CSPB 3202 - Truong - Artificial Intelligence

Started on	Wednesday, 3 July 2024, 4:10 PM
State	Finished
Completed on	Wednesday, 3 July 2024, 4:47 PM
Time taken	36 mins 29 secs

Question **1**

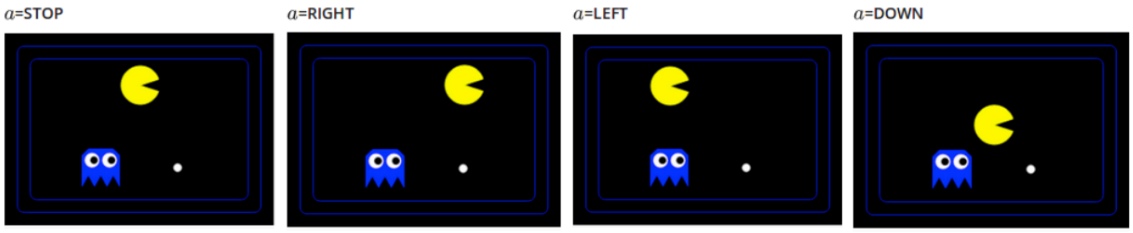
Correct

Marked 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 $f(s = A, a = \textbf{STOP}) = [1/4, 1/4]$.



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 ✔

Question **2**

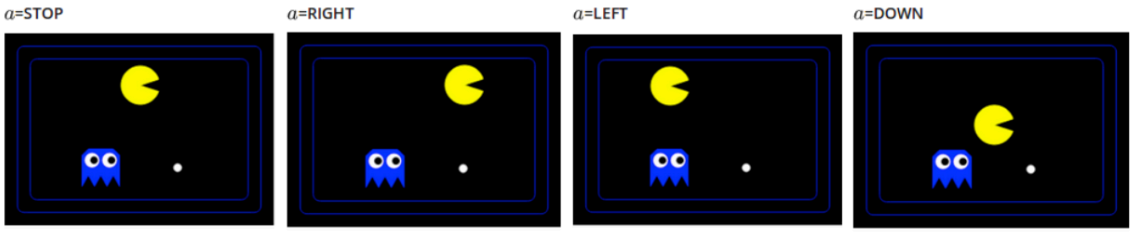
Correct

Marked 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 ✔
- LEFT
- DOWN

Question **3**

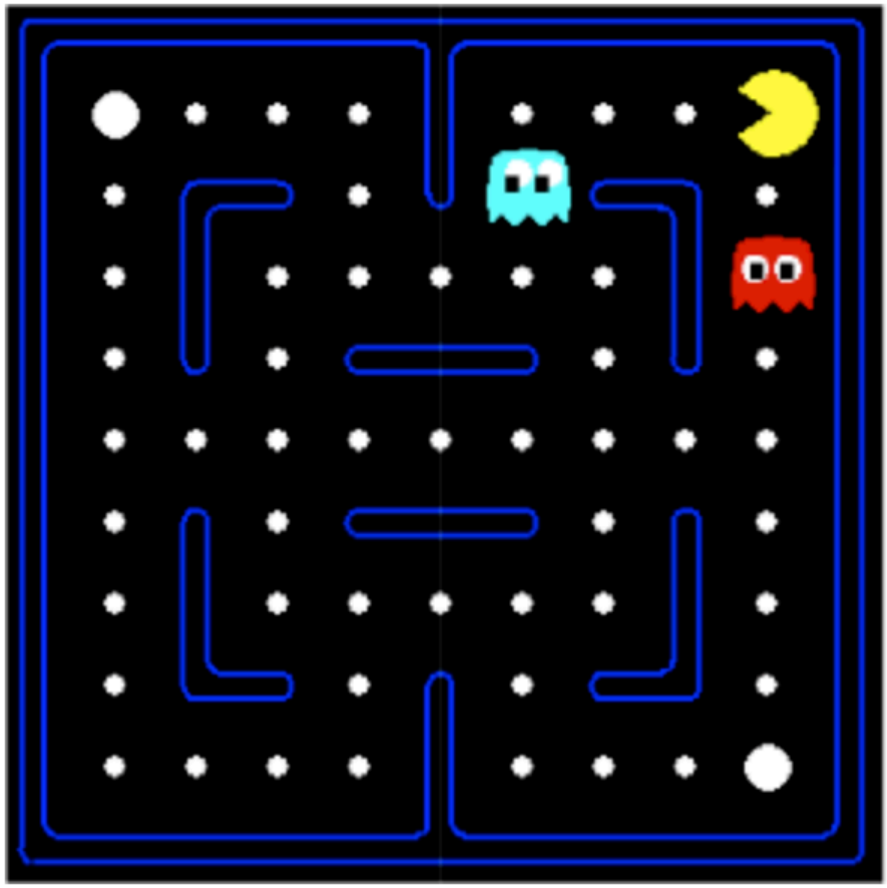
Correct

Marked 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 ✔