

Homework 4 Coding

Due Tuesday, November 2nd at 11:59pm ET

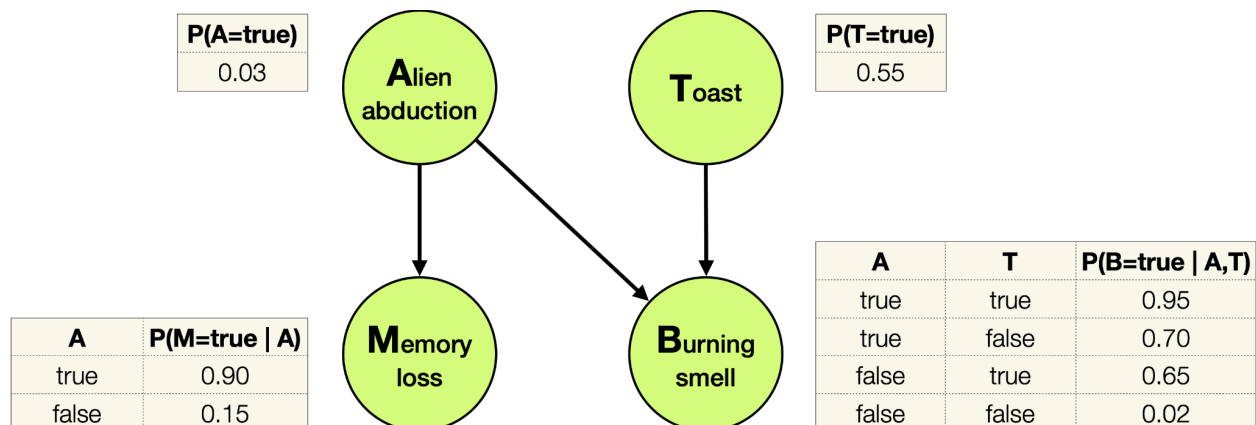
You are encouraged to discuss the assignment in general with your classmates, and may optionally collaborate with one other student. If you choose to do so, you must indicate with whom you worked. Multiple teams (or non-partnered students) submitting the same code will be considered plagiarism.

Code must be written in a reasonably current version of Python (>3.6), and be executable from a Unix command line. You are free to use Python's standard modules for data structures and utilities, as well as the pandas, scipy, and numpy modules.

For this short coding assignment, you will estimate some of the probabilities associated with the Fox Mulder alien abduction Bayesian network. The bulk of the code for generating samples has been written for you and is contained in the file `alien_bayes.py`. The goal of the assignment is to help you get a feel for how these processes work.

I Want to Believe, Part III (co-starring Mr. T) (34 points)

The Bayesian network shown below describes a typical evening at home for your friend Fox Mulder. On any given night, he may decide to make toast, he may get abducted by aliens, he may experience memory loss, and/or there may be a burning smell in his apartment.



The above has been encoded in a list of `alien_bayes.BooleanVariableNode` objects called `ALIEN_NODES`. For this assignment you must complete the code for calculating probabilities from samples and doing some plotting of results.

Step 1

Fill in the bodies of the three `get_prob()` member functions found in the `SimpleSampler`, `RejectionSampler`, and `LikelihoodWeightingSampler` classes. These methods should calculate an empirical probability estimate from a collection of samples generated by the associated `generate_samples()` member functions which have been written for you. Be mindful of the different function parameters and return types.

Once you've filled those in correctly and run the script, the output will provide probability estimations for the kinds of quantities you've been dealing with in previous parts of the assignment. Take some time and see if your answers match, as well as the effect of changing the number of samples being generated by changing the value of `n` on line 176.

Step 2

Complete the `plot_alien_bayes.py` script. This script should plot the probability estimates of $P(\textit{abduct} \mid \textit{memory}, \textit{burning})$ as a function of the number of samples, for both rejection sampling and likelihood weighting. The actual plotting function is provided for you, but you'll need to fill in the code for creating the samples (using the samplers defined in `alien_bayes.py`) and collecting the x- and y-values to plot. Your script should produce a pdf called `alien_bayes.pdf`.

Step 3

There is no step 3.

What to Submit

You should submit your versions of the two Python files (`alien_bayes.py` and `plot_alien_bayes.py`), the plot file `alien_bayes.pdf`, and a `readme.txt` containing:

- Your name(s)
- Any noteworthy resources or people you consulting when doing your project
- Notes or warnings about what you got working, what is partially working, and what is broken