Assignment 3 - Part 1

Deadline: 16th April, 11:55 PM

1 Guidelines

- $x = 1 - (((LastFourDigitsOfRollNum)\%30 + 1)/100)$

- $y = (LastTwoDigitsOfRollNum)\%4 + 1$

Please use the roll number of any one of the team members and make sure that you **mention the roll number being used in the report.**

2 Question

Consider a rectangular grid of dimensions 1×6 and each cell in this grid is a state. There are 6 states namely $S1, S2, S3, S4, S5, S6$ as shown in the figure 1. An agent when in any of these states has two possible actions to take, *Left* or *Right*.

Figure 1: State Space

When the agent decides to take an action, it goes in the desired direction with a probability x and in the opposite direction with a probability $1 - x$.

Note that the agent cannot go out of the grid. When it tries to move out of the grid, it remains in the same state. For example, if the agent is in state $S1$ and takes the action *Right*, it goes to the right state($S2$) with probability x and remains in the same state($S1$) with a probability $1 - x$ as it cannot pierce through the wall.

The sensors of the agent can detect whether it is in a red state ($S1, S3, S6$) or in a green state ($S2, S4, S5$). However, there are uncertainties in the observations made due to technical glitches and the observation probabilities are given in *Table : y*.

Note that the agent can make only two observations i.e Red or Green.

$P(Observation = Red|State = Red)$	0.95
$P(Observation = Green|State = Green)$	0.8

Table : 1

$P(Observation = Red|State = Red)$	0.9
$P(Observation = Green|State = Green)$	0.85

Table : 2

$P(Observation = Red|State = Red)$	0.85
$P(Observation = Green|State = Green)$	0.9

Table : 3

$P(Observation = Red|State = Red)$	0.8
$P(Observation = Green|State = Green)$	0.95

Table : 4

Initially, the agent knows that it is in one of the red states i.e $S1, S3$ or $S6$. The agent has taken 3 actions consecutively and the corresponding action-observation pairs are as follows.

1. Agent took the action Right and observed Green.

2. Agent took the action Left and observed Red.

3. Agent took the action Left and observed Green.

Please derive the beliefs after each of the above actions have been taken.

3   Automated Evaluation

You are required to submit a text file named <RollNumber1_RollNumber2>.txt and the format is as follows:

- The 1st line contains your Roll Numbers separated by a space.

- The 2nd line contains 2 values, x and y separated by a space.

- The next 3 lines contain 6 values each, the beliefs after each step is taken.

An evaluation script named 'parse.py' is uploaded for your reference. Please make sure the '.txt' file you submit is parsed successfully with the script. Failure of doing so will give you a straight 0 in this assignment. You can run the script by running the following command in your terminal:

$$python3 \; parse.py \; \langle file\_path \rangle$$

4 Submission Guidelines

- You are required to submit a typed or handwritten report showing all the computations and steps involved for arriving at the final answer. All the computations must be done manually.

- You are required to submit a zip file named <RollNumber1_RollNumber2>.zip. On unzipping, the following should be the directory structure.

  ```
  <RollNumber1_RollNumber2>
  ├── <RollNumber1_RollNumber2>.txt
  │
  └── partA-report.pdf
  ```