# **Question Paper**

Exam Date & Time: 31-May-2023 (10:00 AM - 01:00 PM)



## MANIPAL ACADEMY OF HIGHER EDUCATION

Manipal School of Information Sciences (MSIS), Manipal

Second Semester Master of Engineering - ME (Artificial Intelligence and Machine Learning) Degree Examination - May 2023

Convolutional Neural Networks for Computer Vision Elective -2 [AML 5232]

#### Marks: 100

3)

Duration: 180 mins.

#### Wednesday, May 31, 2023

#### Answer all the questions.

1)In connection with image arithmetics, explain the various operations for image processing. Also,<br/>explain the difference between wrap around and saturation methods. (TLO 1.1, L2)(10)2)Identify the operation in the following cases. (TLO 1.1, L3) (4 X 2.5 marks)(10)

a) Case 1: An operation was performed on a gray scale image which reduced the total number of bits used for representing the bits used per pixel.

b) Case 2: An operation was performed on an image. The resultant image contained only black and white pixels.

c) Case 3: Contents of two images were merged into a single image. Identify the operation.d) Case 4: A grayscale image was modified to use less number of pixels to represent the same image.

Explain the following types of convolutions. Also give an example each of a CNN which uses this (10) type of convolution.

a) Transposed convolutions

b) Depth separable convolution (TLO 2.1, L3)

- 4) Discuss how you would cheaply increase the receptive field of output units without increasing the (10) kernel size, in connection with convolution operations. (TLO 2.1, L6)
- 5) The R,G and B components of an image are shown below. Using a kernel to detect edges, (10) demonstrate 2D and 3D convolution operations on this image. (TLO 2.2, L3)

### R component

5	10	2	10	5	5	10
10	5	5	5	10	10	5
5	5	5	10	10	10	2
10	2	5	2	2	10	1
5	10	2	1	10	5	1
10	5	5	5	2	2	2
10	10	10	10	2	2	5

G Con	npone	nt								
5	10	2	1	10	5	1				
10	5	5	5	2	2	2				
2	2	10	1	2	2	2				
10	10	2	2	5	10	2				
5	5	10	10	10	2	2				
5	10	2	10	5	5	1				
10	5	5	5	10	10	5				
B Component										
10		-	-			•				
10	5	5	5	2	2	2				
2	5 2	5 10	1	2 2	2 2	2 5				
2 10	5 2 10	5 10 2	5 1 2	2 2 5	2 2 10	2 5  1				
2 10 10	5 2 10 5	5 10 2 5	5 1 2 5	2 2 5 2	2 2 10 2	2 5  1 2				
2 10 10 10	5 2 10 5 10	5 10 2 5 10	5 1 2 5 10	2 2 5 2 2	2 2 10 2 2	2 5  1 2 5				
2 10 10 10 5	5 2 10 5 10 2	5 10 2 5 10 2	5 1 2 5 10 10	2 2 5 2 2 5	2 2 10 2 2 5	2 5 1 2 5 2				

Describe the various activation functions used in CNNs. Compare and contrast the activation (10) 6) functions describing their benefits and drawbacks in different scenarios. (TLO 2.3, L5) Explain various approaches used for tackling overfit and underfit. (TLO 3.1, L5) (10) 7) Explain how augmentation and skip connections are useful for CNN training (TLO 2.1, L2) (10) 8) Discuss the criteria to be considered to choose between transfer learning, traditional machine 9) (10) learning or deep learning for training of CNN for classification. (TLO 2.3, L6) 10) Compare and contrast the following (TLO 3.1, L5) (4 X 2.5 marks) (10) a) Shallow layer CNN and Deep layer CNN b) Full training and transfer learning

c) Use of pretrained CNN for fine tuning and for feature extraction

d) Filter weights and feature maps

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