(Please write your Exam Roll No.) *Exam Roll No. .....*

END TERM EXAMINATION

SIXTH SEMESTER [BCA] JUNE 2024

Paper Code: BCAT-314 ***Subject: Deep Learning with Python***

Time: 3 Hours ***Maximum Marks: 75***

Note: Attempt five questions in all including Q.no.1 which is compulsory. Select one question from each unit.

Q1 Attempt **any Five** from the following **(5x5=25)**

(a) Explain the process of training a neural network, including activation functions, loss functions, and hyperparameters.

(b) Discuss the significance of gradient descent and stochastic gradient descent in optimizing neural network models?

(c) What role does regularization play in preventing overfitting in neural networks?

(d) How do convolutional neural networks (CNNs) differ from shallow networks?

(e) Explore the various CNN architectures, such as LeNet, AlexNet, and VGGNet?

(f) Define deep belief networks and autoencoders?

(g) Describe the concept of reinforcement learning and its application in training agents to make sequential decisions.

UNIT-I

Q2 (a) Discuss the role of activation functions in artificial neural networks (ANN). How do different activation functions, such as sigmoid, tanh, and ReLU, impact the performance of an ANN? **(6)**

(b) Explain the concept of batch normalization and its significance in training neural networks. How does batch normalization help address issues like internal covariate shift? **(6.5)**

Q3 (a) Compare and contrast TensorFlow and Keras as frameworks for building neural networks in Python. What are the advantages and disadvantages of each framework? **(6)**

(b) Explore the concept of hyperparameter optimization in neural networks. What are hyperparameters, and how can techniques like grid search and random search be used to find optimal hyperparameter values? **(6.5)**

UNIT-II

Q4 (a) Define deep learning and explain the differences between deep and shallow neural networks. How does the depth of a network affect its ability to learn complex features? **(6)**

(b) Describe the architecture of convolutional neural networks (CNNs), including convolutional layers, pooling layers, and fully connected layers. How do these components contribute to the success of CNNs in image recognition tasks? **(6.5)**

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Q5 (a) Provide an overview of popular CNN architectures such as LeNet, AlexNet, and VGGNet. What are the design principles behind each architecture, and what types of tasks are they commonly used for? **(6)**

(b) Discuss the process of training a convolutional neural network, including techniques like weight initialization, batch normalization, and hyperparameter optimization. **(6.5)**

UNIT-III

Q6 (a) Explain the concept of deep belief networks (DBNs) and their application in unsupervised learning tasks. How are DBNs trained using the contrastive divergence algorithm? **(6)**

(b) Define autoencoders and discuss their role in dimensionality reduction and feature learning. How do denoising autoencoders differ from traditional autoencoders? **(6.5)**

Q7 (a) Explore the concept of reinforcement learning and its application in training agents to make sequential decisions. What are some real-world applications of reinforcement learning? **(6)**

(b) Discuss the challenges and limitations of reinforcement learning, including the trade-off between exploration and exploitation and the issue of credit assignment. **(6.5)**

UNIT-IV

Q8 (a) Describe recurrent neural networks (RNNs) and their ability to model sequential data. How do RNNs address the limitations of feedforward neural networks in handling sequential inputs? **(6)**

(b) Explain the architecture of long short-term memory (LSTM) networks and their application in sequence prediction and time series forecasting. What are the advantages of using LSTMs over traditional RNNs? **(6.5)**

Q9 (a) Provide an overview of object detection techniques using deep learning, including methods like region-based convolutional neural networks (R-CNN) and You Only Look Once (YOLO). **(6)**

(b) Discuss the concept of transfer learning in deep learning and its application in leveraging pre-trained models for new tasks. What are the benefits and challenges of transfer learning? **(6.5)**

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