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Subject Code:- AMICSE0801

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

M.Tech. (Integrated)

SEM: VIII - THEORY EXAMINATION (20.....- 20.....)

Subject: Computer Vision

Time: 3 Hours

Max. Marks: 100

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of **three Sections -A, B, & C**. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.
2. Maximum marks for each question are indicated on right -hand side of each question.
3. Illustrate your answers with neat sketches wherever necessary.
4. Assume suitable data if necessary.
5. Preferably, write the answers in sequential order.
6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A

20

1. Attempt all parts:-

- 1-a. The purpose of max pooling in a Convolutional Neural Network (CNN) Is--- (CO1,K2) 1
- (a) To reduce the spatial dimensions of the input volume, thus decreasing the computational complexity.
 - (b) To increase the number of feature maps in the network, enabling better feature extraction.
 - (c) To introduce non-linearity into the network, enhancing its ability to learn complex patterns.
 - (d) To normalize the input data, ensuring consistent scaling across the network.
- 1-b. Tick One of the common application of deep learning is (CO1,K1). 1
- (a) NLP
 - (b) data processing
 - (c) language translation
 - (d) None of the above
- 1-c. Identify deep learning architecture is commonly used for real-time moving object detection in computer vision.(CO2,K1) 1
- (a) Recurrent Neural Networks (RNNs)
 - (b) Convolutional Neural Networks (CNNs)
 - (c) Generative Adversarial Networks (GANs)

- (d) Long Short-Term Memory networks (LSTMs)
- 1-d. Mark Popular applications of RNN are(CO2,K1) 1
- (a) Voice search
 - (b) Google translate
 - (c) Text Summarization
 - (d) All of the above
- 1-e. Memorize correct option for active contours (snakes) used for in image processing(CO3,K1) 1
- (a) Measuring image resolution
 - (b) Image compression
 - (c) Object localization and boundary detection
 - (d) Image denoising
- 1-f. Identify Normalized Cuts is a method commonly used for:(CO3,K1) 1
- (a) Image encryption
 - (b) Dimensionality reduction
 - (c) Image stitching
 - (d) Image segmentation and graph partitioning
- 1-g. State the primary purpose of the sliding windows technique in object detection(CO4,K2) 1
- (a) To detect objects of varying sizes and positions within an image.
 - (b) To compress images for faster processing.
 - (c) To enhance the color contrast in images.
 - (d) To remove noise from images.
- 1-h. Apply the term used to describe the process of assigning a label to each pixel in an image based on the object it belongs to(CO4,K3) 1
- (a) Object Detection
 - (b) Object Localization
 - (c) Semantic Segmentation
 - (d) Object Tracking
- 1-i. The filter order of a Butterworth lowpass filter determines whether it is a very sharp or extremely smooth filter function, or an intermediate filter function. Which of the following filters does the filter approach if the parameter value is very high(CO5,K2) 1
- (a) Gaussian lowpass filter
 - (b) Ideal lowpass filter
 - (c) Gaussian & Ideal lowpass filters
 - (d) None of the mentioned
- 1-j. Mention the primary application of Deep Convolutional GAN (DCGAN)(CO5,K1) 1

- (a) Image-to-image translation
- (b) Style transfer
- (c) High-resolution image generation
- (d) Anomaly detection

2. Attempt all parts:-

- 2.a. List three applications of computer vision.(CO1,K1) 2
- 2.b. Explain pooling layer with neat diagrammatic view and examples.(CO2,K2) 2
- 2.c. Discuss spatial operations in image processing primarily concerned with suitable example.(CO3,K2) 2
- 2.d. Mention a common challenge in using sliding windows for object detection(CO4,K2) 2
- 2.e. Explain the concept of ZFNet in advanced architecture of CNN (CO5,K2) 2

SECTION-B

30

3. Answer any five of the following:-

- 3-a. Explain how computer vision is transforming industries such as self-driving cars, healthcare, and augmented reality, highlighting key applications and their impact on Society (CO1,K2). 6
- 3-b. Apply the concept of convolutional neural networks (CNNs) and their role in computer vision tasks(CO1,K3) 6
- 3-c. Execute the arrangement of inception blocks in advanced convolutional neural networks.(CO2,K3) 6
- 3-d. Discuss the architecture of LeNet-5 and its applications in real world applications.(CO2,K2) 6
- 3.e. Report most popular geometric operations in image processing and provide examples of their applications.(CO3,K2) 6
- 3.f. Demonstrate digital watermarking and its types, and how is it used to protect digital content(CO4,K3) 6
- 3.g. Translate concept of variational Auto Encoders and advantages of combining VAEs and GANs(CO5,K2) 6

SECTION-C

50

4. Answer any one of the following:-

- 4-a. Sketch mathematical proof of filtering, stride and padding in Convolutional Neural Network.(CO1,K3) 10
- 4-b. Illustrate the compression techniques employed in R-CNN, Fast R-CNN, Faster R-CNN, and YOLO object detection algorithms, highlighting the advancements made in each iteration to enhance speed and efficiency(CO1,K2). 10

5. Answer any one of the following:-

- 5-a. Differentiate between fine-tuning and transfer learning with suitable examples(CO2,K4). 10

- 5-b. Demonstrate some applications of CNN pen down its role in the field of agriculture and health care (CO2, K3). 10
6. Answer any one of the following:-
- 6-a. Describe geometric operations in image processing. How are rotation, scaling, and translation performed on images(CO3,K2) 10
- 6-b. Explain Convolutional Neural Networks (CNNs) play a role in object detection and image segmentation(CO3,K2) 10
7. Answer any one of the following:-
- 7-a. Test the concept of region-based convolutional neural networks (R-CNN) and how they paved the way for modern object detection techniques.(CO4,K4) 10
- 7-b. Sketch instance recognition differ from category recognition in object detection tasks justify answer with real world examples(CO4,K3) 10
8. Answer any one of the following:-
- 8-a. Discuss the concept of mode collapse in Generative Adversial Networks. Mark strategies can be employed to mitigate mode collapse(CO5,K2) 10
- 8-b. Implement the concept of latent space in the context of VAEs and how it relates to the generation of new data.(CO5,K3) 10

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