

Nirma University

Institute of Technology

Semester End Examination (IR), December - 2019

B. Tech. in Computer Engineering / Information Technology, Semester-VII

IT7F4 Deep Learning

Roll /
Exam No.

Supervisor's initial
with date

Time: 3 Hours

Max. Marks: 100

Instructions:

1. Attempt all questions.
2. Figures to right indicate full marks.
3. Draw neat sketches wherever necessary.
4. Assume suitable data wherever applicable and clearly mention them.
5. CLO_ and BL_ have been mentioned against each question to map it as per Course Learning Objective and Bloom's taxonomy.

Section I

Q 1 Answer the following: [18]
CLO1 (a) Why is vanilla neural network not good at processing raw [8]
BL2 images? Critically discuss issues pertaining to this.

CLO1 (b) Critically compare strided and fractionally strided [10]
BL2 convolution with suitable examples.

Q 2 Assume a neural network with a sequence of layers like: [16]
CLO2 Input Layer (I) -> Convolutional Layer (C1) -> Max Pooling
BL3 Layer (P1) -> Convolutional Layer (C2) -> Fully Connected
Layer (F1) -> Fully Connected Layer (F2). Layer I receives
and passes grey scale images of size 64 x 64 to C1. C1
employs 4 kernels with F=5, S=1 and P=0. Output of C1 is
then fed to P1 which employs F=2 and S=2. Next, Output
of P1 is processed by C2 with 8 kernels having F=5, S=1
and P=0. Output of C2 is further processed by F1 with 40
neurons. Finally, F2 produces probabilities of class using
10 neurons with softmax activations. Calculate total
number of parameters and connections in the network.
Show the computation layer wise. Assume number of
channels in kernels in some layer L = number of channels
in input of layer L. Also, separately report number of
parameters (layer wise and total) when convolutional and
pooling layers are replaced by fully connected layers.

OR

Q 2 Propose a CNN based approach (write an algorithm or draw [16]
CLO2 a block diagram) for face recognition based attendance
BL3 system for an office. Assume that there are 100000
employees and CNN is to be trained using their faces.
Propose architecture of CNN and discuss training process.
Please note that your approach should be such that if a

new employee is recruited, you do not require to train CNN again for him/her.

- Q 3 Answer the following: [16]
 CLO2 (a) What is the discriminator loss? What is the generator loss? [10]
 BL3 What are they each measuring? Why do we alternate between training the generator and training the discriminator? Write equations of loss function. The authors of the original GAN paper (by Ian GoodFellow et. al, NIPS 2014) proposed to use slightly modified loss function for training the generator. State the function and describe why it is favourable.
- CLO1 (b) Describe data augmentation scheme employed in [6]
 BL2 ALEXNET.

Section II

- Q 4 Assume many-to-many RNN for addressing problem of [18]
 CLO1 named entity recognition. Assume that there is one hidden
 BL2 layer and we present input sequence (I) of length 3. Derive equations (in terms of gradients only, no need to expand further) for updating each weight using back propagation through time once the forward pass of I through the network is completed.
- Q 5 Answer the following: [18]
 Q 5 (a) Discuss sliding window approach for object detection. [9]
 CLO1 What are its limitations?
 BL2
- OR**
- Q 5 (a) How can CNN be used for classification with localization? [9]
 CLO1
 BL2
- Q 5 (b) Write a pseudo code to implement UNET like encoder-decoder architecture for semantic segmentation. Assume that encoder layers are implemented using some pretrained network (i.e. using transfer learning for encoder layers). [9]
 CLO3
 BL4
- Q 6 What are autoencoders? Write pseudocode for vanilla, [14]
 CLO3 multilayer, convolutional, sparse and denosing
 BL4 autoencoders.
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