# SEA400- Assignment 5

| Total Mark: | 10 marks |
| --- | --- |
| Submission file(s): | * Asg5.docx |

Please work in **groups** to complete this lab. This lab is worth 7% of the total course grade and will be evaluated through your written submission, as well as the lab demo. During the lab demo, group members are *randomly* selected to explain the submitted solution. Group members absent during the lab demo will lose the demo mark.

Please submit the submission file(s) through Blackboard. Only one person must submit for the group and only the last submission will be marked.

## **Part I: Intro to Logic Programming with Potassco**

1. Visit [Running clingo (potassco.org)](https://potassco.org/clingo/run/) and run the following examples in two reasoning mode (default and enumerate all). Paste the results here and explain the code and the results. See Potassco guide for more information: <https://github.com/potassco/guide/releases/>
   * Harry and Sally
   * Flying Birds
   * Graph Coloring

* A screenshot of a computer

  Description automatically generated
* This code defines innocence based on the absence of guilt despite having a motive.
* From its output we can see that motive(harry) motive(sally) guilty(harry) innocent(sally), meaning that harry is guilty, and sally is innocent.
* A screenshot of a computer

  Description automatically generated
* Since there is only 1 model, the output would be identical.
* o Flying Birds
* A screenshot of a computer program

  Description automatically generated
* The code declares eddy as an eagle, and tux as a penguin.
* fly(X) :- bird(X), not -fly(X).: This rule defines the predicate fly(X). Stating something can fly if it is a bird and there is no explicit rule stating that it cannot fly.
* A screenshot of a computer program

  Description automatically generated
* Again since there is only one model, enumerate all outputs the same result.
* o Graph Coloring
* A screenshot of a computer program

  Description automatically generated
* This line is a constraint that ensures neighboring nodes do not have the same color. It states that if there is an edge between nodes X and Y, and they have the same color C, then this constraint is violated.
* A screenshot of a computer program

  Description automatically generated
* Here, we can see many outputs, each representing a model that satisfies the statement.

1. Write a different version of graph coloring with the following facts and rules:
   * a, b, and c are vertices.
   * There is an edge between a and b; and another edge between a and c.
   * blue and red are colors.
   * A vertex X has color Y if it is not colored with a color except Y.
   * A vertex X is colored with a color except Y, if Z is a color different from Y and vertex X has color Z.
   * If there is an edge between two vertices, they cannot have the same color (constraint).
   * Enumerate all possible colorings.

Paste your code here.

% vertices

vertex(a).

vertex(b).

vertex(c).

% edges

edge(a, b).

edge(a, c).

% colors

color(red).

color(blue).

% rules

color(X, Y) :- vertex(X), color(Y), not colored\_with\_except(X, Y).

colored\_with\_except(X, Y) :- vertex(X), color(Y), color(Z), color(X, Z), Z != Y.

% constraints

:- edge(X,Y), color(X, C), color(Y, C).

% enumerate

#show color/2.

1. Try the Hanoi Tower code on page 12 & 13 of the guide. How many different solutions exists? What are the moves? Paste results here.

There is only 1 solution. The moves are:

move(4,b,1) move(3,c,2) move(4,c,3) move(2,b,4) move(4,a,5) move(3,b,6) move(4,b,7) move(1,c,8) move(4,c,9) move(3,a,10) move(4,a,11) move(2,c,12) move(4,b,13) move(3,c,14) move(4,c,15)

## **Part II: Bayes Classifier**

The questions in this part are **NOT coding questions**. Simply answer in this document, showing all your work.

Use the following data:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Asg1** | **Asg2** | **Midterm** | **Final** | **Pass Course** |
| Done | Done | High | Average | Pass |
| Done | Done | Average | Low | Fail |
|  | Done | High | High | Pass |
| Done |  | Low | Low | Fail |
|  |  | Low | Average | Fail |
| Done | Done | Average | Average | Pass |
| Done | Done | High | High | Pass |
|  | Done | Average | Average | Pass |
| Done |  | Low | Low | Fail |
| Done | Done | High | High | Pass |

1. Using Bayes Theorem, what is the most likely prediction for a student who did not submit assignment 1, but submitted assignment 2? Use only the first two predictors (Asg1 and Asg2) and no assumptions. Show all your work.
2. What is the prediction for above student with two predictors and the Naïve Bayes assumption? Show your work.
3. Using Naïve Bayes assumption and all 4 predictors (Asg1, Asg2, Midterm, Final), what is the prediction for the following student? Show your work.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Asg1** | **Asg2** | **Midterm** | **Final** | **Pass Course** |
|  | Done | Low | High | ? |

**Part III: Group work**

* Complete this declaration by adding your names:

We, Chet, Kasra, Nahaeli, Atem-Ako, declare that the attached assignment is our own work in accordance with the Seneca Academic Policy. We have not copied any part of this assignment, manually or electronically, from any other source including web sites, unless specified as references. We have not distributed our work to other students.

1. Specify what each member has done towards the completion of this work:

|  |  |  |
| --- | --- | --- |
|  | Name | Task(s) |
| 1 | Sthapanavichet Long | All parts |
| 2 | Atem-Ako Eyong Atem | All parts |
| 3 | Nahaeli Brunder | All parts |
| 4 | Kasra Bina | All parts |