



JK Lakshmipat University, Jaipur
Department of Computer Science and Engineering
Machine Learning (CS1138)
End-Term
Date: April 22, 2024

Time: 2:30 hours

BCA Semester IV

Max mark: 35

Please read the following instructions carefully.

- There are 8 questions printed on both sides.
 - **No marks** for providing just expressions/answers unless accompanied with correct justification and/or derivation.
 - In case of any doubt, make your assumption, write it clearly and continue. DO NOT call your instructor.
1. Why is mean squared error not used as a cost function for logistic regression (cross-entropy is used instead)? (CO3) (2)
 2. You are provided a dataset of weight of 1 billion aliens on the exoplanet K2-18b. This is the first column of your csv file. The second column of this csv file is a label stating whether the alien is obese (overweight) or not. You also know that in this dataset all the aliens with weight greater than 80kg are labeled as obese and all the aliens with weight less than or equal to 80kg are labeled as not obese. There is not even a single exception to this rule in the dataset. Argue which machine learning algorithm you will use for this problem, if at all. Clearly state your argument. (CO1,CO2) (3)
 3. Write the gradient descent algorithm. (CO1,CO2) (3)
 4. Assume a vocabulary size is 10,000 words. (CO3,CO4)
 - (a) How will you represent each word using one hot vectors? (1)
 - (b) How will the representation change if the vocabulary size changes to 2,00,000 words? (1)
 - (c) State two prominent disadvantages of one hot vector representation. (2)
 5. Assume your neural network has only two parameters w_1 and w_2 . There is no other parameter (not even bias). Draw a neural network that may fit well in the above description. (CO1, CO2, CO3) (3)
 6. You are provided a previous layer activation volume with dimensions $20 \times 20 \times 100$. Your goal is to convert this volume to another volume of size $20 \times 20 \times 200$. Provide a convolutional layer that may be used to accomplish the above task. Also provide the count of parameters. On the output volume as provided, apply maxpooling with a filter size of 2×2 . What will be the shape of the output and also calculate the number of parameters in the pooling layer? (CO3, CO4) (3+2+1+1)

7. Assume your goal is to train a neural network to do named entity recognition. Assuming that the input is of size 300, and the number of hidden layers is one with 100 neurons. You are asked to train a recurrent neural network to accomplish this task. Draw a neat diagram of the neural network that you will use. Provide the number of parameters in the RNN. Write down the equations that govern the provided neural network. (CO2, CO3, CO4) (2+2+2)

8. You are provided the following tensorflow code to implement a neural network. (CO4, CO5)

(a) Draw a neural network corresponding to the code. (2)

(b) Calculate the total number of parameters associated in each of the five lines provided in the following code. Compute neatly. (5*1)

```
model = tf.keras.models.Sequential([
    tf.keras.layers.Conv2D(32, (3,3), activation='relu', input_shape=(28, 28, 1)),
    tf.keras.layers.MaxPooling2D(2, 2),
    tf.keras.layers.Flatten(),
    tf.keras.layers.Dense(128, activation='relu'),
    tf.keras.layers.Dense(10, activation='softmax')
])
```