COMSATS University Islamabad, Attock Campus

Department of Computer Science

Program: BS (AI)-III

Fall 2022 Terminal Examination
Course: - Programming for Artificial Intelligence

Time Allowed:- 180 Minutes **Dated:- 13/01/2023** **Marks: - 70**

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Note:- Don't write anything on Question Paper except your name & Reg. No.

Q#01: Answer the following short questions by writing the python code, each question carry 3 marks. (CLO-4) (12)

Part (a): Use NumPy library to perform any mathematical operations on arrays and matrices in Python?

Part (b): Write a sample program in python to implement dropout regularization in CNN model to reduce overfitting and batch normalization to improve training?

Part (c): Apply NLTK library to tokenize, preprocess text data and perform natural language processing?

Part (d): Use a sample program in python to load a dataset using pandas and convert it into a format suitable for training a machine learning model?

Q#02: Answer the following short questions (Maximum 5 lines), each question carry 3 marks. (CLO-2) (18)

Part (a): Differentiate between a 2D convolutional layer and a fully connected layer in a neural network?

Part (b): Demonstrate fine-tuning a pretrained CNN model for a new task using transfer learning?

Part (c): Illustrate the use of data augmentation to improve the performance of CNN model on image classification tasks?

Part (d): Demonstrate the selection of kernel size, stride, and padding and how it affect the number of parameters in a 2D convolutional layer?

Part (e): Explain the use of matplotlib to visualize data and plot various charts such as histograms and scatter plots?

Part (f): Illustrate the use of matplotlib to visualize the architecture of a CNN and plot the training and validation loss and accuracy during training?

Q#03: Differentiate between the following highlighted terms and python functions (Maximum 5 lines), Each question carry 3 marks. (CLO-1) (30)

a) StandardScaler() class and MinMaxScaler() class in scikit-learn?
b) one_hot() function and get_dummies() function in pandas?
c) fit() and fit_transform() functions in scikit-learn?
d) LinearRegression() and LogisticRegression() classes in scikit-learn?
e) Batch size and Epochs?
f) MaxPooling2D and AveragePooling2D layer in Keras?
g) Conv2D and Conv1D layers in Keras?
h) Sigmoid and softmax activation functions?
i) Feature and a label in the context of machine learning?
j) Overfitting and underfitting in machine learning?

Q#04: Given below is the snippet of code to answer the following questions? (CLO-3)

```
from keras.models import Sequential
from keras.layers import Conv2D, MaxPooling2D, Flatten, Dense
model = Sequential()
model.add(Conv2D(32, (3, 3), activation='relu', input_shape=(28, 28, 1)))
model.add(MaxPooling2D(pool_size=(2, 2)))
model.add(Flatten())
model.add(Dense(128, activation='relu'))
model.add(Dense(10, activation='softmax'))
model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['accurac
```

Part (a): *Explain the use of loss function in the given code?* (03)

Part (b): *Give the purpose and use of the 'flatten' layer in this model?* (03)

Part (c): *Interpret the number of output classes?* (02)

Part (d): *Relate the use of dense 128 layer?* (02)

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