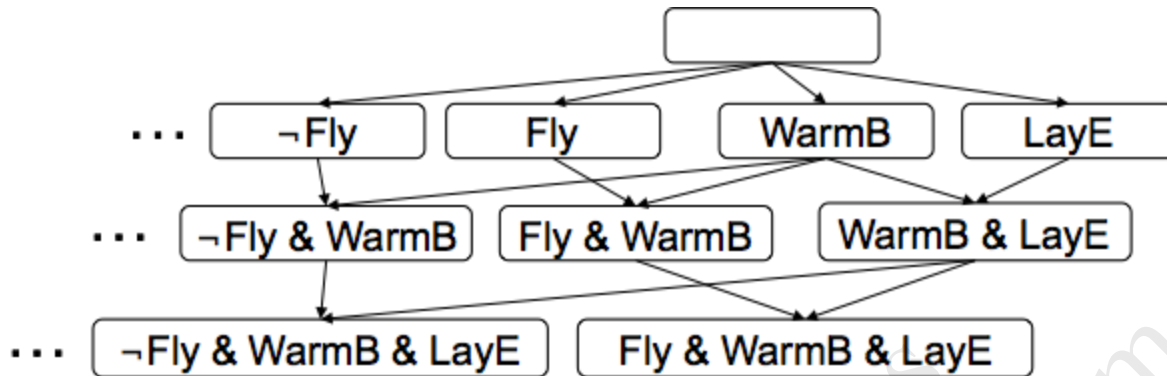


Given this generality partial order for the bird concept hypotheses answer the questions below:



Write the set of bird hypotheses that are consistent with all the training data after each of the following examples is added to the set **T**, which is initially empty.

1) (2pts) Add to training set **T**:  $f(\text{Robin: WarmB} \ \& \ \text{LayE} \ \& \ \text{Fly}) = \text{Bird}/+$

All consistent bird hypotheses: Any, Fly, WarmB, LayE, Fly&WarmB, Warmb&LayE, Fly&WarmB&LayE,

2) (2pts) Add to training set **T**:  $f(\text{Pteranodon: ColdB} \ \& \ \text{LayE} \ \& \ \text{Fly}) = \text{Reptile}/-$

All consistent bird hypotheses: WarmB, Fly&WarmB, Warmb&LayE, Fly&WarmB&LayE

3) (2pts) Add to training set **T**:  $f(\text{Bat: WarmB} \ \& \ \neg \text{LayE} \ \& \ \text{Fly}) = \text{Mammal}/-$

All consistent bird hypotheses: Warmb&LayE, Fly&WarmB&LayE

4) (2pts) Add to training set **T**:  $f(\text{Ostrich: WarmB} \ \& \ \text{LayE} \ \& \ \neg \text{Fly}) = \text{Bird}/+$

All consistent bird hypotheses: Warmb&LayE

5) (2pts) Add to training set **T**:  $f(\text{Platypus: WarmB} \ \& \ \text{LayE} \ \& \ \neg \text{Fly}) = \text{Mammal}/-$

None

Given the grid below answer the questions below:

3	0.812	0.868	0.918	<div style="border: 1px solid black; padding: 2px;">+ 1</div>
2	0.762		0.660	<div style="border: 1px solid black; padding: 2px;">- 1</div>
1	0.705	0.655	0.611	0.388
	1	2	3	4

1) (5pts) What would be the optimal policy for the grid?

1,1 N 2,1 W 3,1 N 4,1 W

1,2 N 3,2 N

1,3 E 2,3 E 3,3 E

2) (5pts) What are the Q-values for the square (3,2) given that the agent is deterministic, i.e.  $Pr(s, a, s') = 1$ ,  $R(3,2)=0$  and  $\gamma = .5$

Recall that  $Q(a, s) = \sum Pr(s, a, s')[R(s) + \gamma \max Q(a', s')]$  and  $Q(a, s) = 0$  at Terminal states (4,2), (4,3)

$$Q(N, (3,2)) = 1 * [0 + .5 (Q(E, (3,3)))] = .25$$

$$Q(E, (3,2)) = 1 * [-1 + .5 (0)] = -1$$

$$Q(S, (3,2)) = 1 * [0 + .5 (Q(N, (3,1)))] = .0625$$

$$Q(E, (3,3)) = 1 * [0 + .5 (1 * [1 + 0])] = .5$$

$$Q(N, (3,1)) = 1 * [0 + .5 (Q(N, (3,2)))] = .125$$

Given the grid below answer the following questions:

3	0.812	0.868	0.918	<span style="border: 1px solid black; padding: 2px;">+ 1</span>
2	0.762		0.660	<span style="border: 1px solid black; padding: 2px;">- 1</span>
1	0.705	0.655	0.611	0.388
	1	2	3	4

1) (5pts) Is this an optimal policy for the grid? Why or why not?

3	→	→	→	<span style="border: 1px solid black; padding: 2px;">+ 1</span>
2	↑		↑	<span style="border: 1px solid black; padding: 2px;">- 1</span>
1	↑	←	←	←
	1	2	3	4

No, at state 3,1 the optimal action is to go N not W, because state (3,2) has a higher utility value than state (2,2)

2) (5pts) What are the Q-values for the square (3,3) given that the agent is deterministic, i.e.

$Pr(s, a, s') = 1$ ,  $R(3,2)=0$  and  $\gamma = .5$

Recall that  $Q(a, s) = \sum Pr(s, a, s')[R(s) + \gamma \max Q(a', s')]$  and  $Q(a, s) = 0$  at Terminal states (4,2), (4,3)

$$Q(E, (3,3)) = 1 * [0 + .5(1 + 0)] = .5$$

$$Q(W, (3,3)) = 1 * [0 + .5 (Q(E, (3,3)))] = .25$$

$$Q(S, (3,3)) = 1 * [0 + .5 (Q(N, (3,2)))] = .125$$

$$Q(N, (3,2)) = 1 * [0 + .5(Q(E, (3,3)))] = .25$$