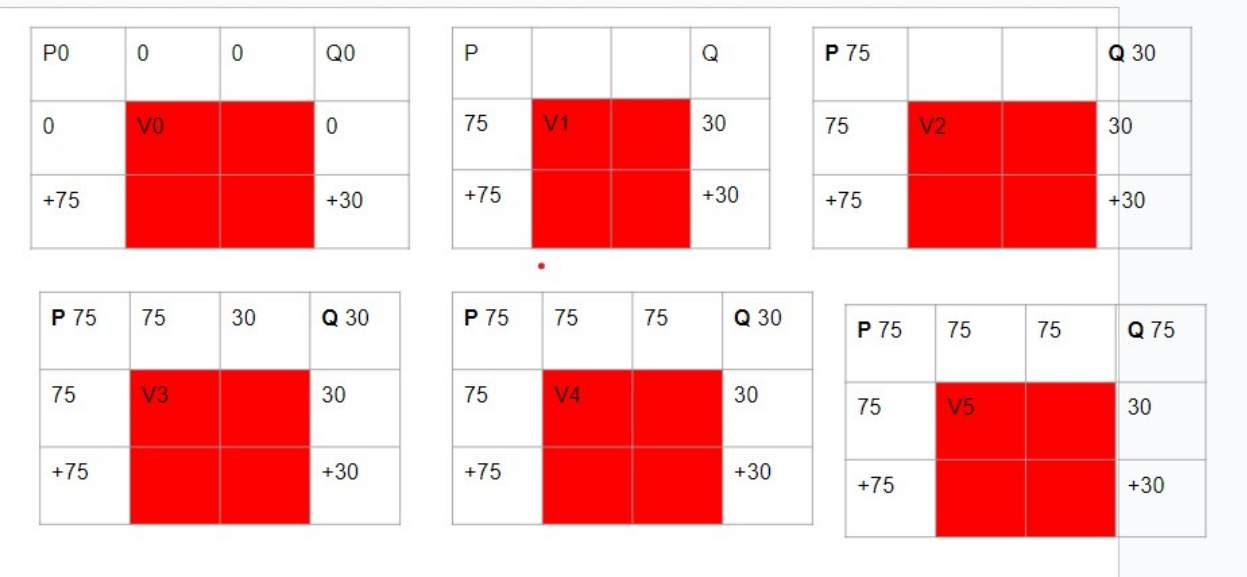

Figure 1: (a) The value iteration process

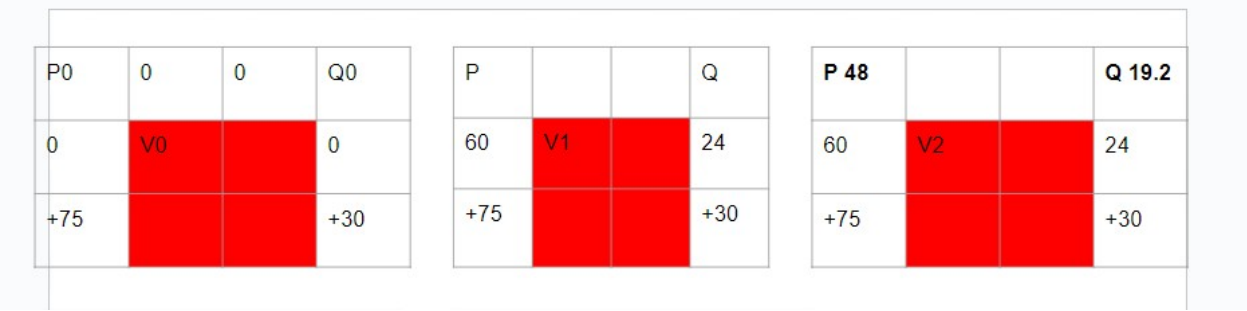

Figure 2: (b) The stochastic value iteration process

4. (a) see figures below
   (b) V* = 6.4
   (c) grid[row2, col3] = 8, grid[row1, col3] = 10

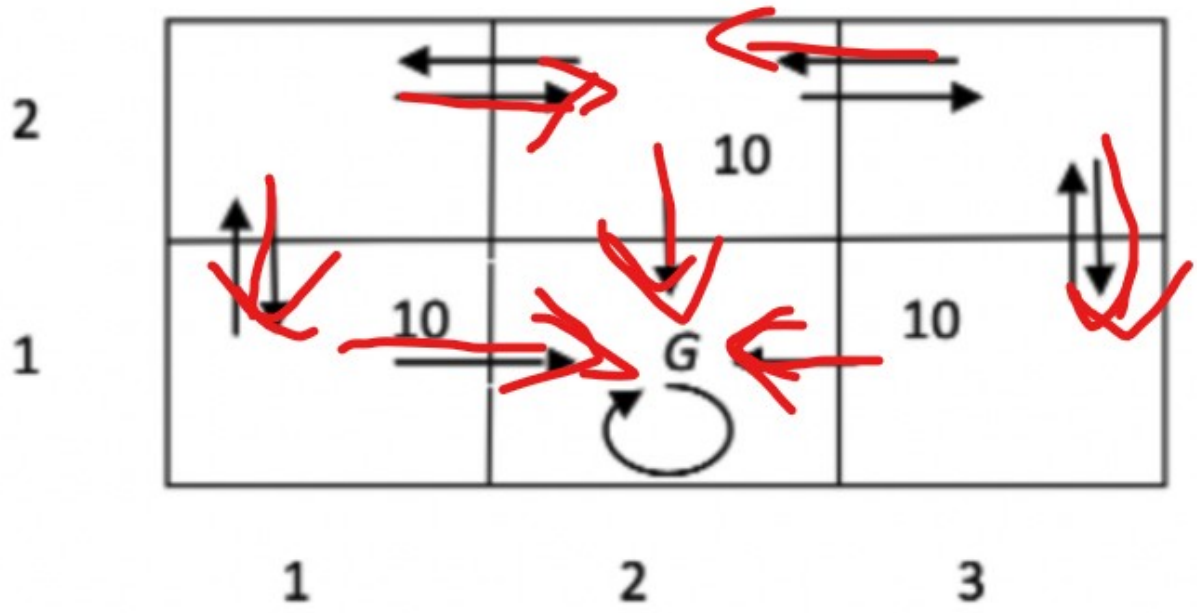

Figure 3: (a) The optimal action