CSPB 3202 - Truong - Artificial Intelligence

Started on	Thursday, 11 July 2024, 9:17 PM
State	Finished
Completed on	Thursday, 11 July 2024, 9:38 PM
Time taken	20 mins 9 secs
Grade	Not yet graded

Question **1**

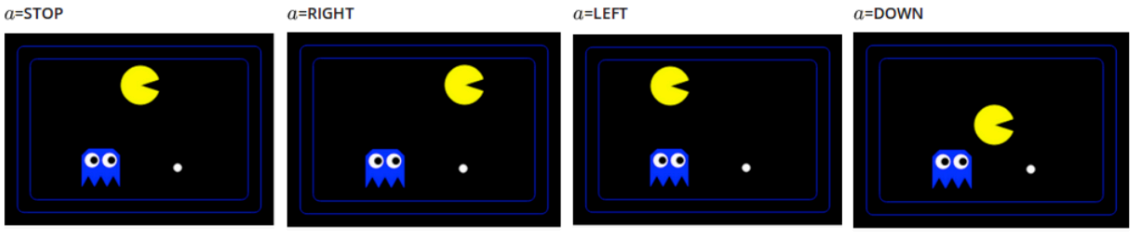
Correct

Mark 3.00 out of 3.00

A Pacman agent is using a feature-based representation to estimate the $Q(s,a)$ value of taking an action in a state, and the features the agent uses are:

- f_0 = 1/(Manhattan distance to closest food + 1)
- f_1 = 1/(Manhattan distance to closest ghost + 1)

The images below show the result of taking actions STOP, RIGHT, LEFT, and DOWN from a state A. The feature vectors for each action are shown below each image. For example, the feature representation $f(s = A, a = \textbf{STOP}) = [1/4, 1/4]$.



$f(s,a)$	[0.25, 0.25]	[1/3, 0.2]	[0.2, 1/3]	[1/3, 1/3]

The agent picks the action according to $\arg\max_a Q(s,a) = w^T f(s,a) = w_0 f_0(s,a) + w_1 f_1(s,a)$, where the features $f_i(s,a)$ are as defined above, and w is a weight vector.

Using the weight vector $w = [0.2, 0.5]$, which action, of the ones shown above, would the agent take from state A?

Select one:

- STOP
- RIGHT
- LEFT
- DOWN ✔ $0.2 * 0.33 + 0.5 * 0.33 = 0.231$

Your answer is correct.

Question **2**

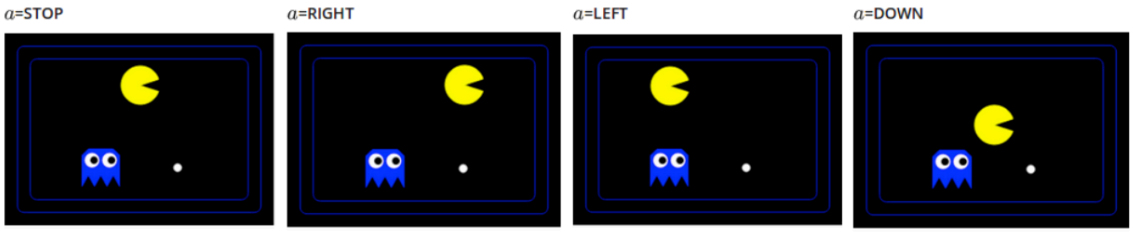
Correct

Mark 3.00 out of 3.00

A Pacman agent is using a feature-based representation to estimate the $Q(s,a)$ value of taking an action in a state, and the features the agent uses are:

- f_0 = 1/(Manhattan distance to closest food + 1)
- f_1 = 1/(Manhattan distance to closest ghost + 1)

The images below show the result of taking actions STOP, RIGHT, LEFT, and DOWN from a state A. The feature vectors for each action are shown below each image. For example, the feature representation $f(s = A, a = \textbf{STOP}) = [1/4, 1/4]$.



$f(s,a)$	[0.25, 0.25]	[1/3, 0.2]	[0.2, 1/3]	[1/3, 1/3]

The agent picks the action according to $\arg\max_a Q(s,a) = w^T f(s,a) = w_0 f_0(s,a) + w_1 f_1(s,a)$, where the features $f_i(s,a)$ are as defined above, and w is a weight vector.

Using the weight vector $w = [0.2, -1]$, which action, of the ones shown above, would the agent take from state A?

Select one:

- STOP
- RIGHT ✔ $0.2 * 0.33 - 0.2 = -0.134$
- LEFT
- DOWN

Your answer is correct.

Question **3**

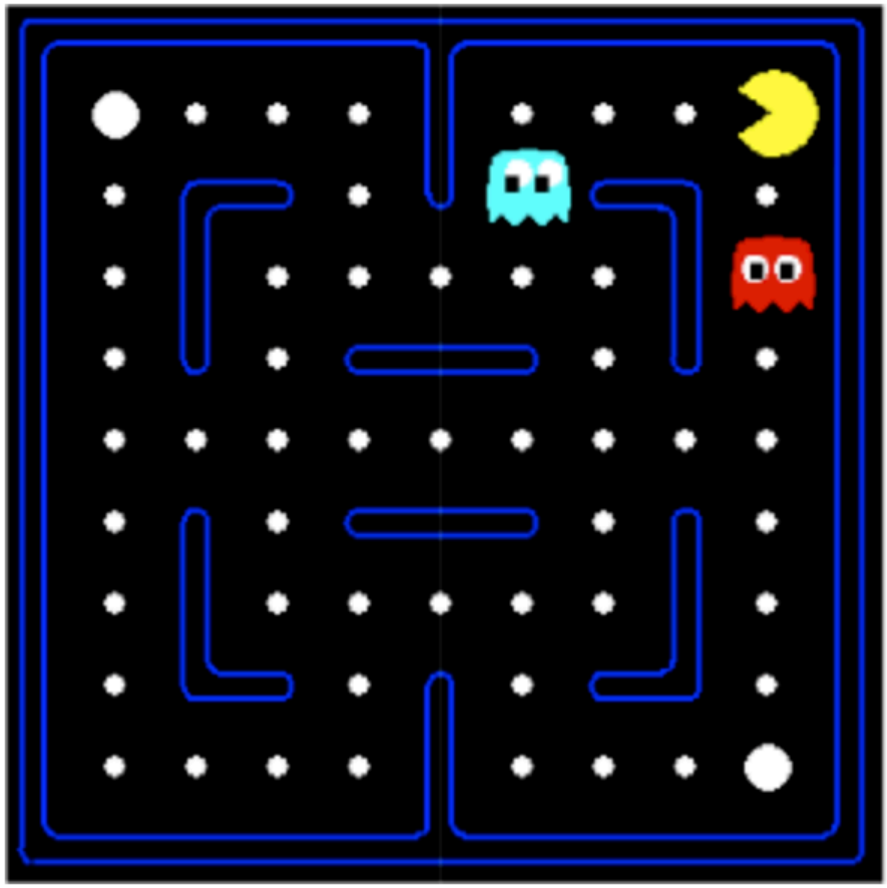
Correct

Mark 9.00 out of 9.00

Consider the following feature based representation of the Q-function: $Q(s,a) = w_1 f_1(s,a) + w_2 f_2(s,a)$ with
$f_1(s,a) = 1/(\text{Manhattan distance to nearest dot after having executed action } a \text{ in state } s)$
$f_2(s,a) = (\text{Manhattan distance to nearest ghost after having executed action } a \text{ in state } s)$

Q1:

Assume$w_1 = 1, w_2 = 10$. For the state s shown below, find the following quantities. Assume that the red and blue ghosts are both sitting on top of a dot.



Q(s, West) = 31 ✔

Q(s, South) = 11 ✔

Based on this approximate Q-function, which action would be chosen:

West ✔

Q2:

Assume Pac-Man moves West. This results in the state s' shown below. Pac-Man receives reward 9 (10 for eating a dot and -1 living penalty). Assume $\gamma = 1$.

Q(s',West)= 11 ✔

Q(s',Eest)= 11 ✔

sample =$[r + \gamma max_{a'} Q(s', a')]$= 20 ✔

Q3:

Now let's compute the update to the weights. Let $\alpha = 0.5$.

difference =$[r + \gamma max_{a'} Q(s', a')] - Q(s, a)$= -11 ✔

w_1 <- $w_1 + \alpha(difference) f_1(s, a)$= -4.5 ✔

w_2 <- $w_2 + \alpha(difference) f_2(s, a)$= -6.5 ✔

Question **4**

Complete

Marked out of 4.00

For the following questions, you will be given a set of probability tables and a set of conditional independence assumptions. Given these tables and independence assumptions, write an expression for the requested probability tables. Keep in mind that your expressions cannot contain any probabilities other than the given probability tables. If it is not possible, mark "Not possible."

(i) Using probability tables P(A), P(A | C), P(B | C), P(C | A, B) and no conditional independence assumptions, write an expression to calculate the table P(A, B | C).

(ii) Using probability tables P(A), P(A | C), P(B | A), P(C | A, B) and no conditional independence assumptions, write an expression to calculate the table P(B | A, C).

(iii) Using probability tables P(A | B), P(B), P(B | A, C), P(C | A) and conditional independence assumption A⫫B, write an expression to calculate the table P(C).

(iv) Using probability tables P(A | B, C), P(B), P(B | A, C), P(C | B, A) and conditional independence assumption A⫫B | C, write an expression for P(A, B, C).

Part (i)

Not Possible

Part (ii)

$$\frac{P(A)P(B|A)P(C,B|A)}{\sum_b P(A)P(B|A)P(C|A,B)}$$

Part (iii)

$$\sum_a P(A|B)P(C|A)$$

Part (iv)

Not Possible

Question **5**

Correct

Mark 1.00 out of 1.00

For each of the following equations, select the minimal set of conditional independence assumptions necessary for the equation to be true.

$P(A, C) = P(A \mid B)\, P(C)$

Select one or more:

- [x] $A \perp\!\!\!\perp B$ ✔
- [ ] $B \perp\!\!\!\perp C$
- [ ] $A \perp\!\!\!\perp B \mid C$
- [ ] $B \perp\!\!\!\perp C \mid A$
- [x] $A \perp\!\!\!\perp C$ ✔
- [ ] $A \perp\!\!\!\perp C \mid B$
- [ ] No independence assumptions needed.

Your answer is correct.

Question **6**

Correct

Mark 1.00 out of 1.00

For each of the following equations, select the minimal set of conditional independence assumptions necessary for the equation to be true.

$P(A \mid B, C) = \frac{P(A)P(B|A)P(C|A)}{P(B|C)P(C)}$

Select one:

- A ⫫ B
- B ⫫ C
- A ⫫ B | C
- B ⫫ C | A ✔
- A ⫫ C
- A ⫫ C | B
- No independence assumptions needed.

Your answer is correct.

Question **7**

Correct

Mark 1.00 out of 1.00

For each of the following equations, select the minimal set of conditional independence assumptions necessary for the equation to be true.

P(A, B) = $\sum_c P(A|B,c)P(B|c)P(c)$

Select one:

- A ⫫ B
- B ⫫ C
- A ⫫ B | C
- B ⫫ C | A
- A ⫫ C

A ⫫ C | B

No independence assumptions needed. ✔

Your answer is correct.

Question **8**

Correct

Mark 1.00 out of 1.00

For each of the following equations, select the minimal set of conditional independence assumptions necessary for the equation to be true.

$P(A, B \mid C, D) = P(A \mid C, D)\, P(B \mid A, C, D)$

Select one:

A ⫫ B

C ⫫ D | A

A ⫫ B | C

C ⫫ D | B

A ⫫ B | D

C ⫫ D

No independence assumptions needed. ✔

Your answer is correct.

Question **9**

Correct

Mark 1.00 out of 1.00

Mark all expressions that are equal to P(A | B), given no independence assumptions.

Select one or more:

- [ ] $\sum_c P(A|B,c)$
- [ ] $\frac{P(A,C|B)}{P(C|B)}$
- [x] $\sum_c P(A,c|B)$
- [ ] $\frac{P(A|C,B)P(C|A,B)}{P(C|B)}$
- [ ] $\frac{P(B|A)P(A|C)}{\sum_c P(B,c)}$
- [x] $\frac{\sum_c P(A,B,c)}{\sum_c P(B,c)}$
- [ ] None of the provided options.

Your answer is correct.

Question **10**

Correct

Mark 1.00 out of 1.00

Mark all expressions that are equal to P(A, B, C), given that A⫫B.

Select one or more:

- [ ] P(A|C)P(C|B)P(B)
- [x] P(A)P(B|A)P(C|A,B)
- [x] P(A)P(B)P(C|A,B)
- [x] P(A,C)P(B|A,C)
- [ ] P(C)P(A|C)P(B|C)
- [ ] P(A)P(C|A)P(B|C)
- [ ] None of the provided options.

Your answer is correct.

Question **11**

Correct

Mark 1.00 out of 1.00

Mark all expressions that are equal to P(A, B | C), given that A⫫B | C.

Select one or more:

- [x] P(A|C)P(B|C)
- [ ] $\frac{\sum_c P(A,B,c)}{P(C)}$
- [ ] $\frac{P(A)P(B|A)P(C|A,B)}{\sum_c P(A,B,c)}$
- [x] $\frac{P(C,A|B)P(B)}{P(C)}$
- [ ] P(A|B)P(B|C)
- [ ] $\frac{P(C)P(B|C)P(A|C)}{P(C|A,B)}$
- [ ] None of the provided options.

Your answer is correct.