

INFO510 Bayesian Modelling

Fall 2025

Sample Quiz questions

1. In classical probability, the probability of an event is:

- a) A degree of belief about the event
- b) The relative frequency of the event over many trials
- c) The ratio of favorable outcomes to total possible outcomes
- d) A subjective estimate based on prior knowledge

2. If two events, A and B, are independent, which of the following is true?

- a) $P(A \text{ and } B) = P(A) + P(B)$
- b) $P(A \text{ and } B) = P(A) * P(B)$
- c) $P(A \text{ and } B) = P(A | B)$
- d) $P(A \text{ or } B) = P(A) + P(B)$

3. In a Bayesian analysis, the 'Prior' represents:

- a) The likelihood of the observed data
- b) The initial belief about the parameters before observing the data
- c) The probability of an event given a parameter
- d) The probability distribution after observing the data

4. When belief propagation is applied to graphs with cycles, it is referred to as:

- a) Junction tree algorithm
- b) Exact belief propagation
- c) Loopy belief propagation (LBP)

d) Variable elimination

5. Which of the following models is a type of Bayesian graphical model?

a) Hidden Markov Model (HMM)

b) Bayesian Network

c) Naive Bayes Classifier

d) All of the above

6. In a Hidden Markov Model (HMM), the hidden states form a:

a) Bayesian network

b) Markov chain

c) Naive Bayes classifier

d) Cyclic graph

7. What is the PMF of a Bernoulli distributed variable X with parameter μ ?

a) $\mu^x (1 - \mu)^{(1-x)}$

b) $x\mu + (1-x)(1-\mu)$

c) $\mu x + (1-\mu)(1-x)$

d) $\mu(1-\mu)^x$

8. Given a Beta(a, b) prior and observing x heads in n Bernoulli trials, what is the posterior distribution?

a) Beta($x + a, b + n - x$)

b) Beta($a + x, b - x$)

c) Beta($a + n, b + x$)

d) Beta($a + n - x, b + x$)

9. In a population of 1000 students, 30% are enrolled in a mathematics course and 20% in a physics course. If 10% of students are enrolled in both, what is the probability that a randomly selected student is enrolled in either mathematics or physics (but not both)?

- a) 0.30
- b) 0.40
- c) 0.50
- d) 0.60

10. In a complex Bayesian network, exact inference becomes computationally expensive because:

- a) Marginal probabilities cannot be computed
- b) The elimination of variables leads to NP-hard problems
- c) The priors dominate the inference process
- d) Approximate inference methods require more computational power

11. What is a clique in the context of MRFs?

- a) A subset of nodes with no edges
- b) A group of variables that are conditionally independent
- c) A fully connected subset of nodes
- d) A cycle of variables with the same potential