Register Number:……..

B.E/B.TECH DEGREE EXAMINATIONS: NOV/DEC 2024

(Regulation 2018)

Fourth Semester

ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

U18AII4202**:** Neural Networks and Deep Learning

COURSE OUTCOMES

CO1: Understand different methodologies to create application using deep nets.
CO2: Design the test procedures to assess the efficacy of the developed model.
CO3: Identify and apply appropriate deep learning models for analyzing the data for a variety of problems.
CO4: Implement different deep learning algorithms.

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1.	In a CNN, if you apply a 3x3 filter on a 28x28 input image with a stride of 1 and no padding, what will be the dimensions of the output feature map?		CO1	[K_3]
2.	If a CNN model is overfitting on the training data, name two regularization techniques to address this issue.		CO1	[K_2]
3.	Mention the main advantage of using Bidirectional Recurrent Neural Networks (Bi-RNNs) over standard RNNs?		CO2	[K_2]
4.	Outline the problem solved by Long Short-Term Memory (LSTM) networks in RNNs, and how do they address it?		CO2	[K_3]
5.	Mention the significance of the encoder-decoder architecture in sequence-to-sequence models, and where is it commonly used?		CO2	[K_2]
6.	Differentiate overfitting and underfitting in machine learning models?		CO3	[K_2]
7.	Write about the capacity in neural networks.		CO3	[K_2]
8.	Differentiate Restricted Boltzmann Machines (RBMs) and Deep Boltzmann Machines (DBMs).		CO3	[K_2]
9.	Describe the function of the generator and discriminator in a Generative Adversarial Network (GAN).		CO4	[K_2]
10.	Realize the role of hidden units in a Deep Feedforward Network.		CO4	[K_2]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11.	a)	Explain the architecture of ResNet, highlighting how residual connections solve the vanishing gradient problem in deep networks.	8	CO1	[K_2]

	b)	Consider a CNN model that consists of three convolutional layers, each followed by a 2x2 max pooling layer. The input is a 128x128 grayscale image. The first convolutional layer has 16 filters (3x3), the second has 32 filters (3x3), and the third has 64 filters (3x3), all with stride 1 and padding of 1. Calculate the output feature map size after the third max-pooling layer. Explain in detail about CNN.	8	CO1	[K_3]
12.	a)	Explain in detail about the architecture of AlexNet.	8	CO1	[K_2]
	b)	Explain in detail about Parameter Sharing and Regularization.	8	CO1	[K_2]
13.	a)	Consider working on a sentiment analysis project where the goal is to classify movie reviews as positive or negative. Initial model uses a basic RNN, but it is observed that it fails to capture long-term dependencies, especially when key sentiment words are far apart in the text. Explain why the basic RNN might struggle with this task and propose an alternate solution.	8	CO2	[K_3]
	b)	Explain in detail about Bidirectional RNNs.	8	CO2	[K_2]
14.	a)	Explain the role of activation functions in deep learning. Compare and contrast ReLU, Leaky ReLU, and Exponential ReLU (ELU), focusing on their advantages, disadvantages, and scenarios where each might be preferable.	8	CO3	[K_2]
	b)	Write in detail about Restricted Boltzmann Machines (RBMs) and Deep Boltzmann Machines (DBMs)? Describe their architectures, training process, and how they contribute to unsupervised learning. Include the differences in their capacities and applications.	8	CO3	[K_2]
15.	a)	Explain the concept of autoencoders and their role in unsupervised training of neural networks. Discuss the architecture of a basic autoencoder and its variants, such as sparse autoencoders and denoising autoencoders. Define autoencoders and their use in unsupervised learning.	8	CO3	[K_2]
	b)	Explain in detail about representation learning	8	CO3	[K_2]
16.	a)	Explain the concept of Generative Adversarial Networks (GANs). Describe the architecture of GANs, including the roles of the generator and discriminator, and explain how adversarial training leads to improved synthetic data generation.	8	CO4	[K_2]
	b)	Describe semi-supervised and multitask learning in the context of deep learning. Discuss how these approaches address challenges associated with labeled data scarcity and explain their benefits in improving model generalization.	8	CO4	[K_2]

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