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| C:\Users\RAJESH\Downloads\Logo 2.png |  | ***Go, Change the World*** | | | | | | | | | | |
| **Academic Year 2024-25 (ODD Semester)** | | | | | | | | | | |
| **USN** | **1** | **R** | **V** |  |  |  |  |  |  |  |
| **Department of Artificial Intelligence and Machine Learning** | | | | | | | | | | | | |

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| **ARTIFICIAL NEURAL NETWORKS AND DEEP LEARNING** | | | | | |
| **Course Code** | **:** | **AI253IA** | **Date** | **:** | **29/1/2025** |
| **Semester** | **:** | **V Sem** | **Time** | **:** | **2:30pm to 4:30pm** |
| **Max Marks** | **:** | **10 (Q) + 50(CIE)** | **Duration** | **:** | **30 + 90=120 min** |

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| **Re-Test** | | | | | |
| **Note: Answer all the Questions** | | | | | |
| **Q. No** | | **Questions** | **M** | **BT** | **CO** |
| **1** | **a)** | What is striding in CNN? | **2** | **2** | **1** |
|  | **b)** | Examine the effectiveness of the ReLU layer compared to other activation functions (sigmoid and Tanh) in CNNs. | **2** | **1** | **1** |
|  | **c)** | How would you analyse the application of Recurrent Neural Networks (RNNs) in automatic image captioning, and what role do they play in generating textual descriptions of images? | **2** | **3** | **1** |
|  | **d)** | Evaluate the challenges of Reinforcement Learning in real-world applications like self-driving cars and conversational systems, and suggest possible solutions. | **2** | **2** | **1** |
|  | **e)** | Give the max pooling considering 2×2 window size   |  |  |  |  | | --- | --- | --- | --- | | 6 | 8 | 3 | 2 | | 1 | 7 | 5 | 8 | | 5 | 6 | 4 | 5 | | 3 | 2 | 8 | 5 | | **2** | **2** | **1** |

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| **Re-Test** | | | | | |
| **Note: Answer all the Questions** | | | | | |
| **Q. No** | | **Questions** | **M** | **BT** | **CO** |
| **2** | **a)** | Examine the architectures of Gated Recurrent Unit (GRU) and Long Short-Term Memory (LSTM) models, derive the output equations for each layer, and analyse the distinctions between the two. | 5 | 3 | 1 |
| **b)** | Explain Back propagation, through matrix multiplication in Convolutional Neural Network (CNN) | 5 | 2 | 1 |
| **3** | **a)** | Demonstrate the process of backpropagation through convolutions with an example matrix calculation: (Considering: Input Image (3x3 matrix): Input = [[1, 2, 3], [4, 5, 6], [7, 8, 9]] Filter (Kernel) (2x2 matrix): Filter = [[1, 0], [0, -1]]).  Compute the following:  a. Output feature map  b. Backpropagation to update the weights: Assume the loss function L has been  calculated and its gradient concerning the output is: ∂L/∂ Output = [[1, 1], [1, 1]]  c. Update the filter weights | 10 | 3 | 3 |
| **b)** | What is data augmentation? Explain with example | 5 | 2 | 1 |
| **4** | **a)** | Consider the convolutional neural network defined by the layers in the left column below. Fill in the shape of the output volume and the number of parameters at each layer. You can write the shapes in the NumPy format (e.g. (64,64,3)).  Notation:   1. CONV5-N denotes a convolutional layer with N filters with height and width equal to 5. Padding is 2, and stride is 1. 2. POOL2 denotes a 2x2 max-pooling layer with stride of 2 and 0 padding. 3. FC-N denotes a fully connected layer with N neurons.  |  |  |  | | --- | --- | --- | | **Layer** | **Activation Volume Dimensions** | **Number of parameters** | | **Input** | **32\*32\*1** | **0** | | **CONV5-10** |  |  | | **POOL2** |  |  | | **CONV5-10** |  |  | | **POOL2** |  |  | | **FC10** |  |  | | 10 | 3 | 3 |
| **5** | **a)** | How does Backpropagation Through Time (BPTT) differ from regular backpropagation in feed-forward networks, and what are the challenges faced when applying it to RNNs, particularly in terms of gradient explosion or vanishing gradients? | 5 | 3 | 2 |
| **b)** | Explain any two approaches of CNN for video classification ? | 5 | 4 | 3 |
| **6** |  | Compare the performance of basic RNNs, LSTMs, and GRUs in handling long-term dependencies in time-series forecasting. What are the strengths and weaknesses of each model | 5 | 3 | 2 |

**M-Marks, BT-Blooms Taxonomy Levels, CO-Course Outcomes**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Marks Distribution** | **Particulars** | **CO1** | **CO2** | **CO3** | **CO4** | **L1** | **L2** | **L3** | **L4** | **L5** | **L6** |
| **Max Marks CIE & Quiz** | 30 | 5 | 15 | - | 4 | 12 | 20 | 14 | 10 | - |

**Course Outcomes**

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| --- | --- |
| **CO1:** | Describe basic concepts of neural networks, its applications and various learning models |
| **CO2:** | Analyse different network architectures, learning tasks, CNN, and deep learning models |
| **CO3:** | Investigate and apply neural networks model and learning techniques to solve problems related to society and industry. |
| **CO4:** | Demonstrate a prototype application developed using any NN tools and APIs. |
| **CO5** | Appraise the knowledge of neural networks and deep learning as an individual/as an team member. |