Q1

We have following propositions:

P1: mythical -> immortal

P2 : mythical -> (immortal mammal)

P3 : (immortal mammal) -> horned

P4 : horned -> magical

Immortal -> mythical

Immortal -> (immortal mammal)

Immortal (immortal mammal)

(Immortal immortal) (Immortal mammal)

(Immortal mammal)

horned

magical

Therefore, it is magical and horned. There is no way to justify it is mythical.

Q2

Define vocabulary:

Student(x) : person x is a student

Take(x,y) : Student x take course y

Failed(x,y) : Student x failed course y

Person(x) : x is a person

Vegetarian(x) : x is a vegetarian

Like(x,y) : x likes y

Smart(x) : x is smart

Homework(x,y) : x do homework for y

1. x (Student(x) -> (Take(x,history) Take(x,Biology))
2. x (Student(x) Failed(x,history)) y (Student(y) Failed(x,history)) -> x = y
3. x (Person(x) y vegetarian(y) -> like(x,y)) -> smart(x)
4. xy (person(x) vegetarian(y) smart(y)) -> like(x,y)
5. x student(x) y homework(x,y) homework(y,y)

Q3

1. Begin with the rule true -> 1
2. Rgpa = 4/7 = 0.57 Rust = 1/3 = 0.33 Rhku = 2/4 = 0.5 Rcu = 1/4 = 0.25 Rrec = 4/8 = 0.5 R­exp = 3/4 = 0.75 Generating EXP -> 1

The rule covers negative instance, continue this rule.

1. Rgpa = 3/3 = 1 Rust = 0 Rhku = 2/2 = 1 Rcu = 1/1 = 1 Rrec = 3/3 = 1

Generating EXP GPA -> 1

This Rule does not cover negative instance, we stop. Eliminate from the samples and continue to another rule

1. Begin with the rule true -> 1
2. Rgpa = 1/4 = 0.25 Rust = 1/3 = 0.33 Rhku = 0 Rcu = 0 Rrec = 1/5 = 0.2 R­exp = 0

Generating GPA -> 1.

The rule covers negative instance, continue this rule.

1. Rust = 1/2 = 0.5 Rhku = 0 Rcu = 0 Rrec = 1/3 = 0.33 R­exp = 0

Generating GPA UST -> 1.

This rule cover negative instance, continue

1. Rhku = 0 Rcu = 0 Rrec = 1

Generating GPA UST REC -> 1.

This rule does not convers negative instance, stop

(EXP GPA) (GPA UST REC) covers all of the positive instances, we stop.

Q4

P(A) = .001 \* .002 \* .95 + .001 \* .998 \*.94 + .999 \* .002 \*.29 + .999\*.998\*.001 = 0.0025

P( = 1 – P(A) = 0.9975

P(M) = .0025 \* .70 + .9975 \* .01 = 0.0117

P(J M) = P(J M A) \* P(J M A)

= P(J M | A) \* P(A) + P(J M | A) \* P(A)

= .90 \* .70 \* .0025 + .05 \* .01 \* .9975 = 0.0020

P(J | M) = P(J M) / P(M) = 0.0020 / 0.0117 = 0.1709

Q5

1. Yes

All undirected paths from Test 1 to Test2:

(Test1, Disease2, Test2),

(Test1, Disease2, Symptom3, Disease3, Test3, Disease2, Test2),

(Test1, Disease1, Symptom2, Disease2, Test2),

(Test1, Disease1, Symptom2, Disease2, Symptom3, Disease3, Test3, Disease2, Test2).

For Disease 2, it is type head-to-head, block all the path

1. No

(Disease1, Test1, Disease2) is not block

1. Yes

Same as question1, For Disease 2, it is type head-to-head, block all the path

1. All paths from Disease1 to Disease2:

(Disease1, Test1, Disease2)

(Disease1, Symptom2, Disease2), which is block

1. E = {Test1, Disease2, Symptom2, Symptom3}

Q6

The unique Nash equilibrium point is (Pol:Expand, Fed:contract)

Q7:

A set of agents N = (1,2)

A set of actions of both agents: A = (1,2,3,4,5,6)

Utility function: Ui(x1,x2) = 6 – xi if agent I wins (x1 > x2) else 0

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | 2.5,2.5 | 0,4 | 0,3 | 0,2 | 0,1 | 0,0 |
| 2 | 4,0 | 2,2 | 0,3 | 0,2 | 0,1 | 0,0 |
| 3 | 3,0 | 3,0 | 1.5,1.5 | 0,2 | 0,1 | 0,0 |
| 4 | 2,0 | 2,0 | 2,0 | 1,1 | 0,1 | 0,0 |
| 5 | 1,0 | 1,0 | 1,0 | 1,0 | 0.5,0.5 | 0,0 |
| 6 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 |

Therefore three nash quilibria points: (4,4), (5,5), (6,6)