CSE 473/573: Probabilistic Methods in AI

Homework #4

Due **on Gradescope**, 11:59pm on Monday, May 8, 2017

Guidelines: You may solve this short programming project in **teams of two**, as long as your contributions are roughly equal and you both understand the complete program. Pair programming is encouraged. You may also do this independently if you prefer.

Write a command-line program that reads in a discrete **Markov network** file (specified on the command-line) and prints out the **partition function** for the network (computed by multiplying all factors and summing all entries). For the network file format, see:
`http://www.hlt.utdallas.edu/~vgogate/uai14-competition/modelformat.html`

You will reuse and build on this code in future assignments.

Start early! Programming assignments such as this one can take a very long time to complete. Here are some recommended steps for completing this project without becoming overwhelmed:

1. Read the description of the file format and look at some examples.
2. Read Box 10.A on page 358 of K&F for useful tips about factor manipulation. Using a data structure similar to what is recommended there can make your code easier to write and faster to run. (Don't worry about converting things to log-space at this time.)
3. Design a data structure for a factor. At a minimum, it needs to keep track of the scope of the factor (the indices of the variables used by the factor) and the numeric values in the factor. You may also find it convenient to store the range or stride (see K&F) of each variable used by the factor.
4. Design a data structure for a Markov network itself. It needs to keep track of the number of variables, their scopes, and all of the network's factors.
5. Write code to read in a Markov network.
6. Write a routine to multiply two factors together.
7. Finally, compute the partition function by multiplying all factors together and then adding up all of the resulting values.

Please submit your source code, including all documentation and scripts necessary to compile and run it. (**Do not** assume a specific input file or output file, since we will need to change these for testing!)