Reg. No. : | E | N | G | G | T | R | E | E | . | C | O | M |

Question Paper Code : 50904

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024.

Fourth/Sixth Semester

Computer Science and Engineering

CS 3491 – ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

(Common to : Biomedical Engineering/Computer Science and Design/Computer Science and Engineering (Cyber Security)/Computer and Communication Engineering/Electronics and Communication Engineering/ Electronics and Telecommunication Engineering/Medical Electronics/Information Technology)

(Regulations 2021)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the various applications of AI?

2. How will you measure the performance of AI application?

3. Mention the needs of probabilistic reasoning in AI.

4. Given that $P(A)=0.3$, $P(A|B)=0.4$ and $P(B)=0.5$, Compute $P(B|A)$.

5. How can overfitting be avoided?

6. Assume a disease so rare that it is seen in only one person out of every million. Also assume that we have a test that is effective in that if a person has the disease, there is a 99 percent chance that the test result will be positive; however, the test is not perfect, and there is a one in a thousand chance that the test result will be positive on a healthy person. Assume that a new patient arrives and the test result is positive. What is the probability that the patient has the disease?

7. Write the three types of ensemble learning.

8. How expectation maximization is used in Gaussian mixture models?

9. What is stochastic gradient descent and why is it used in the training of neural networks?

10. Why is ReLU better than Softmax? Give the equation for both.

PART B — (5 × 13 = 65 marks)

11. (a) Differentiate Blind Search and Heuristic Search.

Or

(b) Explain characteristics of intelligent agents.

12. (a) Consider the following set of propositions:
*   Patient has spots
*   Patient has measles
*   Patient has high fever
*   Patient has Rocky mountain spotted fever.
*   Patient has previously been inoculated against measles.
*   Patient was recently bitten by a tick
*   Patient has an allergy.

(i) Create a network that defines the casual connections among these nodes. (5)

(ii) Make it a Bayesian network by constructing the necessary conditional probability matrix. (8)

Or

(b) Construct a Bayesian Network and define the necessary CPTs for the given scenario. We have a bag of three biased coins a, b and c with probabilities of coming up heads of 20%, 60% and 80% respectively. One coin is drawn randomly from the bag (with equal likelihood of drawing each of the three coins) and then the coin is flipped three times to generate the outcomes X1, X2 and X3.

(i) Draw a Bayesian network corresponding to this setup and define the relevant CPTs. (7)

(ii) Calculate which coin is most likely to have been drawn if the flips come up HHT. (6)

13. (a) State when and why you would use random forests vs SVM?

Or

(b) Explain the principle of the gradient descent algorithm. Accompany your explanation with a diagram.

14. (a) Explain various learning techniques involved in unsupervised learning.

Or

(b) List the applications of clustering and identify advantages and disadvantages of clustering algorithms.

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15. (a) Draw the architecture of a single layer perceptron (SLP) and explain its operation. Mention its advantages and disadvantages.

Or

(b) How do you tune hyperparameters for better neural network performance? Explain in detail.

PART C — (1 × 15 = 15 marks)

16. (a) Discuss constraint satisfaction problems with an algorithm for solving crypt arithmetic. Trace the algorithm for the following:

CROSS

+ ROADS

DANGER

Or

(b) Construct the decision tree for the below dataset

Day	Outlook	Temperature	Humidity	Wind	Play Golf
D1	Sunny	Hot	High	Weak	No
D2	Sunny	Hot	High	Strong	No
D3	Overcast	Hot	High	Weak	Yes
D4	Rain	Mild	High	Weak	Yes
D5	Rain	Cool	Normal	Weak	Yes
D6	Rain	Cool	Normal	Strong	No
D7	Overcast	Cool	Normal	Strong	Yes
D8	Sunny	Mild	High	Weak	No
D9	Sunny	Cool	Normal	Weak	Yes
D10	Rain	Mild	Normal	Weak	Yes
D11	Sunny	Mild	Normal	Strong	Yes
D12	Overcast	Mild	High	Strong	Yes
D13	Overcast	Hot	Normal	Weak	Yes
D14	Rain	Mild	High	Strong	No

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Reg. No. : | E | N | G | G | T | R | E | E | . | C | O | M |

Question Paper Code : 20871

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023.

Fourth Semester

Computer Science and Engineering

CS 3491 – ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

(Common to : Computer and Communication Engineering and Information Technology)

(Regulations 2021)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List the characteristics of AI.

2. What are agents for AI and software doing?

3. Differentiate logical and probabilistic assertions.

4. Why a hybrid Bayesian network is called as such?

5. What is the niche of machine learning?

6. State the logic behind Gaussian processes.

7. When does an algorithm become unstable?

8. Why is the smoothing parameter h need to be optimal?

9. Differentiate computer and human brain.

10. Show the perceptron that calculates parity of it's three inputs.

PART B — (5 × 13 = 65 marks)

11. (a) Explain iterative deepening search algorithm with an example.

Or

(b) Discuss in detail about hill climbing algorithm by using 8-queens problem.

12. (a) Demonstrate the use of Bayes' rule with an example in a doctor finding the probability P (disease / symptoms) before and after the decease becomes epidemic.

Or

(b) Briefly explain about how the sustainability of enumeration algorithm can be improved.

13. (a) Describe the general procedure of random forest algorithm.

Or

(b) With a suitable example explain knowledge extraction in detail.

14. (a) Assume an image has pixel size 240 × 180. Elaborate how K means clustering can be used to achieve lossy data compression of that image.

Or

(b) Explain in detail about combining multiple classifiers by voting.

15. (a) Elaborate the process of training hidden layers by ReLU in deep networks.

Or

(b) Briefly explain hints and the different ways it can be used.

PART C — (1 × 15 = 15 marks)

16. (a) Consider the statement "Stocks rallied on Monday, with major indexes gaining 1% as optimism persisted over the first quarter earnings season". Taken from a news article. Design a naïve Bayes model to classify the statement into appropriate category.

Or

(b) Construct a training dataset. By using it, demonstrate the AdaBoost algorithm that makes an ensemble classifier.

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