

BINUS University

Academic Career: <i>Undergraduate / Master / Doctoral *)</i>		Class Program: <i>International/Regular/Smart Program/Global Class*)</i>	
<input checked="" type="checkbox"/> Mid Exam <input type="checkbox"/> Final Exam <input type="checkbox"/> Short Term Exam <input type="checkbox"/> Others Exam : _____		Term : Odd/Even/Short *)	
<input checked="" type="checkbox"/> Kemanggisan <input checked="" type="checkbox"/> Alam Sutera <input type="checkbox"/> Bekasi <input type="checkbox"/> Senayan <input type="checkbox"/> Bandung <input type="checkbox"/> Malang		Academic Year : 2021 / 2022	
Faculty / Dept. : School of Computer Science		Deadline	Day / Date : Thursday / Nov 25 th , 2021 Time : 13:00
Code - Course : COMP6639001 – Artificial Intelligence		Class : All Classes	
Lecturer : Team		Exam Type : Online	
*) <i>Strikethrough the unnecessary items</i>			
<i>The penalty for CHEATING is DROP OUT!!!</i>			

Learning Outcomes:

- LO 2 :** Describe what is AI and identify concept of intelligent agent
LO 3 : Explain various intelligent search algorithms to solve the problems
LO 4 : Explain how to use knowledge representation in reasoning purpose
LO 5 : Apply various techniques to an agent when acting under certainty
LO 6 : Apply various AI algorithms to solve the problems

I. Case (100%)

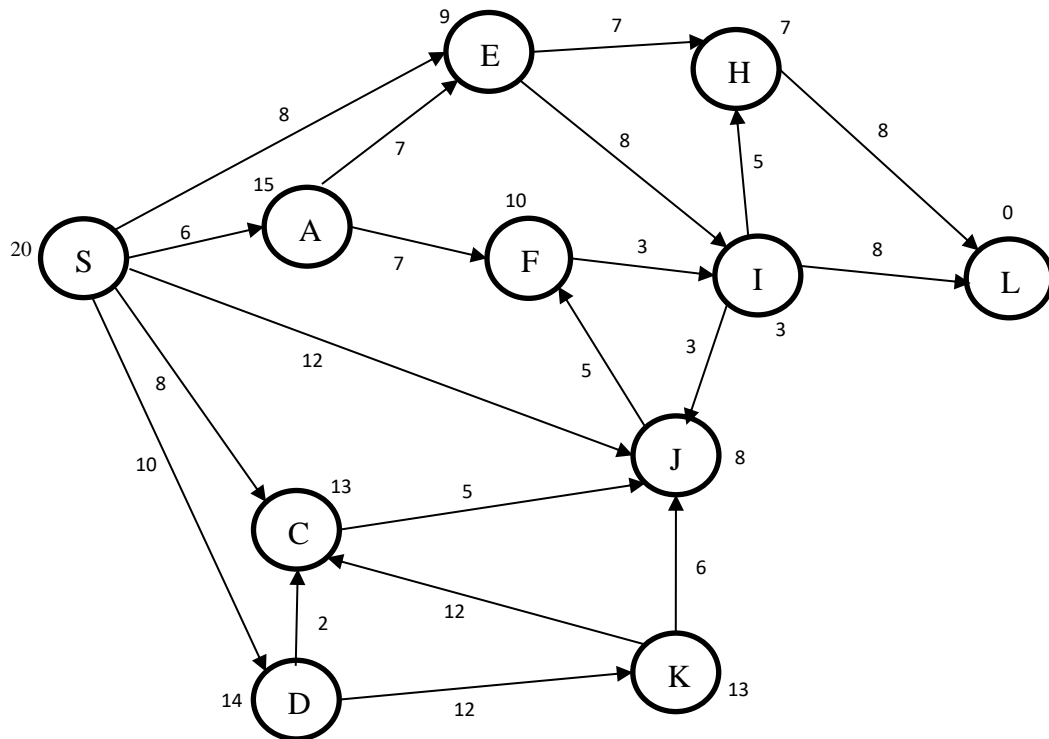
1. [LO 2, LO 3, LO 4, LO 5 & LO 6, 20 points] Search Strategies

Based on the graph on page 2, answer the following questions

- a) What solution would Depth First Search algorithm find to move from node S to node L.
- b) What solution would Best First Search (Greedy search) algorithm find to move from node S to node L.
- c) What solution would A* Search algorithm find to move from node S to node L.

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2. [LO 2, LO 3, LO 4, LO 5 & LO 6, 20 points] Inference using First-Order Logic

Suppose you are given some facts in First-Order Logics:

- Andi is a professor
- All professors are people.
- Ani is the dean.
- All Deans are professors.
- All professors consider the dean a friend or don't know him.
- Everyone is a friend of someone.
- People only criticize people that are not their friends.
- Lucy criticized Ani.

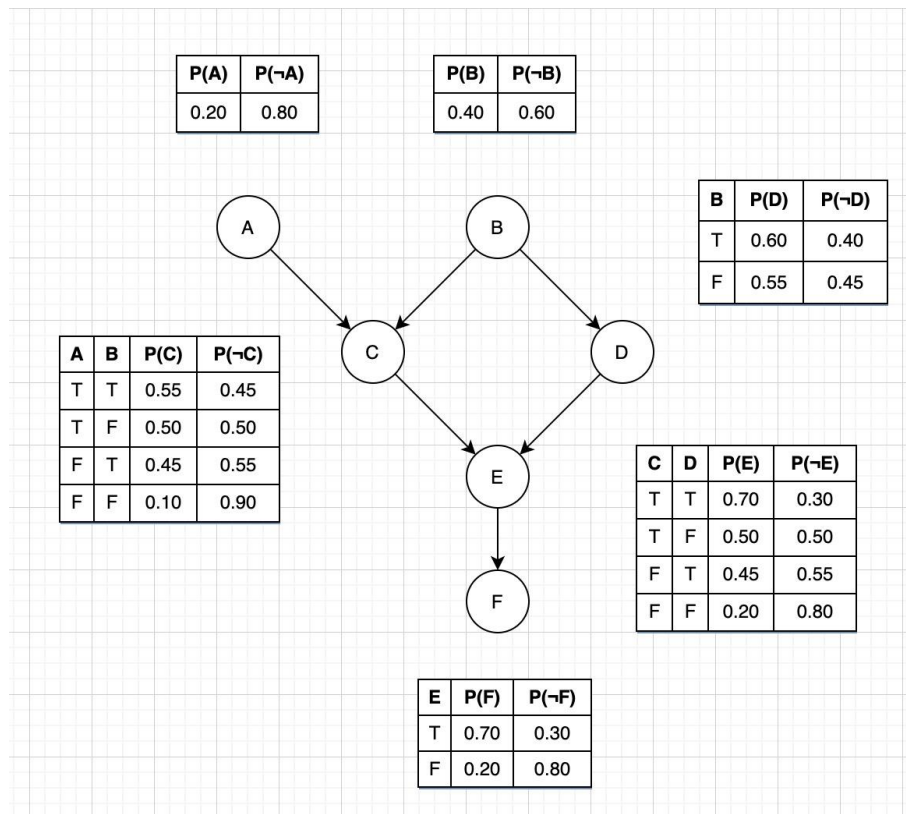
Prove that: Ani is not Andi's friend.

3. [LO 2, LO 3, LO 4, LO 5 & LO 6, 20 points] Bayesian Network

The 3rd problem is on the next page

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Please compute the following probabilities:

- $\text{Prob}(F, E, C, D, \neg A, \neg B)$
- $\text{Prob}(F, E, \neg C, D, A, \neg B)$
- $\text{Prob}(C \mid B)$
- $\text{Prob}(C \mid \neg A)$

4. [LO 2, LO 3, LO 4, LO 5 & LO 6, 20 points] Hidden Markov Model

Given a hidden Markov Model (HMM) diagram in Figure 2 to represent weather in Jakarta in the past three months. The diagram in Figure 2 shows the process of predicting whether someone will be walking, shopping, or cleaning on a particular day based on whether the day is rainy or sunny. In the diagram, two hidden states are rainy and sunny; while the observed states (activities during corresponding weather) are shopping, walking, or cleaning.

Based on observation, someone has the following activity sequence: shop, walk, and clean. **What is the most likely weather (the hidden states: Rainy or Sunny) sequence, given such activity sequence.** Answer this question **using Viterbi algorithm** and **draw weather hidden states sequence using the Trellis diagram.**

Hint: For the Viterbi algorithm and the Trellis diagram you can refer to the following book: Stuart Russell, Peter Norvig. 2010. Artificial Intelligence : A Modern Approach, 2nd edition, Pearson Education. New Jersey, ISBN:9780132071482 (see Figure 15.5, p. 548).

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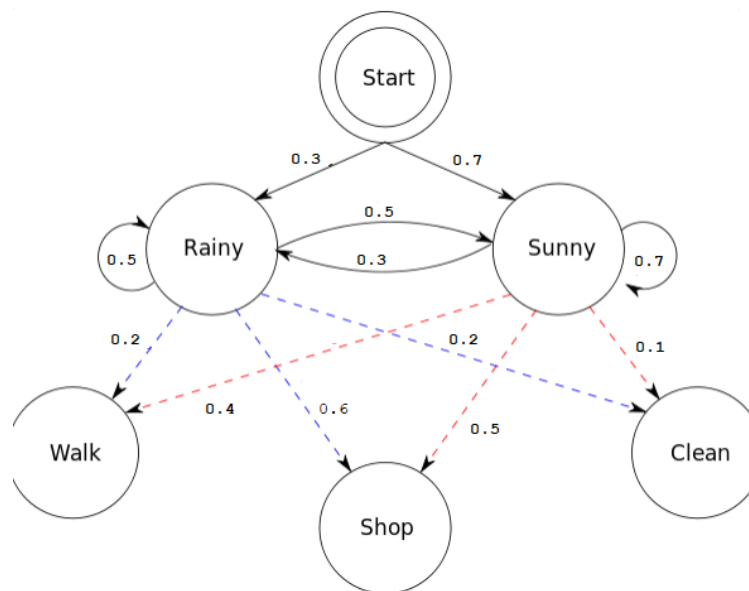


Figure 2. The Hidden Markov Diagram

5. [LO 2, LO 3, LO 4, LO 5 & LO 6, 20 points] Fuzzy Logics

Consider the following three simple rules to represent fuzzy relationship between food quality and service in a restaurant as input variables and tip amount as output variables.

- 1) If the food is bad OR the service is poor, then the tip will be low
- 2) If the service is acceptable, then the tip will be medium
- 3) If the food is great OR the service is amazing, then the tip will be high.

Given the membership functions illustrated in Figure 1 and 2 as follows.

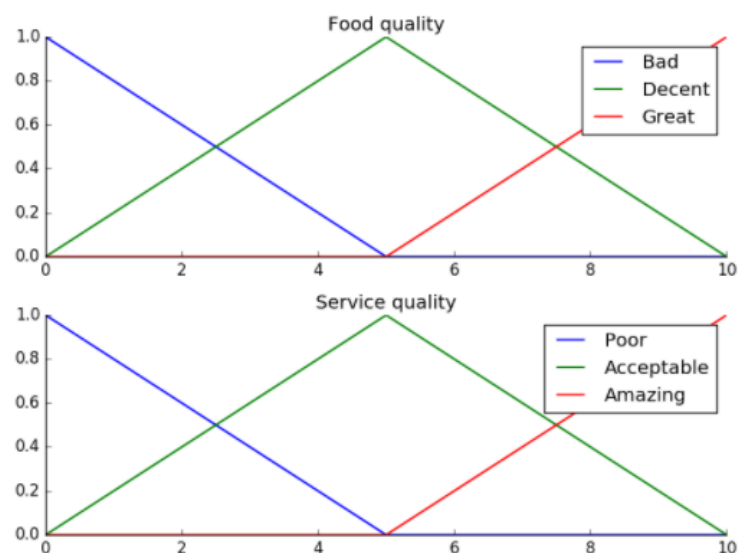


Figure 1. Food Quality and Service Membership Functions

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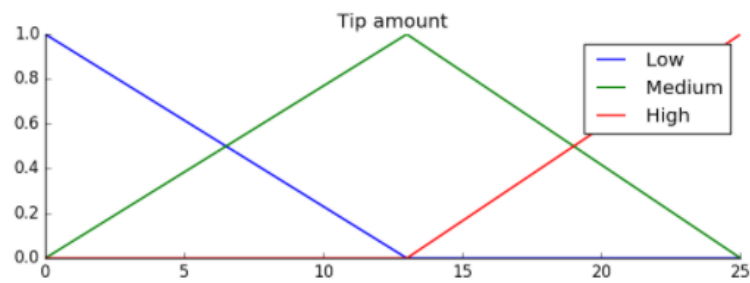


Figure 2. Tip Membership Functions

Using the **clipped center of gravity method**, compute the tip amount based on the following circumstances:

- 1) Food quality was 6.0, and
- 2) Service was 8.0

-- Good Luck --

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