KUMARAGURU college of technology
character is life

Register Number:……..…

M.TECH DEGREE EXAMINATIONS: APRIL / MAY 2023

(Regulation 2018)

Second Semester

DATA SCIENCE

P18ITI2205: Deep Learning

COURSE OUTCOMES

CO1: Understand the fundamental principles, theory and approaches for learning with deep neural networks.

CO2: Understand the key concepts, issues and practices when training and modelling deep neural networks.

CO3: Understand convolution neural networks and various popular CNN architectures in literature.

CO4: Apply neural networks in applications like - object detection, face recognition, neural style transfer.

CO5: Understand the variations of neural network for sequence data, apply RNN in applications like - Sentiment classification, Language translation, Speech Recognition and Trigger word detection.

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Assume that your machine has a large enough RAM dedicated to training neural networks. Compared to using stochastic gradient descent for your optimization, choosing a batch size that fits your RAM will lead to CO2 [K_2]

   a) a less precise but faster update
   b) a less precise and slower update.
   c) a more precise but slower update.
   d) a more precise and faster update

2. Which of the following would have a constant input in each epoch of training a Deep Learning model? CO1 [K_2]

   a) Weight between hidden and output layer
   b) Biases of all hidden layer neurons
   c) Activation function of output layer
   d) Weight between input and hidden layer

3. Which of the following statement is the best description of early stopping? CO2 [K_2]

   a) Train the network until a local minimum in the error function is reached
   b) Simulate the network on a test dataset after every epoch of training. Stop training when the generalization error starts to increase
   c) Add a momentum term to the weight update in the Generalized Delta Rule, so that training converges more quickly
   d) A faster version of backpropagation, such as the `Quickprop' algorithm

4. Suppose you have 5 filters convolutional kernel of size 7 x 7 with zero padding and stride 1 in the first layer of a convolutional neural network. Match the input with correct output dimention. CO3 [K_2]

Input dimension	Output dimension
A. 224 x 224 x 3	i. 216 x 216 x 5
B. 222 x 222 x 3	ii. 215 x 215 x 5
C. 220 x 220 x 3	iii. 218 x 218 x 5
D. 221 x 221 x 3	iv. 214 x 214 x 5

a) A-iii, B-i, C-iv, D-ii
b) A-ii, B-iii, C-ii, D-iv
c) A-iii, B-iv, C-i, D-ii
d) A-ii, B-i, C-iv, D-iii

5. What are the factors to select the depth of neural network? CO1 [K_2]
   1. Type of neural network (eg. MLP, CNN etc)
   2. Input data
   3. Computation power, i.e. Hardware capabilities and software capabilities
   4. Learning Rate
   5. The output function to map

a) 1,2,3,4,5
b) 2,3,4,5
c) 1,3,4,5
d) 1,2,3,5

6. Which of the following method DOES NOT prevent a model from overfitting to the training set? CO1 [K_1]

a) Dropout
b) Pooling
c) Early Stopping
d) Data Augmentation

7. Assertion (A): As the number of hidden layer increases, model complexity decreases. CO2 [K_2]
Reason (R): Increase in the learning rate and dropout will decrease the model complexity

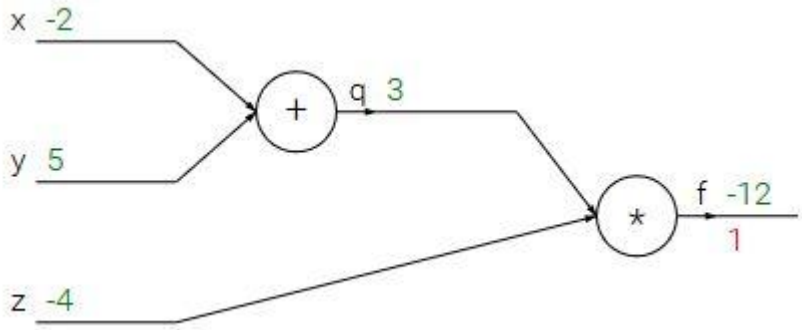
a) Both A and R are individually true and R is the correct explanation of A
b) Both A and R are individually true but R is not the correct explanation of A
c) A is true but R is false
d) A is false but R is true.

8. Suppose you have inputs as x, y, and z with values -2, 5, and -4 respectively. You have a neuron 'q' and neuron 'f' with functions: CO2 [K_2]

$q = x + y$

$f = q * z$

Graphical representation of the functions is as follows:

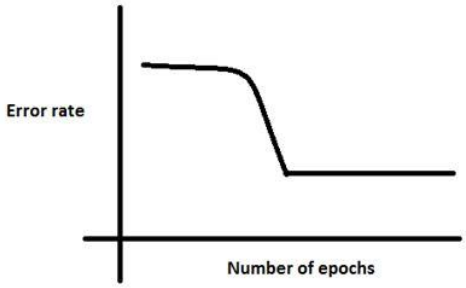


What is the gradient of F with respect to x, y, and z?
(HINT: To calculate gradient, you must find (df/dx), (df/dy) and (df/dz))

a) (-3,4,4) b) (4,4,3)

c) (-4,-4,3) d) (3,-4,-4)

9. In training a neural network, you notice that the loss does not decrease in the few starting epochs. CO2 [K_2]



The reasons for this could be:

1. The learning is rate is low
2. Regularization parameter is high
3. Stuck at local minima

a) 1 and 2 b) 1 and 3

c) 2 and 3 d) 1 2 and 3

10. Assume a simple MLP model with 3 neurons and inputs= 1,2,3. The weights to the input neurons are 4,5 and 6 respectively. Assume the activation function is a linear constant value of 3. What will be the output.? CO2 [K_2]

a) 123 b) 96

c) 63 d) 192

PART B (10 x 2 = 20 Marks)

11. What are vanishing and exploding gradients? CO1 [K_2]

12. Explain how dropout in a neural network act as a regularizer. CO1 [K_2]

13. Describe one way that the neural network could be initiated poorly and what effect that would have? CO1 [K_2]

14.	What will happen if the learning rate is set too low or too high?	CO2	[K_2]
15.	Explain the architecture of an Auto encoder.	CO2	[K_2]
16.	List some limitations of deep learning.	CO1	[K_2]
17.	Write a note on hyperparameters.	CO2	[K_2]
18.	What is Valid convolution and Same Convolution.	CO2	[K_2]
19.	Differentiate between a CNN and Recurrent Neural Network.	CO2	[K_2]
20.	How does an LSTM network work?	CO4	[K_2]

PART C (6 x 5 = 30 Marks)

21.	Explain the Activation functions.	CO1	[K_2]
22.	Explain the following two variants of gradient descent: 1. Batch 2. Stochastic	CO2	[K_2]
23.	Given input image of size 39*39 with 3 Channels. Input is passed through the following Deep CNN Layers .Write the output Dimension after each of the layers 10 Filters of size 3*3,Stride – 1, Padding – 0 20 Filters of size 5*5,Stride – 2, Padding - 0 50 Filters of size 7*7,Stride – 2, Padding - 0	CO3	[K_3]
24.	Explain Convolution Layer, Pooling Layer and Fully Connected Layer in CNN.	CO4	[K_2]
25.	Discuss about IoU and anchor boxes.	CO4	[K_2]
26.	Write short note on Siamese Network.	CO5	[K_2]

Answer any FOUR Questions
PART D (4 x 10 = 40 Marks)

27.	Explain, end to end implementation of training L layer deep feed forward neural network. At every step of implementation, specify the dimensions of each of the variables, which are computed and used.	10	CO1	[K_3]
28.	Write the procedure to build the image classification model using CNN.	10	CO3	[K_2]
29.	Explain the concept of YOLO algorithm with a case study.	10	CO4	[K_3]
30.	Elaborate the RNN application Language translation and speech recognition.	10	CO5	[K_2]
31.	Write Short notes on i) Triplet Loss ii) Neural Style Transfer	 5 5	CO4	[K_2]

****