

End Semester Exam
November – December 2023

B.Tech. Program: Information Technology Scheme: II

Examination: LY - Semester VII

Course Code: ITC7041 Course Name: Machine Learning and Deep Learning

Date: December 10, 2023

Duration: 2.5 Hours

Max. Marks: 60

Instructions:

- (1) All questions are compulsory.
- (2) Draw neat diagrams wherever applicable.
- (3) Assume suitable data, if necessary.

Ques. No.	Question	Max. Marks	CO	BT Level																																		
Q1.	Solve any six questions out of eight:	12																																				
i)	Explain types of Machine Learning approaches.	2	CO1	U																																		
ii)	Explain Incremental Learning.	2	CO2	U																																		
iii)	Explain the role of Bias in Neural Networks.	2	CO3	U																																		
iv)	Explain Case Updating in Neural Networks.	2	CO3	U																																		
v)	Explain the need of Padding in CNN.	2	CO4	U																																		
vi)	Explain the role of Inception Module.	2	CO4	U																																		
vii)	List various Gates and States in LSTM.	2	CO5	U																																		
viii)	Explain the role of Generator in GANs.	2	CO6	U																																		
Q2.	Solve any four questions out of six:	16																																				
i)	Explain Goodness of Fit.	4	CO1	U																																		
ii)	Compare Bagging and Boosting.	4	CO2	A																																		
iii)	Sketch a Neural Network for Diabetes prediction.	4	CO3	A																																		
iv)	Apply Convolution operation on the below Input Feature Map using the given Convolution Filter and derive the Output Feature Map: <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>Input Feature Map</p> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td></tr> </table> </div> <div style="text-align: center;"> <p>Convolutional Filter</p> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>1</td><td>0</td><td>1</td></tr> <tr><td>0</td><td>1</td><td>0</td></tr> <tr><td>1</td><td>0</td><td>1</td></tr> </table> </div> </div>	1	1	1	0	0	0	1	1	1	0	0	0	1	1	1	0	0	1	1	0	0	1	1	0	0	1	0	1	0	1	0	1	0	1	4	CO4	A
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0	1	0																																				
1	0	1																																				
v)	Differentiate LSTM and GRU.	4	CO5	A																																		
vi)	Explain applications of Autoencoders.	4	CO6	U																																		
Q3.	Solve any two questions out of three:	16																																				
i)	A Machine Learning model is trained to predict tumor in patients. The test dataset consists of 100 patients. Based on the following Confusion Matrix derived from the test, calculate Accuracy, Precision, Recall, Sensitivity, and Specificity: <table border="1" style="border-collapse: collapse; text-align: center; margin-left: auto; margin-right: auto;"> <tr> <td rowspan="4" style="writing-mode: vertical-rl; transform: rotate(180deg);">Predicted</td> <td colspan="2">Actual</td> </tr> <tr> <td>Positive</td> <td>Negative</td> </tr> <tr> <td>Positive</td> <td>560 60</td> </tr> <tr> <td>Negative</td> <td>50 330</td> </tr> </table>	Predicted	Actual		Positive	Negative	Positive	560 60	Negative	50 330	8	CO2	A																									
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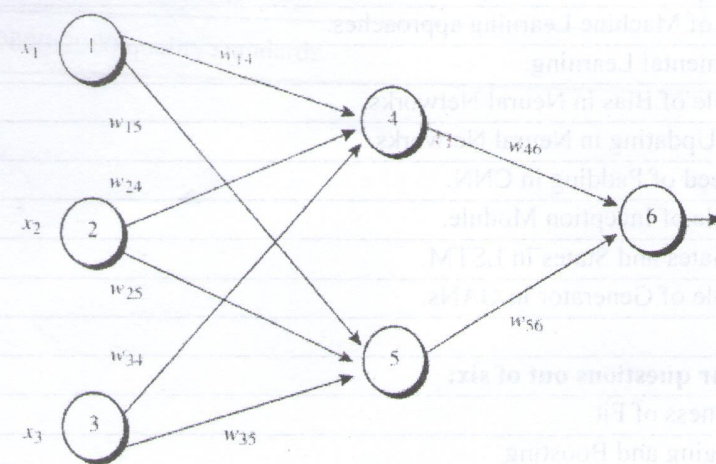
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ii)	Apply GANs for healthcare and explain the architecture of GAN.	8	CO6	A																						
iii)	<p>Consider the following multilayer feed-forward neural network. Let the learning rate be 0.5. The initial weight and bias values of the network are given in the table below, along with the first training tuple, $X = (1, 0, 1)$, whose class label is 0. Calculate the net input, output and error of each unit in hidden and output layer once the tuple is fed into the network. Also show updated values of weights and bias after first iteration calculating the error.</p>  <table border="1" data-bbox="351 1216 1244 1305"> <tr> <td>w14</td><td>w15</td><td>w24</td><td>w25</td><td>w34</td><td>w35</td><td>w46</td><td>w56</td><td>θ_1</td><td>θ_2</td><td>θ_3</td> </tr> <tr> <td>0.2</td><td>-0.3</td><td>0.4</td><td>0.1</td><td>-0.5</td><td>0.2</td><td>-0.3</td><td>-0.2</td><td>-0.4</td><td>0.2</td><td>0.1</td> </tr> </table>	w14	w15	w24	w25	w34	w35	w46	w56	θ_1	θ_2	θ_3	0.2	-0.3	0.4	0.1	-0.5	0.2	-0.3	-0.2	-0.4	0.2	0.1	8	CO3	A
w14	w15	w24	w25	w34	w35	w46	w56	θ_1	θ_2	θ_3																
0.2	-0.3	0.4	0.1	-0.5	0.2	-0.3	-0.2	-0.4	0.2	0.1																
Q4.	Solve any two questions out of three:	16																								
i)	Apply CNN for hand-written digit recognition (classified from 0 to 9) and explain its various layers.	8	CO4	A																						
ii)	Apply GRU for time-series based temperature prediction and explain its architecture.	8	CO5	A																						
iii)	Consider designing an E-Commerce Mobile Application for Glasses (Sunglasses, Spectacles, etc.) based on Machine Learning. Apply and discuss all steps in designing a Machine Learning system.	8	CO1	U																						

	Actual	
Positive	200	Positive
Negative	20	Negative