Probabilistic Graphical Models

Lab Questions
CSE 627A: Machine Learning

December 14, 2018

Name: _____

These questions are to help me verify that you get what I want you to learn out of our labs.

1. (0 points) What are Graphical Models?

   Solution: diagrammatic representation of probability distribution

2. (0 points) What are the 3 types of graphical models?

   Solution: BN, MRF and FG

3. (0 points) Name any potential application area of PGM?

   Solution: Pattern Recognition

4. (0 points) What does a node represent in graph of PGM?

   Solution: a random variable

5. (0 points) Which type of graph is used by Markov Random Fields?

   Solution: Undirected Graphs

6. (0 points) What is the difference between Bayesian Network and Markov Random Field?

   Solution: BN use directed graph but MRF use undirected graph

7. (0 points) What is a CLIQUE?

Solution: a subset of the nodes in a graph such that there exists a link between all pairs of nodes in the subset.

8. (0 points) Write the formula for joint distribution over maximal cliques of the graph.

Solution:

$$p(\mathbf{x}) = \prod_s f_s(\mathbf{x_s})$$

9. (0 points) What is a potential function?

Solution: Potential function are the functions defined over cliques which is always greater than or equal to zero.

10. (0 points) What is image de-noising used for?

Solution: to recover the original noise-free image from given noisy image

11. (0 points) What is Ising Model?

Solution:

12. (0 points) What is Moralization?

Solution: A moral graph which 'marries the parents' nodes

13. (0 points) What is a factor graph?

Solution: graph which consists variables and factors

14. (0 points) How are variables and factors represented in graphs?

Solution: circles and squares

15. (0 points) Why are factor graphs called bipartite?

Solution: they consist of two distinct kinds of nodes and all links go between nodes of opposite types

16. (0 points) What library is used to draw (factor)graphs in python?

Solution: fglib

17. (0 points) What algorithm is also called belief propagation?

Solution: Sum-product algorithm is also known as belief propagation.

18. (0 points) How to trace forward and backward path from root node while using inference algorithms (sum-product) on factor graph?

Solution: Using DFS(depth first search)

19. (0 points) How do you differentiate Max Sum algorithm with Sum Product algorithm?

Solution: Sum-Product obtains the marginals for every variable and max-sum finds the value of variable that maximizes that marginal