

Department : CSE-DATA SCIENCE

Year & Semester : IV YEAR&VII

Sub Code & Sub Name :20CSE471A &DEEP LEARNING

Unit-I

S.No	Part-A Questions
1.	Define Tensors.
2.	Distinguish between linear dependence and linear independent.
3.	What is the use of a function called norm?
4.	Define orthogonal matrix.
5.	Define eigen decomposition
6.	Define single value decomposition.
7.	Define the trace operation.
8.	State the difference between bias and variance.
9.	Define Deep Learning.
10.	List two types of learning algorithms in Machine Learning.
11.	Define regularization in machine learning.
12.	Explain the meaning of overfitting in model fitting.
13.	Give one example each of supervised and unsupervised learning.
14.	Differentiate between training error and testing error.
15.	Compare L1 and L2 regularization.
16.	Contrast underfitting and overfitting with examples.
17.	Analyze the role of hyperparameters in model performance.
18.	Distinguish between estimators and hyperparameters.

S.No	Part-B Questions
1.	Discuss about Scalars, vectors, matrices and tensors.
2.	Explain about linear dependence and span.
3.	Discuss about norms
4.	Explain about eigen decomposition.
5.	Explain singular value decomposition.
6.	Distinguish between inverse matrices and trace operator.
7.	Explain the types of machine learning with suitable examples. Discuss their applications in real life.
8.	Explain the historical development of deep learning .Highlight key milestones, challenges, and breakthroughs.
9.	Discuss the importance of linear algebra in machine learning. Explain the role of vectors, matrices, eigenvalues, and eigenvectors with applications in model training and dimensionality reduction.
10.	Explain the concept of cross-validation techniques in deep learning .
11.	Define underfitting and overfitting with examples. Explain the bias-variance trade off and suggest strategies to achieve a good fit for a machine learning model.

12.	Define regularization. Discuss L1, L2 regularization																		
13.	A machine learning model is trained to predict whether a customer will purchase a product. The dataset contains the following true labels and predicted probabilities for 5 customers: <table><tr><th>Customer</th><th>True Label(y)</th><th>Predicted ($y^{\wedge}$)</th></tr><tr><td>1</td><td>1</td><td>0.9</td></tr><tr><td>2</td><td>0</td><td>0.2</td></tr><tr><td>3</td><td>1</td><td>0.7</td></tr><tr><td>4</td><td>0</td><td>0.6</td></tr><tr><td>5</td><td>1</td><td>0.4</td></tr></table> 1. Compute the Mean Absolute Error (MAE) for this dataset. 2. Compute the Mean Squared Error (MSE) for this dataset.	Customer	True Label(y)	Predicted ($y^{\wedge}$)	1	1	0.9	2	0	0.2	3	1	0.7	4	0	0.6	5	1	0.4
Customer	True Label(y)	Predicted ($y^{\wedge}$)																	
1	1	0.9																	
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3	1	0.7																	
4	0	0.6																	
5	1	0.4																	
14.	A model has a weight vector: $w=[1,-2,3,-4]$ 1. Compute the L1 norm of w. (2 Marks) 2. Compute the L2 norm of w. (2 Marks) 3. Compute the L_{∞} norm of w. (2 Marks) 4. Compute the p-norm with $p=3$. (2 Marks)																		

Unit-II

S.No	Part-A Questions
1.	What is a biological neuron?
2.	Define a computational unit in neural networks.
3.	What is a linear perceptron?
4.	State the perceptron learning rule.
5.	What is meant by linear separability?
6.	Define a multilayer perceptron (MLP).
7.	What is the purpose of the activation function in a perceptron?
8.	Explain what is meant by the convergence theorem of the perceptron.
9.	What is backpropagation in neural networks?
10.	List two advantages of multilayer perceptrons over single-layer perceptrons.
11.	Give an example of a problem that is linearly separable .
12.	Give an example of a problem that is not linearly separable .

S.No	Part-B Questions
1.	Explain about working principle of single layer feed forward neural network or SLP
2.	Explain about gradient-based learning
3.	Explain the structure of a biological neuron and its analogy in an artificial neuron.
4.	Describe the working principle of a linear perceptron with a suitable example.
5.	State and explain the perceptron learning algorithm step by step.
6.	Explain the convergence theorem of the perceptron learning algorithm.
7.	Explain about working principle of Multi layer feed forward neural network or MLP

8.	Explain about Back-propagation in deep learning
9.	Discuss about learning XOR problem.
10.	Justify the use of gradient descent in backpropagation and discuss how learning rate affects convergence.

Unit-III

S.No	Part-A Questions
1.	What is a Deep Neural Network (DNN)?
2.	Name two popular platforms for deep learning.
3.	List three deep learning software libraries.
4.	Define feedforward neural network.
5.	Give one example each of ReLU and Sigmoid activation functions.
6.	Define an error function in deep learning.
7.	What is regularization in deep learning?
8.	What is early stopping in training neural networks?
9.	State one purpose of dropout in a neural network.
10.	Define overfitting and explain how regularization helps.
11.	Name two optimization methods used in neural networks.
12.	State the difference between Adam and Adagrad optimizers.
13.	List types of gradient decent

S.No	Part-B Questions
1.	Explain the structure of a simple DNN.
2.	Discuss popular platforms for deep learning and their advantages.
3.	Briefly discuss of deep learning libraries.
4.	Explain feedforward networks and the concept of gradient-based learning.
5.	Describe various activation functions (ReLU, Sigmoid, Tanh) and their properties.
6.	Compare L1 and L2 regularization methods in deep learning.
7.	Explain types of Gradient Descent
8.	Discuss different types of optimization techniques in deep learning
9.	Discuss about Adagrad, Adam optimization techniques in deep learning
10.	Explain about Architecture Design?
11.	Give an example of Learning XOR?

Unit-IV

S.No	Part-A Questions			
1.	Define CNN			
2.	Define Convolution operation.			
3.	In convolutional network terminology identify the three arguments.			
4.	In CNN, if the input is 2-D image I and the kernel is 2-D K then find Convolution equation.			
5.	If the input image is 7*7 and kernel is 3*3 find the dimension of output image.			
6.	Write the equation of output image in 2D in terms of input image.			
7.	What reduces the no. of parameters in the model.			
8.	List the characteristics of CNN.			
9.	What is Max pooling.			
10.	1	4	2	1
	5	8	3	4
	7	6	4	5
	1	3	1	2
	Max pool 2*2 kernel (Stride=2)			
11.	Define sequence learning.			
12.	In the task of predicting the part of speech tag of each word in a sentence find in put and output.			
13.	Write the equation of the function learning executed at each time step in RNN.			
14.	What is the suitable output function for the task of auto completion.			
15.	What is the suitable loss function for the task of auto completion.			
16.	Write the equation for total loss in RNN.			
17.	In RNN, backpropagation we compute the gradients with respect to what parameter?			
18.	Define RNN.			
19.	Distinguish between RNN and CNN			

S.No	Part-B Questions																
1.	Explain the motivation of CNN in deep learning ,																
2.	Explain about the relation between input size,output size and filter size																
3.	Let us consider an image of size width w1=227,Height H1=227, and Depth D1=3. And filter size(11,11,3),padding =0, stride =1,k=96 find the output size.																
4.	Explain the working principle of CNN with an example.																
5.	Discuss about various characterstics of CNN.																
6.	Discuss about pooling with an example in CNN.																
7.	<table><tr><td>a</td><td>b</td><td>c</td><td>d</td></tr><tr><td>e</td><td>f</td><td>g</td><td>h</td></tr><tr><td>i</td><td>j</td><td>k</td><td>l</td></tr></table> and kernel is <table><tr><td>w</td><td>x</td></tr><tr><td>y</td><td>z</td></tr></table> find the output in CNN	a	b	c	d	e	f	g	h	i	j	k	l	w	x	y	z
a	b	c	d														
e	f	g	h														
i	j	k	l														
w	x																
y	z																
8.	What is the training algorithm used to train in CNN model																
9.	Explain the RNN backpropagation through time.																

10.	Explain RNN with an example.
11.	Explain RNN architecture.
12.	Discuss about backpropagation in RNN with suitable example.
13.	Discuss about Unfolding computational graphs.
14.	Discuss about Encoder-Decoder sequence -to- sequence architectures.
15.	Explain about Deep Recurrent networks.
16.	Discuss about recursive neural networks.
17.	Explain about LSTM model.
18.	Explain about Gated RNNs

Unit-V

S.No	Part-A Questions
1.	What is the main objective of handwritten digit recognition?
2.	Define LSTM and mention one advantage over traditional RNN.
3.	What is the role of the Sequential model in Keras?
4.	Name two activation functions commonly used in LSTM networks.
5.	Define sentiment analysis in natural language processing.
6.	What is the purpose of image dimensionality reduction?
7.	Explain what an encoder is in the context of autoencoders.
8.	Give one difference between AlexNet and VGGNet architectures.
9.	Mention the input image size used in AlexNet.
10.	State the key feature of VGGNet that improves classification accuracy.
11.	What is the purpose of Dropout in deep learning networks?
12.	Name one loss function used for classification in LSTM networks.
13.	What is the difference between max pooling and average pooling?
14.	Define “vanishing gradient problem” and how LSTM addresses it.
15.	Mention one application of autoencoders in image processing.

S.No	Part-B Questions
1.	Give brief description of Deep Learning application?
2.	Explain the process of Hand written digits recognition using Deep Learning?
3.	LSTM With Keras?
4.	What Is Sentiment Analysis with Deep Learning?
5.	Image Dimensionality Reduction using Encoders LSTM with Keras?
6.	Briefly Describe about AlexNet and VGGNet?
7.	Explain the vanishing gradient problem in RNNs and how LSTM mitigates this issue.
8.	Describe the step-by-step process of image classification using VGGNet.
9.	Given a dataset of handwritten digits, outline how you would split, normalize, and train an

	LSTM model.
10.	Write a Keras example for building a convolutional neural network using VGGNet architecture.
11.	Explain how feature extraction is performed using pre-trained AlexNet or VGGNet for transfer learning.