Lab 3
Reasoning with Bayesian networks

In this assignment, you will use a Bayesian network software to solve a problem.
Note:

- For help with laboratory assignments, please contact TAs.
- You are required to perform the experiments using a Bayesian network software tool. We recommend SamIam (which uses Java), but please feel free to use other packages.
  - The Windows and Mac versions of SamIam are attached (For Windows 32 bit system, download samiam30_windows_i386.zip; For Windows 64 bit system, download samiam30_windows_amd64.zip). For online help and downloading other versions including Linux and Solaris, please visit `http://reasoning.cs.ucla.edu/samiam/`. A good place to learn SamIam is `http://reasoning.cs.ucla.edu/samiam/help/`. A tutorial video is attached.
  - If you have trouble installing SamIam on Windows with the error message "'C:\Program' is not recognized as an internal or external command, operable program or batch file", try modifying the samiam.bat file as follows:
    Change
    `%EXECCMD% %VMARGS% -launchcommand "%EXECCMD% %VMARGS% %\*" -launchscript %0 %\*`
    to
    `"%EXECCMD%" %VMARGS% -launchcommand "%EXECCMD% %VMARGS% %\*" -launchscript %0 %\*`
    (i.e., adding double-quotes around the first `%EXECCMD%`).

1 The Problem

Lisa is given a fair coin C_1 and asked to flip it eight times in a row. Lisa also has a biased coin C_2 with a probability .7 of landing heads. All we know is that Lisa flipped the fair coin initially (the first flip), then she intends to switch to the biased coin, and that she tends to be 40% successful in performing the switch (per attempt). Lisa will keep using the biased coin if switched successfully. Suppose that we observe the outcomes of the eight coin flips. We want to find out whether Lisa managed to perform a coin switch and when.

Suppose that the outcome of the eight coin flips are: tail, head, head, tail, tail, head, head, head. Has Lisa managed to perform a coin switch? When?

2 Tasks

1. Construct a Bayesian network for solving the above problem using a Bayesian network software tool (e.g. SamIam). Save the Bayesian network file (e.g. as Coin.net in SamIam).
2. Describe a probabilistic query for solving the problem, and answer the queries using the Bayesian network software tool. (Note: probabilistic queries refer to queries such as $P(X)$, $P(X = True|Y = False)$, specific MAP, MPE queries, etc.)

3 What to turn in

Turn in via Canvas a compressed file (.zip) containing the following:

- A file (e.g. Answer.txt or Answer.pdf) containing queries and answers to the queries.
- The Bayesian network file (e.g. Coin.net in SamIam).