Practice/Real-Life Applications of Computational Algorithms, Fall 2016

Homework 3: Viterbi Algorithm

1. ## Goal

   Suppose your friend Andrew lives in London and he likes posting what he wears on Facebook every day. And you are asked to implement Viterbi algorithm to find the most likely weather sequence in London (the hidden state sequence in hidden Markov model).

   The following two tables show the transition matrix of the weather in London and the emission matrix of Andrew's wearing, respectively.

today \ tomorrow	sunny	foggy	rainy
sunny	0.8	0.15	0.05
foggy	0.2	0.5	0.3
rainy	0.2	0.2	0.6

	sunny	foggy	rainy
P(coat=no|weather)	0.9	0.7	0.2
P(coat=yes|weather)	0.1	0.3	0.8

   And assume that the probability of each weather on the first day is

	sunny	foggy	rainy
Start_prob.	0.5	0.25	0.25

   .

2. ## Input / Output

   The first line in the input file is an integer n ($1 \leq n \leq 1000$), which is the number of observed days. The next n lines each describes the actual weather in London (hidden) and whether or not Andrew wears a coat the day (observable). In this homework you should print out an output file, which displays the accuracy of your Viterbi classifier on the given data set in the first line and in the following n lines, shows the classified weather sequence in London (found by using Viterbi algorithm).

Sample Input	Sample Output	Comment
10	0.4	Because the states of the
foggy,no	sunny	following 4 lines (marked
foggy,no	sunny	with 'V') are the same, the
foggy,no	sunny	accuracy is 4/10 = 0.4
rainy,yes	sunny	
sunny,no	sunny	V
foggy,no	sunny	
rainy,yes	rainy	V
rainy,yes	rainy	V
foggy,no	rainy	
rainy,yes	rainy	V

3. Command Line

To run your program:

./viterbi [input file] [output file]

4. Programming Language

C/ C++

5. Hand in Your Assignment

In a single folder, include your (*i*) source code and (*ii*) a report introducing your implementation. Zip the folder and submit only one *.zip file. Name the *.zip file with your student ID (e.g., 0456456.zip). Other filenames and formats such as *.rar and *.7z are NOT accepted!

6. Platform

Linux

7. Q&A

For any question regarding Homework 3, please contact 黃甯琪 (blackitty321@gmail.com)