III-II CSM   Deep Learning Lab Question Paper   12-04-2023

1. Checking the TF version and availability of physical devices
   a. Get the version of TensorFlow running on your machine?
   b. Get the type & number of physical devices available on your machine, print what are they, and test whether the GPU is available?

2. Random number generator
   a. What is the need for setting a 'seed' value in any random number generation?
   b. Create two random number generators using TensorFlow with the same seed of 42, create two random gaussian tensors of shape 2x3, and verify that the both tensors are identical.
   c. Create two random number generators using TensorFlow with two different seed values say 42 & 11, create two random gaussian tensors of shape 2x3, and verify that the both tensors are not identical.

3. Shuffling of Tensors
   a. Shuffle the given Tensor with and without an operation seed value. Write down your observations.
   b. Show that 'operation seed' in 'tf.random.shuffle' and the 'global seed' in 'tf.random.set_seed' are different? Illustrate that having both gives the tensor in same order every time after shuffling?

4. Reshaping the tensors
   a. (i) Construct a vector consisting of first 24 integers using 'numpy'.
      (ii) Convert that 'numpy' vector into a Tensor of rank 3.
      (iii) Write your observations on how the elements of the vector got rearranged in the rank 3 tensor.
   b. (i) Create a tensor of rank 2.
      (ii) Convert that tensor into another tensor of shape 2x2x1 using 'tf.newaxis'
   c. (i) Create a tensor of rank 2.
      (ii) Convert that tensor into another tensor of shape 2x2x1 using 'tf.expand_dims'.

5. Linear Regression full experiment
6. Regularization full experiment
7. ANN

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Layer (type)                 Output Shape              Param #
================================================================
Layer1_tanh (Dense)          (None, 4)                 12

Layer2_tanh (Dense)          (None, 2)                 10

Layer3_sigmoid (Dense)       (None, 1)                 3


================================================================
Total params: 25
Trainable params: 25
Non-trainable params: 0
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```

   a. (i) Import all the necessary libraries required for creating the above neural network model
      (ii) Construct the model using **Sequential API**. Consider the corresponding activation functions as specified in the Layer Type, and assume that each of the input feature vector has **two features** in it. Chose the number of units in each layer accordingly.
      (iii) Compile the model with the following details and print the model as given in the figure
         i. Optimizer = Adam
         ii. Loss function = Choose appropriately from the layer types
         iii. Metrics = Choose appropriately considering the binary class classification task
   b. (i) Import all the necessary libraries required for creating the above neural network model
      (ii) Construct the model using **Functional API**. Consider the corresponding activation functions as specified in the Layer Type, and assume that each of the input feature vector has **two features** in it. Chose the number of units in each layer accordingly.
      (iii) Compile the model with the following details and print the model as given in the figure
         i. Optimizer = Adam

    ii. Loss function = Choose appropriately from the layer types

    iii. Metrics = Choose appropriately considering the binary class classification task

8. CNNs

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Layer (type)                 Output Shape            Param #
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conv_1_relu (Conv2D)         (None, 13, 13, 32)      544

max_pool_1 (MaxPooling2D)    (None, 6, 6, 32)        0

flatten_7 (Flatten)          (None, 1152)            0

dense_1_relu (Dense)         (None, 128)             147584

dense_2_softmax (Dense)      (None, 10)              1290


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Total params: 149,418
Trainable params: 149,418
Non-trainable params: 0
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  a. (i) Import all the necessary things

    (ii) Construct the model using **Sequential API**. Consider the corresponding activation functions as specified in the Layer Type, and assume that the input is of shape **28x28x1**. The kernel size of the convolutional layer should be **3x3**. Chose the number of filters, padding, and stride accordingly.

    (iii) Compile the model with the following details and print the model as given in the figure.

      i. Optimizer = Adam

      ii. Loss function = Choose appropriately from the layer types

      iii. Metrics = Choose appropriately considering the multiclass classification task

  b. (i) Import all the necessary things

    (ii) Construct the model using **Functional API**. Consider the corresponding activation functions as specified in the Layer Type, and assume that the input is of shape **28x28x1**. The kernel size of the convolutional layer should be **3x3**. Chose the number of filters, padding, and stride accordingly.

    (iii)Compile the model with the following details and print the model as given in the figure.

      i. Optimizer = Adam

      ii. Loss function = Choose appropriately from the layer types

      iii. Metrics = Choose appropriately considering the multiclass classification task

  c. (i) Load the 'cifar100' dataset that comes with TensorFlow.

    (ii) Determine the images in training set and test sets respectively.

    (iii) Identify the resolutions of the images.

    (iv) Perform the normalization of the dataset along with extending their dimension to consider the 'batches' while training.

9. Write a Program for text processing to identify the POS tags from the input text?

10. Write a Program for Text Processing to identify the common tags for the parsing?

11. Write a program for Text Processing to identify the Named Entity Recognition from the given Text?

12. Write the Code for implementing the LSTM model for the sentiment Analysis on IMDB Movie Reviews dataset with Sigmoid Optimizer?

13. Write the Code for implementing the LSTM model for the sentiment Analysis on IMDB Movie Reviews dataset with Adam Optimizer?

14. Write the Code for implementing the LSTM model for the sentiment Analysis on IMDB Movie Reviews dataset with '*RMSProp*' Optimizer?