Register Number:……..

KUMARAGURU college of technology
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B.E/B.TECH DEGREE EXAMINATIONS: APRIL /MAY 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.	Define exploding gradient descent in the context of neural network training and suggest a strategy to mitigate this issue.	CO1	[K_2]
2.	Consider a neural network with input x1=2, x2=3 two neurons in hidden layer weights w1=0.5, w2=0.8, b1=0.3. Output layer weights are w3=1.2, w4=0.6, b2=0.2. Compute the output y using Relu as the activation function.	CO1	[K_3]
3.	Compute the max pooling output for the following input with a 2*2 filter and specify the output dimension.	CO1	[K_3]

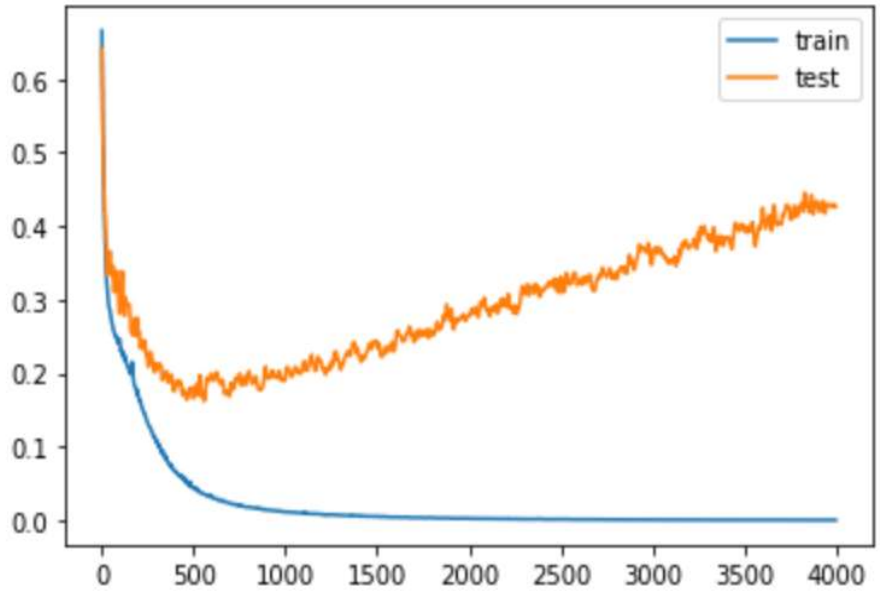
1	6	0	3	9	3
2	7	1	-1	2	8
3	2	8	6	2	4
2	1	1	7	5	3
5	4	-4	7	6	3
7	6	5	9	1	0

Input feature map

4.	How does speech recognition technology work, and what are the key challenges associated with developing accurate speech recognition systems?	CO2	[K_2]
5.	Describe the process of backpropagation in Recurrent Neural Networks (RNNs).	CO2	[K_2]

6. Differentiate machine learning and deep learning. CO3 [K_2]

7. Identify the issue in following plot and provide the remedy to handle the issue. X axis denotes epochs and y axis indicates error. Straight lines denotes training and zig zag line denotes testing. CO3 [K_3]



8. Compare LRELU and ERELU. CO3 [K_2]

9. How does dataset augmentation help in improving model performance? CO4 [K_2]

10. Brief about multitask learning and mention its significance in machine learning. CO4 [K_2]

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

11. a) Consider an input image with the following properties: 8 CO1 [K_3]

Size: 6x6 pixels, Number of channels: 1 (grayscale)

Pixel values:

[[1, 0, 1, 0, 1, 0],
[0, 1, 0, 1, 0, 1],
[1, 0, 1, 0, 1, 0],
[0, 1, 0, 1, 0, 1],
[1, 0, 1, 0, 1, 0],
[0, 1, 0, 1, 0, 1]]

Number of filters: 2, Filter size: 2x2, Stride: 1, Padding: None

Filter1:

[[0.1, 0.2],

[0.3, 0.4]]

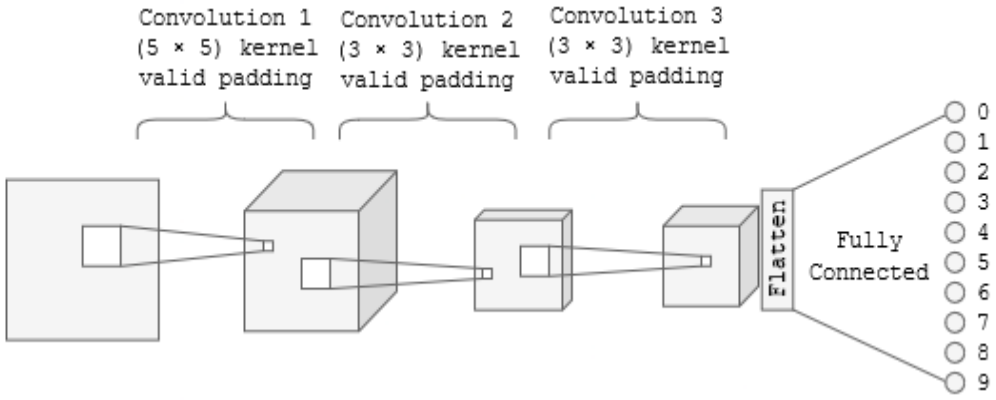
Filter2:

[[0.01, 0.02],

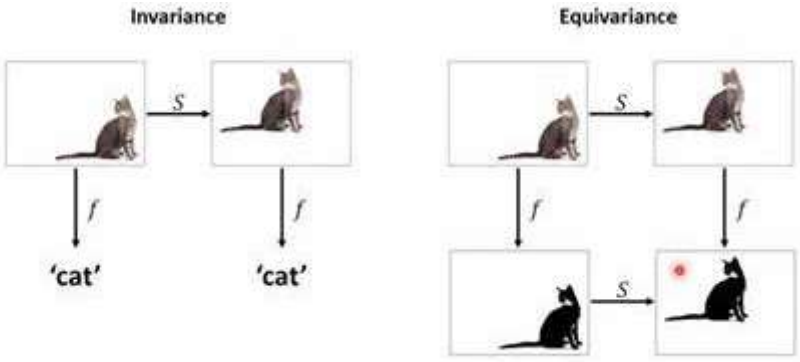
[0.03, 0.04]]

Compute the output feature map for the above image and describe convolution operation along with the steps involved in feature computation.

b) Calculate the number of parameters and output dimensions for the following architecture. Convolution 1 and Convolution 2 uses a stride of 2 with 16 filters and 2 filters respectively. Convolution 3 uses a stride of 1 with 3 filters. Write a brief note on the steps done in the architecture. 8 CO1 [K3]



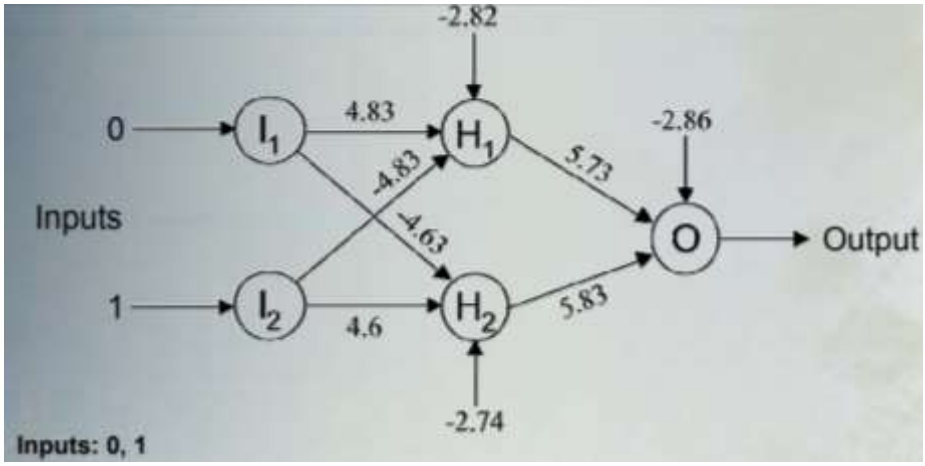
12. a) Consider the following image. Explain all the motivation factors for CNN and brief on why Artificial Neural Network (ANN) is not suitable for this scenario. 8 CO1 [K2]



b) Mention the motivation behind the creation of AlexNet, and how did it tackle the challenges related to handling large-scale image datasets and enhancing accuracy in tasks such as image classification, particularly in competitions like the 8 CO1 [K1]

ImageNet Large Scale Visual Recognition Challenge (ILSVRC)?

13.	a)	Explain how does a Bidirectional Recurrent Neural Network (BRNN) differ from traditional RNNs, and what advantages does it offer in sequential data processing tasks?	8	CO2	[K_2]
	b)	Describe the utility of recurrent neural networks (RNNs) in Natural Language Processing (NLP), providing an in-depth explanation along with code examples to illustrate their effectiveness in any of the tasks such as text generation, sentiment analysis, and language translation.	8	CO2	[K_2]
14.	a)	Explain Restricted Boltzmann Machines.	8	CO3	[K_2]
	b)	How do Deep Boltzmann Machines (DBMs) differ from other types of neural networks, and what advantages do they offer in modeling complex data distributions?	8	CO3	[K_1]
15.	a)	Explain how autoencoders work and discuss their applications in unsupervised learning tasks.	8	CO3	[K_2]
	b)	Provide a comprehensive explanation of representation learning, its significance in machine learning tasks, and its applications in real-world scenarios.	8	CO3	[K_2]
16.	a)	Consider the following neural network architecture. Compute the output with sigmoid activation.	8	CO4	[K_3]



	b)	Explain in detail about Deep Belief networks.	8	CO4	[K_2]

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