Question Paper

Exam Date & Time: 29-Jun-2022 (02:00 PM - 05:00 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 - June 2022

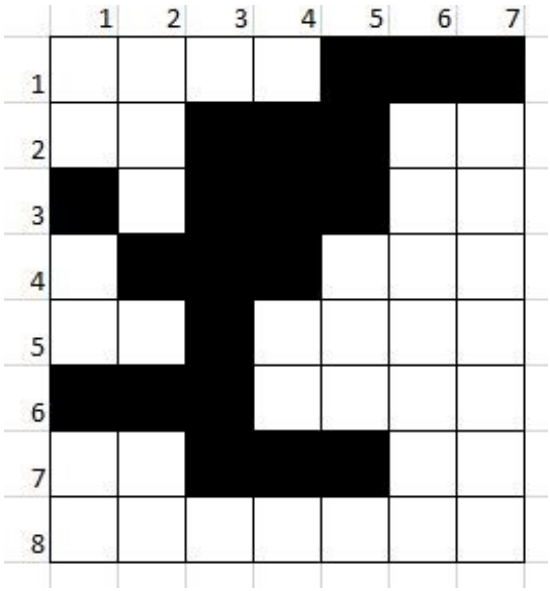
Convolutional Neural Networks for Computer Vision Elective -2 [AML 5232]

Marks: 100 **Duration: 180 mins.**

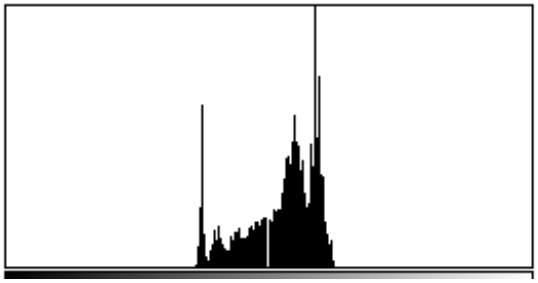
Wednesday, June 29, 2022

Answer all the questions.

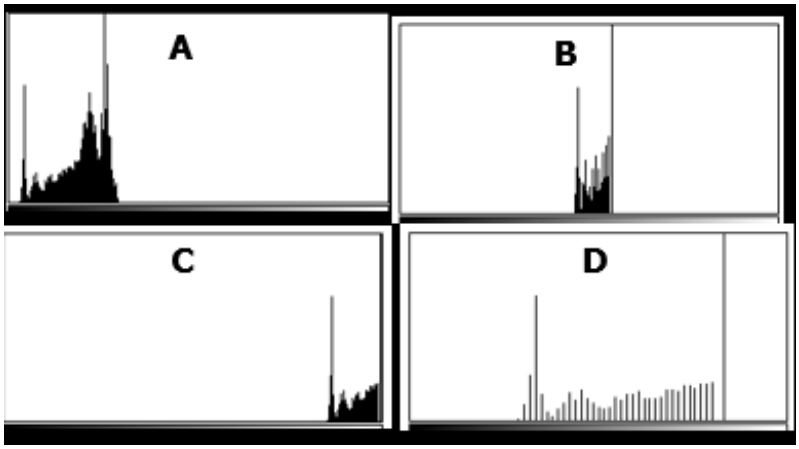
1) What are moments? How moments can be used to obtain area and centroid of an object? Evaluate the area and centroid of the object marked black in the following image. (1+4+5 marks) (10)



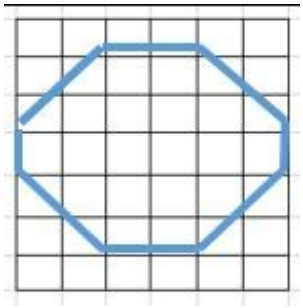
2) Histogram of an image is shown below. Some operations when applied on this image modifies the histogram of the image. (10)



Figures below labelled A,B,C and D represent the modified histograms. Identify the operations which lead to modified histograms as shown in figures A,B,C and D. Also provide the justification to the answer.



3) Describe chain code as a shape descriptor. Provide chain code for the image given below. Also, provide its rotational invariant representation and starting point invariant representation. Explain how the invariance can be achieved. Also, explain how scaling invariance can be achieved. (10)



4) Using an 7X7 matrix as an example, demonstrate the effect of kernel size, stride and padding values on dimension of the output matrix. (10)

5) The R,G and B components of an image are shown below. Using a kernel to detect edges, demonstrate 2D and 3D convolution operations on this image. (10)

R component G component

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

B 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

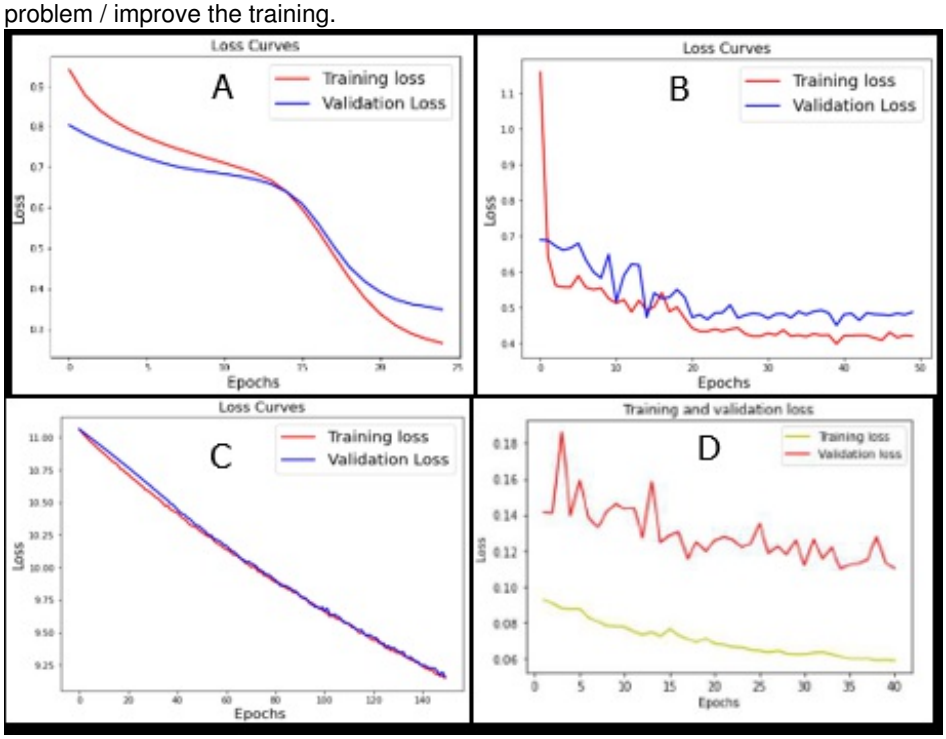
6) Describe the various activation functions used in CNNs. Compare and contrast the activation functions describing their benefits and drawbacks in different scenarios. (10)

7) Describe various approaches used for tackling overfit and underfit. (10)

8) Describe the use of 'image resize' while training CNN using the transfer learning approach. Also, (10)

explain data augmentation and its role in CNN training.

9) Loss curves are shown below. In each of these cases, identify the state of learning of the model / issue with training of the model and suggest the remedial steps that would be used to overcome the problem / improve the training. (10)



10) For an object detection task, describe how you would use a CNN architecture for a transfer learning approach. Describe the architecture briefly and explain the approach you would take for training and evaluation using various hyperparameters and metrics. (10)

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