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B.Tech DEGREE EXAMINATION, MAY 2024

Seventh Semester

18AIE424T - ARTIFICIAL INTELLIGENCE AND INTERNET OF THINGS

(For the candidates admitted during the academic year 2018-2019 to 2021-2022)

Note:

i. **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

ii. **Part - B** and **Part - C** should be answered in answer booklet.

Time: 3 Hours **Max. Marks: 100**

PART - A (20 × 1 = 20 Marks)

Answer **all** Questions

		Marks	BL	CO
1.	Which of the following is used to capture data from the physical world in IoT devices? (A) Sensors (B) Actuators (C) Microprocessors (D) Microcontrollers	1	1	1
2.	Which of the following is not a fundamental component of an IoT system? (A) Sensors (B) Connectivity and data processing (C) User interface (D) Transformer	1	1	1
3.	Which of the following Pandas data structures is commonly used to represent CSV data in Python? (A) Series (B) DataFrame (C) Array (D) List	1	2	1
4.	What does HDF5 stand for in Python? (A) High-Definition File Format (B) Hierarchical Data Format Version 5 (C) Hyper-Dynamic Filestore 5 (D) High-Level Data File Format	1	1	1
5.	Which evaluation metric is commonly used for regression tasks to measure the average squared difference between predicted and actual values? (A) Precision (B) Recall (C) Mean Absolute Error (MAE) (D) F1-score	1	1	2
6.	What is the goal of linear regression? (A) To find the best-fitting straight line that minimizes the sum of squared differences between predicted and actual values. (B) To maximize the margin between data points in a high-dimensional space. (C) To partition data into clusters based on similarity. (D) To classify data points into different categories.	1	2	2
7.	What are the support vectors in SVM? (A) Data points that are not important for classification (B) Data points that lie closest to the decision boundary. (C) Data points that have the largest feature values. (D) Data points that are outliers in the dataset.	1	1	2
8.	What is pruning in the context of decision trees? (A) Trimming the branches of the tree to reduce overfitting (B) Adding more nodes to increase the tree's depth. (C) Reversing the direction of some splits in the tree. (D) Resampling the data to create a more balanced dataset.	1	2	2

9. Which layer type is typically used to extract local features in a CNN? 1 1 3
(A) Convolutional layer (B) Pooling layer
(C) Fully connected layer (D) Activation layer

10. What is the purpose of the stride parameter in a convolutional layer? 1 2 3
(A) To determine the size of the receptive field (B) To control the step size of the convolution operation
(C) To adjust the learning rate during training (D) To reduce the dimension

11. Which layer type is responsible for applying non-linear transformations to the feature maps in a CNN? 1 2 3
(A) Convolutional layer (B) Pooling layer
(C) Fully connected layer (D) Activation layer

12. What is true regarding backpropagation rule? 1 2 3
(A) it is a feedback neural network (B) actual output is determined by computing the outputs of units for each hidden layer
(C) hidden layers output is not all important, they are only meant for supporting input and output layers (D) Dimensionality reduction

13. In optimization, what does the term "local minimum" refer to? 1 2 4
(A) The lowest point in the entire search space (B) The lowest point within a specific region of the search space
(C) The highest point in the entire search space (D) A point where the function's value is zero

14. What is the purpose of the "crossover" operation in a Genetic Algorithm? 1 2 4
(A) To create a new generation of individuals by mixing the genetic material of two parents (B) To evaluate the fitness of individuals in the population
(C) To select the best individual in the current generation (D) To introduce random mutations into the population

15. What is the primary objective of policy gradient methods? 1 2 4
(A) To estimate the optimal Q-values for state-action pairs (B) To find the shortest path between states in a graph
(C) To optimize the agent's policy directly to maximize expected rewards (D) To minimize the variance in reward distributions

16. What is the exploration-exploitation trade-off in Q-learning? 1 2 4
(A) The balance between learning from the environment and using prior knowledge (B) The trade-off between state and action spaces
(C) The trade-off between immediate and delayed rewards (D) The balance between taking random actions and exploiting the current best knowledge

17. What is the primary purpose of Spark MLlib in Apache Spark? 1 1 5
(A) Data storage and retrieval (B) Machine learning and data analysis
(C) Real-time data processing (D) Querying structured data

18. Which H2O.ai product integrates H2O with Apache Spark, allowing for distributed machine learning on Spark clusters? 1 1 5
(A) H2O-3 (H2O Open Source) (B) H2O Driverless AI
(C) H2O Sparkling Water (D) H2O Wave

19.	What does the term "smart grid" refer to in the context of smart cities and IoT? (A) An advanced traffic management system (B) An intelligent power distribution network (C) A system for automated waste collection (D) A network of public Wi-Fi hotspots	1	1	5
20.	How can IoT sensors be used for environmental monitoring in smart cities? (A) By detecting nearby pedestrians (B) By monitoring pollution levels, air quality, and weather conditions (C) By tracking the location of parked cars (D) By measuring the number of streetlights in operation	1	1	5

PART - B (5 × 4 = 20 Marks)

Answer **any 5** Questions

		Marks	BL	CO
21.	What are the key components of the IoT reference model, and how do they interact with each other?	4	1	1
22.	How does a CSV file differ from other file formats commonly used for data storage and exchange, such as Excel spreadsheets or JSON?	4	2	1
23.	What are the different variants of Naive Bayes, such as Gaussian, Multinomial, and Bernoulli Naive Bayes, and when should you use each one?	4	2	2
24.	How do RNNs handle sequential data, and what are their advantages in tasks like time series prediction and natural language processing?	4	2	3
25.	How are partial derivatives and gradients used to update the weights and biases of a neural network during backpropagation?.	4	2	3
26.	What is the intuition behind the "adversarial" aspect of GANs, where the generator and discriminator compete with each other?	4	2	4
27.	How do wearable sensors handle real-time data streaming and storage for prolonged human activity monitoring?.	4	1	5

PART - C (5 × 12 = 60 Marks)

Answer **all** Questions

		Marks	BL	CO
28.	(a) (i) What are some common data validation and cleansing techniques used when reading data from IoT systems to ensure data quality and integrity?[6 marks] (ii) Can you explain the steps involved in processing IoT data stored in a database, such as MySQL, and exporting it to an Excel file for reporting purposes? [6 marks]	12	2	1
	(OR)			
	(b) Can you explain the role of IoT, big data, and AI in enhancing healthcare delivery, patient monitoring, and disease management?			
29.	(a) Explain the importance of hyperparameter tuning in SVM. Provide an example where optimizing hyperparameters like the C parameter or kernel parameters significantly improves model performance.	12	2	2
	(OR)			
	(b) (i) Explain the concept of diversity in ensemble learning and why it's important for improving model performance? [6 marks] (ii) Explain the concept of the slope (coefficients) and intercept in a linear regression equation. How are they interpreted in the context of the data? [6 marks]			

30.	(a) What is the architecture of a typical CNN, including convolutional layers, pooling layers, fully connected layers, and output layers? explain the purpose of each layer type?	12	2	3
	(OR)			
	(b) (i) Compare and contrast the use cases and strengths of CNNs and RNNs. In what types of problems would you choose one over the other? [6 marks] (ii)What are the key differences between LSTM and GRU architectures, and when might you prefer one over the other for sequential data modeling? [6 marks]			
31.	(a) (i)Describe the process of encoding problem solutions into chromosomes and genes for use in a genetic algorithm. What are the considerations when choosing an encoding scheme? [6 marks] (ii) What is the fitness function, and how does it evaluate the quality of potential solutions within a genetic algorithm? How is it defined for different problem domains? [6 marks]	12	2	4
	(OR)			
	(b) (i) Explain the concept of the Q-value (action-value) function in Q-learning. What is the role of Q-values in estimating the expected cumulative reward of taking a specific action in a given state? [6 marks] (ii)How are policy gradients used to update the policy in reinforcement learning, and what is the objective in optimizing the policy [6 marks]			
32.	(a) Demonstrate a comprehensive understanding of IIoT concepts and practical considerations for implementing predictive maintenance solutions in a manufacturing environment.	12	2	5
	(OR)			
	(b) Provide examples of how IoT technology can be applied to reduce pollution, enhance waste management, optimize resource consumption, and promote sustainable living in densely populated urban areas improving urban sustainability and addressing environmental challenges.			

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