

Reg. No.: MBAL766

Name :



VIT

Vellore Institute of Technology  
(Deemed to be University under section 3 of Act, 1956)

## Continuous Assessment Test II- October 2024

Programme	: B.Tech ( CSE, AI & ML, MECH, ECE, ECM)	Semester	: Fall 24-25
Course Title	: Deep Learning	Code	: BCSE332L
		Class Nbr(s)	: CH2024250100992 CH2024250100984 CH2024250100978
Faculty (s)	: Khadar Nawas K, Pandiaraju V, Rajalakshmi R	Slot	: F1+TF1
Time	: 1½ Hours	Max. Marks	: 50

## General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information.
- Only non-programmable calculator without storage is permitted

## Answer all the Questions

- A person has done a forgery to avail multiple passports on different names by using different versions of his photo. Police department has identified the crime done by the person using a particular App by generating his different images. The probability distribution of features extracted from images were  $[0.1, 0.2, 0.8, 0.7, 0.5]$ . The predicted probability distributions were  $[0.2, 0.3, 0.7, 0.6, 0.5]$ . 15

  - Identify the suitable model used in the App and brief on the model architecture with a neat sketch. [ 8 marks]
  - Compute the reconstruction loss associated with this model using the appropriate metric. [7 marks]
- A pharmaceutical company is working on a system to recommend personalized drugs for patients based on their genetic profiles and medical histories. However, patient data is often incomplete, and certain genetic or medical records may be missing. The company wants to generate accurate predictions of potential treatments even when some information is unavailable. You are tasked with building a model that can handle incomplete patient data and generate latent representations to recommend personalized drugs. This includes the constraint 10 that, the same data distribution should be maintained for both original and reconstructed medical records and it should not diverge from the original.

  - Which type of auto-encoder would you choose for this task ? Why ? [ 2 marks]
  - Elaborate the chosen auto-encoder and its working principle [ 5 marks]
  - Which measure do you use to ensure that, both the true distribution and the model's approximate distribution is same and how ? [ 3 marks ]
- Imagine you are working with a single image where a **dog** is present, and your model tries to detect it using a model P. Your friend has also tried using the same image data, with a technique Q. The table below lists the coordinates of the dog's actual location (G) in the given image, as 10 predicted by your model (P), and your friend's model (Q).



	x min	y min	x max	y max
Actual (G)	50	50	200	200
Model P	45	45	190	190
Model Q	10	10	60	60

Determine the Intersection over Union (IoU) for both your model P and your friend's model Q. Comment on the performance of P and Q, which is better and why? Also, write the other performance metrics that can be useful, to evaluate such a system.

4. a) Compare and contrast the strengths and weaknesses of the VGG architecture with more modern CNN architectures like ResNet or GoogleNet. Consider factors such as computational efficiency, model interpretability, and performance on specific tasks. [ 7 marks] 10
- b) What is the purpose of  $1 \times 1$  convolution in the InceptionNet? Elaborate the same by considering a medical image. [ 3 marks]

5. Assume that, you have the following activations for two neurons (two features) in a hidden layer, across 3 samples in a mini-batch. Apply a suitable normalization technique that helps to stabilize the training of deep neural network and speed up convergence. On the obtained normalized output, use 0.8 and 0.1 as the scale and shift parameters, and present the final output. 5

Sample	Activation (X1)	Activation (X2)
S1	0.5	0.4
S2	0.3	0.8
S3	0.7	0.09