Vidyalankar Institute of Technology

Semester 8 - INFT - Mid Semester Assessment

Data Science

Exam Date: 2025-03-31 | Time: 10:00

30 Marks / 1 hour

1) Solve any five (2 marks each)

A) What do CPTs stand for and what is their function?

B) Name one application of Bayesian Networks in the medical field.

C) What is another name for Bayesian Networks?

D) Name one application of HMMs.

E) What type of data do Hidden Markov Models (HMMs) model?

2) Solve any two (5 marks each)

A) Compare and contrast the applications of Bayesian Networks and Hidden Markov Models, providing at least two specific examples for each where their strengths are best utilized.

B) How do Hidden Markov Models utilize the Markov property? Explain the significance of this property in the context of modeling sequential data.

C) Discuss the limitations of using Bayesian Networks for modeling complex systems with numerous variables and intricate dependencies. Suggest potential alternative approaches.

3) Solve anyone (10 marks each)

A) Design a Bayesian Network to model the risk of a specific type of car accident (e.g., rear-end collision) considering factors like weather conditions, driver age, road conditions, and vehicle type.

Clearly define the nodes, edges, and Conditional Probability Tables (CPTs) required, justifying your choices.

B) Consider a scenario where both Bayesian Networks and Hidden Markov Models could potentially be applied. Analyze the strengths and weaknesses of each approach in this context, providing a detailed justification for which model would be more appropriate and why. Illustrate your argument with a concrete example.