

Project 3: Reasoning with Bayesian Networks (50 pts)

Due at 11:59pm

Sunday, Dec 8

Extended with **no penalty** to 11:59pm

Friday, Dec 13

1. The Coin Switch Problem

In this project, you are required to perform experiments using a Bayesian network software tool, more specifically, to conduct reasoning over the problem below.

Lisa was given a fair coin C_1 and asked to flip it eight times in a row. Lisa also had a biased coin C_2 with a probability 0.75 of landing heads. It is to our knowledge that Lisa flipped the fair coin C_1 the first time, and then intended to switch to the biased coin C_2 . She tended to be 45% successful in performing the switch per attempt. In the case of a successful switch, Lisa would keep using the biased coin for the remaining flips.

Suppose that we were able to observe the outcomes of her eight coin flips sequentially as *tail, head, head, tail, tail, head, head, head*. Now, we want to find out

- a) whether Lisa managed to perform a coin switch, and
- b) when the switch took place.

2. Tasks

You are asked to do the following:

- a) Construct a Bayesian network for solving the above problem using a Bayesian network software tool (e.g., Samlam as detailed in the appendix). Save the Bayesian network file (e.g. as `Coin.net` in Samlam).
- b) Describe a probabilistic query for solving the problem and answer the queries using the Bayesian network software tool. (Some examples of probabilistic queries are $P(X)$, $P(X | Y = \text{False})$, $P(X = \text{True} | Y = \text{False})$, etc.)

3. Submission

Turn in via Canvas a zip file named `Firstname_Lastname_proj3.zip` that contains the following:

- a) A file `Answer.pdf` containing queries and answers to the queries.
- b) The Bayesian network file (e.g. `Coin.net` in Samlam).

Please follow the discussion forums [Project 3 Discussion](#) and [Project 3 Clarifications](#) on Canvas.

Appendix

We recommend Samlam (which uses Java), but please feel free to use other packages.

- a) The Windows and Mac versions of Samlam 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 Samlam is <http://reasoning.cs.ucla.edu/samiam/help/>. A tutorial video is attached.
- b) If you have trouble installing Samlam 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%`).

- c) Please contact the TAs for any further help with your installation.