
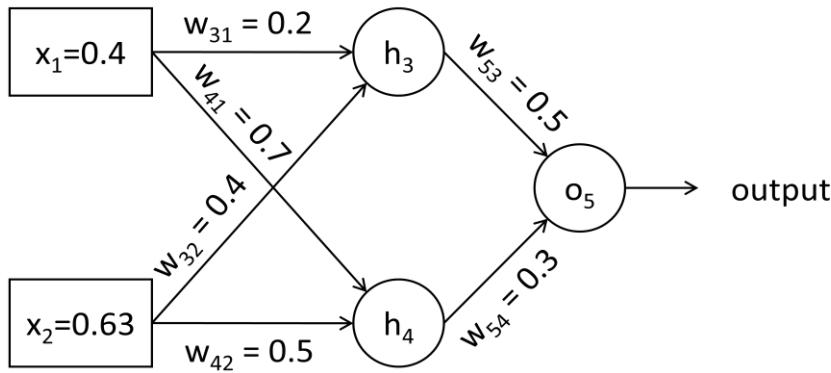


Name:			
Enrolment No:			
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES End Semester Examination, December 2022			
Course: Neural Networks Program: B.Tech (CSE+AIML) Course Code: CSAI 3001		Semester: V Time: 03 hrs. Max. Marks: 100	
Instructions:			
SECTION A (5Qx4M=20Marks)			
S. No.		Marks	CO
Q1	Discuss the architecture of an Artificial Neuron Model.	4	CO1
Q2	Explain how an XOR function can be implemented using MP neuron.	4	CO1
Q3	What is cross-validation technique? Illustrate early stopping of training based on the cross-validation.	4	CO2
Q4	<p>Recurrent Neural Networks (RNNs) can be used in four configuration: One to one, One to many, Many to one, and Many to many.</p> <p>Identify which type of RNN will you apply for the following problems:</p> <p>i) Named-Entity Recognition: For each word in a sentence classify that word as either a person, organization, location, or none</p> <p>ii) Sentiment Analysis: Classify the sentiment of a sentence ranging from negative to positive (integer values from 0 to 4).</p> <p>iii) Language models: Generating text from a chatbot that was trained to speak like you by predicting the next word in the sequence.</p> <p>iv) Image Tagging: Automatic generation of tags from a photo</p>	4	CO4
Q5	Differentiate between discriminative and generative classifiers with suitable examples	4	CO5
SECTION B (4Qx10M= 40 Marks)			
Q6	<p>Define and plot the identity function, binary step function, binary sigmoidal function, bipolar sigmoidal function, and ReLU functions used in neural networks</p> <p style="text-align: center;">OR</p> <p>Assume that the neurons have sigmoid activation function, perform a forward pass and a backward pass on the network.</p>	10	CO2

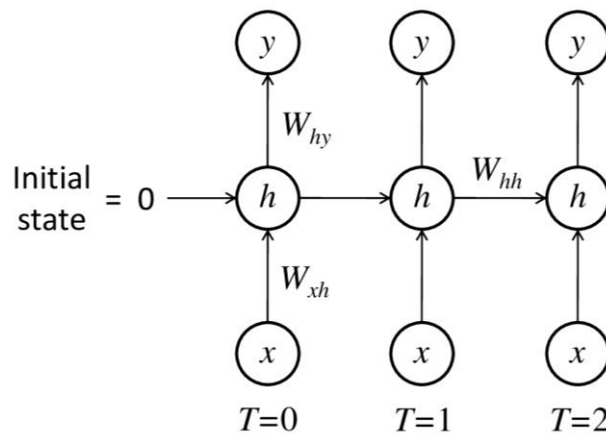


Assume that the actual output of y is 0.5 and learning rate is 1.

Q7

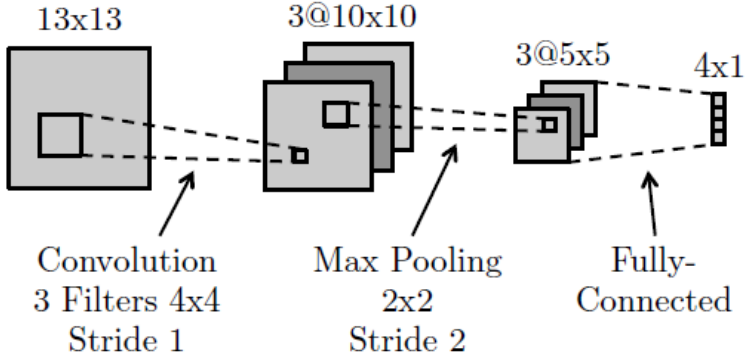
Define a "vanilla" RNN. What are the two main issues that could occur while training an RNN?

The figure below shows a Recurrent Neural Network (RNN) with one input unit x , one logistic hidden unit h , and one linear output unit y . The RNN is unrolled in time for $T = 0, 1$, and 2. The network parameters are: $W_{xh} = 0.5$, $W_{hh} = -1.0$, $W_{hy} = -0.7$, $b_h = -1.0$, and $b_y = 0.0$. Remember, $\sigma(k) = 1/(1 + \exp(-k))$. If the input x takes the values 9, 4, -2 at time steps 0, 1, 2 respectively, what is the value of the hidden state h at $T = 2$? Give your answer with at least two digits after the decimal point.



4 + 6

CO4

<p>Q8</p>	<p>Define a Convolutional Neural Network. What are its advantages over a traditional fully connected network?</p> <p>Below is a diagram of a small convolutional neural network that converts a 13x13 image into 4 output values. The network has the following layers/operations from input to output: convolution with 3 filters, max pooling, ReLU, and finally a fully-connected layer. For this network we will not be using any bias/offset parameters. Please answer the following questions about this network.</p>  <p>(a) How many weights in the convolutional layer do we need to learn?</p> <p>(b) How many ReLU operations are performed on the forward pass?</p> <p>(c) How many weights do we need to learn for the entire network?</p>	<p>4+2+2+2</p>	<p>CO3</p>
<p>Q9</p>	<p>Define Autoencoder Neural Network. What type of problems it solve.</p> <p>Discuss the implementation of following types of Autoencoders:</p> <ol style="list-style-type: none"> Vanilla autoencoder Denoising autoencoder 	<p>4+6</p>	<p>CO4</p>
<p>SECTION-C (2Qx20M=40 Marks)</p>			
<p>Q10</p>	<p>Discuss the following techniques and explain how they help to improve the performance of Convolutional Neural Networks:</p> <ol style="list-style-type: none"> Data Augmentation Batch Normalization Dropout 	<p>7+7+6</p>	<p>CO3</p>
<p>Q11</p>	<p>Explain the implementation of Seq2Seq model for machine translation task. Discuss what kind of problems it may suffer when processing long sequences.</p> <p>Discuss the implementation of Attention mechanism to improve the performance of Seq2Seq model.</p>	<p>8 + 12</p>	

	<p style="text-align: center;">OR</p> <p>GANs can train generative models by emulating a supervised approach to learning problems. To understand the GAN architecture, describe the following points with proper scenario.</p> <ol style="list-style-type: none">i. Sketch the GAN architectureii. Write the objective of Generatoriii. Write the Objective of Discriminatoriv. Define the training loop to train GAN.	<p style="text-align: center;">OR</p> <p style="text-align: center;">4+3+3+10</p>	<p style="text-align: center;">CO5</p>
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