

SRM VALLIAMMAI ENGINEERING COLLEGE
(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

QUESTION BANK

V SEMESTER



PAD103– IMAGE AND VIDEO ANALYTICS

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SUBJECT : PAD103 – IMAGE AND VIDEO ANALYTICS

SEM / YEAR: VI SEM / III Year

UNIT I INTRODUCTION

Computer Vision – Image representation and image analysis tasks - Image representations – digitization – properties – color images – Data structures for Image Analysis - Levels of image data representation - Traditional and Hierarchical image data structures.

PART – A

Q.No	Questions	BT Level	Competence
1.	Define computer vision.	BTL1	Remembering
2.	Define image resolution.	BTL1	Remembering
3.	List the digital image properties..	BTL1	Remembering
4.	Give the names of hierarchical data structures.	BTL2	Understanding
5.	Define sampling.	BTL1	Remembering
6.	Elaborate quantization.	BTL2	Understanding
7.	State the applications of computer vision.	BTL1	Remembering
8.	Define pixel and voxel.	BTL1	Remembering
9.	Classify visual perception of the image.	BTL2	Understanding
10.	Identify the histogram of digital image.	BTL2	Understanding
11.	Illustrate the physics of color.	BTL2	Understanding
12.	Write about color images.	BTL2	Understanding
13.	Define palette images	BTL2	Understanding
14.	What are the types of noise in the image?	BTL2	Understanding
15.	List the traditional image data structures.	BTL1	Remembering
16.	Identify the color perceived by humans.	BTL2	Understanding
17.	Outline the term pseudo color.	BTL2	Understanding
18.	Differentiate RGB and HSV color models.	BTL2	Understanding
19.	What is image digitization?	BTL2	Understanding
20.	Differentiate between M-Pyramids(matrix-pyramids) and	BTL2	Understanding

	T-Pyramids(tree-pyramids).		
21.	What is the concept of chain code?	BTL1	Remembering
22.	Assess run-length encoding.	BTL2	Understanding
23.	Justify Chain code.	BTL2	Understanding
24.	Express about topological data structure.	BTL2	Understanding
PART - B			
1.	Evaluate in detail about traditional image data structures.	BTL5	Evaluating
2.	Describe in detail about pyramids.	BTL3	Applying
3.	Evaluate the visual perception of the image.	BTL5	Evaluating
4.	What is digital image property and explain in detail.	BTL3	Applying
5.	Summarize the following: i)Image quality ii)noise in images	BTL3	Applying
6.	Illustrate image representation and image analysis tasks with neat diagram.	BTL3	Applying
7.	Discuss the following: i)Infer the term 'entropy'.(8) ii)Express the term 'contrast' and 'acuity'(8)	BTL4	Analyzing
8.	Discuss in detail about why is computer vision is difficult.	BTL3	Applying
9.	Explain in detail about color spaces.	BTL3	Applying
10.	i) Explain in detail about metric and topological properties of digital images. (8) ii) Examine the term histogram.(8)	BTL3	Applying
11.	Analyze the concept of palette images.	BTL4	Analyzing
12.	Write a concept on quadrees.	BTL3	Applying
13.	Analyze the different color models used in computer vision and compare their advantages, limitations, and applications with suitable examples.	BTL4	Analyzing
14.	Explain in detail about hierarchical data structure.	BTL4	Analyzing
15.	i)Analyze the levels of image data representation. (8) ii)Categorize image digitization process. (8)	BTL4	Analyzing
16.	Discuss the following: i) Summarize on matrices in image data structure. (8) ii) Justify relational structures. (8)	BTL5	Evaluating
17.	Design an image representation framework for a medical imaging application using appropriate image data structures and justify your choice.	BTL6	Creating

UNIT II IMAGE PRE-PROCESSING

Local pre-processing - Image smoothing - Edge detectors - Zero-crossings of the second derivative - Scale in image processing - Canny edge detection - Parametric edge models - Edges in multi-spectral images - Local pre-processing in the frequency domain - Line detection by local pre-processing

operators - Image restoration.**PART - A**

Q.No	Questions	BT Level	Competence
1.	Define image smoothing.	BTL1	Remembering
2.	What are two groups in local-preprocessing?	BTL2	Understanding
3.	List down the examples of spatial filtering.	BTL2	Understanding
4.	Define Gaussian filtering.	BTL1	Remembering
5.	Define transfer learning.	BTL1	Remembering
6.	What is meant by a convulsion mask?	BTL1	Remembering
7.	How can you define a low-pass filter?	BTL2	Understanding
8.	Do you know about median filtering? explain it.	BTL2	Understanding
9.	Infer edge detector.	BTL2	Understanding
10.	Rewrite the edges in a multi-spectral image?	BTL1	Remembering
11.	List down the objective of image sharpening.	BTL1	Remembering
12.	Determine the facet model.	BTL2	Understanding
13.	Can you justify the homomorphic-filtering?	BTL2	Understanding
14.	Determine the formula for bi-cubic facet model.	BTL2	Understanding
15.	When to use a high-pass filter?	BTL1	Remembering
16.	Differentiate averaging filter and median filter.	BTL2	Understanding
17.	Examine the difference between Roberts and laplace operators.	BTL2	Understanding
18.	Examine the high pass filter used in homomorphic-filtering.	BTL2	Understanding
19.	Discuss about prewitt operators.	BTL1	Remembering
20.	Justify the optimality of the detector based on the criteria?	BTL2	Understanding
21.	What's the difference between magnitude and direction?	BTL2	Understanding
22.	Define Wiener filtering.	BTL1	Remembering
23.	How to create a scale-space filtering.	BTL2	Understanding
24.	List the applications of edge detection.	BTL1	Remembering

PART - B

1.	Evaluate various edge detection techniques for noisy images and justify the selection of a suitable operator for different applications.	BTL3	Applying
2.	Define Canny edge detection and explain in detail about optimality of the detector based on criteria and its dimension?	BTL3	Applying
3.	Analyze the working of median filtering algorithm with a neat flow.	BTL4	Analyzing
4.	Describe in detail about deterministic or stochastic restoration techniques.	BTL3	Applying

5.	Explain the following operators in detail i) Roberts ii) Laplace iii) Prewitt iv) Sobel	BTL3	Applying
6.	Show the process of implementing parametric-edge models in computer vision applications. Discuss how these models differ from non-parametric approaches and provide examples of scenarios where parametric edge models are advantageous.	BTL5	Evaluating
7.	Summarize the concept of zero-crossings of the second-derivative.	BTL3	Applying
8.	Explain the mechanisms involved in line detection using local-preprocessing operators, and discuss their advantages and limitations compared to other line detection methods.	BTL3	Applying
9.	Explain how to achieve image smoothing.	BTL3	Applying
10.	Evaluate various edge detection techniques for noisy images and justify the selection of a suitable operator for different applications.	BTL5	Evaluating
11.	Examine the edges in a multi-spectral image. (8) Interpret about parametric edge-models.(8)	BTL3	Applying
12.	Compare inverse filtering and weiner filtering in the context of image restoration for the underlying principles of each method, their advantages, limitations and suitable scenarios for their applications with examples to illustrate the effectiveness of both techniques in restoring degraded images.	BTL4	Analyzing
13.	How can you use the canny-edge detection algorithm to improve edge detection in a complex grayscale image?	BTL4	Analyzing
14.	i) Organize how to perform averaging, statistical principles of noise suppression. (8) ii) Organize how to perform averaging with limited data validity. (8)	BTL4	Analyzing
15.	How do you justify the different filtering methods in image restoration?	BTL5	Evaluating
16.	Can you summarize laplacian or gaussian?	BTL5	Evaluating
17.	Design an image restoration model for medical images using suitable restoration techniques and illustrate its workflow.	BTL6	Creating

UNIT III - OBJECT DETECTION USING MACHINE LEARNING

Object detection– Object detection methods – Deep Learning framework for Object detection– bounding box approach-Intersection over Union (IoU) –Deep Learning Architectures-R-CNN-Faster R-CNN-You Only Look Once(YOLO)-Salient features-Loss Functions-YOLO architectures.

PART - A

Q.No	Questions	BT Level	Competence
1.	Define confidence score in object detection	BTL-1	Remember

2.	List any two traditional object detection methods.	BTL-1	Remember
3.	What is a bounding box in object detection?	BTL-1	Remember
4.	Differentiate between object classification and object detection.	BTL-2	Understand
5.	State the purpose of Intersection over Union (IoU).	BTL-1	Remember
6.	Illustrate the importance of IoU in evaluating model performance.	BTL-2	Understand
7.	List the applications of object detection	BTL-1	Remember
8.	Summarize how YOLO differs from traditional object detection techniques.	BTL-2	Understand
9.	Define transfer learning.	BTL-1	Remember
10.	What are salient features in the context of object detection?	BTL-1	Remember
11.	Describe the role of the loss function in object detection.	BTL-2	Understand
12.	Outline the structure of Faster R-CNN.	BTL-2	Understand
13.	Identify the key components in a YOLO architecture.	BTL-1	Remember
14.	Define Non-Maximum Suppression (NMS).	BTL-1	Remember
15.	List the stages involved in R-CNN.	BTL-1	Remember
16.	Explain anchor boxes.	BTL-2	Understand
17.	What is a region proposal in object detection?	BTL-1	Remember
18.	Illustrate the significance of backbone networks in detection.	BTL-2	Understand
19.	Compare R-CNN and Fast R-CNN.	BTL-2	Understand
20.	What do you understand about the feature map?	BTL-2	Understand
21.	Name two loss components in YOLO.	BTL-1	Remember
22.	Show how grid cells are used in YOLO.	BTL-2	Understand
23.	Outline the steps of object localization.	BTL-2	Understand
24.	Differentiate one-stage and two-stage object detectors.	BTL-2	Understand
PART - B			
1.	Explain in detail the different methods of object detection with examples.	BTL-4	Analyze
2.	Analyze the advantages and limitations of using bounding boxes in object detection.	BTL-4	Analyze
3.	Compare and contrast R-CNN, Fast R-CNN, and Faster R-CNN.	BTL-5	Evaluate
4.	Elaborate the YOLO architecture with neat diagram and flow of operations.	BTL-4	Analyze
5.	Explain the concept of Intersection over Union (IoU) and how it affects model accuracy.	BTL-4	Analyze
6.	Evaluate the working of Faster R-CNN and its improvements over R-CNN.	BTL-5	Evaluate
7.	Illustrate various loss functions used in object detection models and their impact.	BTL-4	Analyze
8.	Design a custom object detection pipeline using YOLO for real-time applications.	BTL-6	Create
9.	Evaluate the performance of YOLO and Faster R-CNN for autonomous	BTL-5	Evaluate

	driving applications by considering speed, accuracy, and computational complexity.		
10.	Justify the importance of salient features in object detection.	BTL-5	Evaluate
11.	Examine deep learning frameworks used for object detection with suitable case studies.	BTL-4	Analyze
12.	Develop an object detection system using YOLOv5 and explain each step in the workflow.	BTL-6	Create
13.	Interpret the working of anchor boxes and how they improve object detection accuracy.	BTL-4	Analyze
14.	Summarize the role of feature extraction in deep learning-based object detection.	BTL-4	Analyze
15.	Design an intelligent surveillance system using deep learning-based object detection and illustrate its workflow with a neat diagram	BTL-6	Create
16.	Critically analyze the speed vs accuracy trade-off in YOLO and Faster R-CNN.	BTL-5	Evaluate
17.	Compare traditional object detection techniques with deep learning-based approaches.	BTL-5	Evaluate

UNIT IV - FACE RECOGNITION AND GESTURE RECOGNITION

Face Recognition-Introduction-Applications of Face Recognition-Process of Face Recognition-DeepFace solution by Facebook-FaceNet for Face Recognition- Implementation using FaceNet-Gesture Recognition.

PART - A

Q.No	Questions	BT Level	Competence
1.	Define face recognition.	BTL-1	Remember
2.	List any two applications of face recognition.	BTL-1	Remember
3.	What are the main steps in the face recognition process?	BTL-1	Remember
4.	Define biometric authentication.	BTL-2	Understand
5.	Mention any two advantages of using DeepFace.	BTL-1	Remember
6.	What is the main role of FaceNet in face recognition?	BTL-1	Remember
7.	State the applications of FaceNet.	BTL-1	Remember
8.	Summarize the key features of DeepFace.	BTL-2	Understand
9.	What is the accuracy of FaceNet on LFW dataset?	BTL-1	Remember
10.	List two components of the face recognition system.	BTL-1	Remember
11.	Define gesture recognition.	BTL-1	Remember
12.	List any two types of gestures.	BTL-1	Remember
13.	Mention any two applications of gesture recognition.	BTL-1	Remember
14.	Differentiate between static and dynamic gestures.	BTL-2	Understand
15.	Explain the role of CNN in face recognition.	BTL-2	Understand
16.	What is the purpose of feature extraction in face recognition?	BTL-2	Understand

17.	Differentiate face verification and face identification.	BTL-2	Understand
18.	What is a face embedding?	BTL-1	Remember
19.	List the stages of gesture recognition.	BTL-1	Remember
20.	Explain how FaceNet maps faces into Euclidean space.	BTL-2	Understand
21.	Give any two differences between DeepFace and FaceNet.	BTL-2	Understand
22.	Show the steps involved in training FaceNet.	BTL-2	Understand
23.	What is triplet loss in FaceNet?	BTL-1	Remember
24.	Identify the use of face recognition in security systems.	BTL-2	Understand

PART - B

1.	Explain in detail the applications and process of face recognition.	BTL-4	Analyze
2.	Analyze the working of DeepFace and how it performs face recognition.	BTL-4	Analyze
3.	Compare DeepFace and FaceNet in terms of architecture and performance.	BTL-5	Evaluate
4.	Illustrate the step-by-step working of FaceNet with a diagram.	BTL-4	Analyze
5.	Discuss the advantages and limitations of using FaceNet for face recognition.	BTL-5	Evaluate
6.	Design a face recognition system using FaceNet and explain the implementation steps.	BTL-6	Create
7.	Summarize the key challenges in gesture recognition.	BTL-4	Analyze
8.	Explain the implementation of gesture recognition using machine learning.	BTL-4	Analyze
9.	Evaluate the performance of DeepFace and FaceNet for large-scale face recognition applications and justify the most suitable approach.	BTL-5	Evaluate
10.	Justify the use of face recognition in modern security applications.	BTL-5	Evaluate
11.	Examine the role of CNN and embeddings in the FaceNet architecture.	BTL-4	Analyze
12.	Develop a system for gesture-based control using computer vision.	BTL-6	Create
13.	Interpret the concept of triplet loss and its importance in FaceNet.	BTL-4	Analyze
14.	Summarize the contribution of Facebook's DeepFace to facial recognition research.	BTL-4	Analyze
15.	Design a FaceNet-based smart attendance system and illustrate its implementation with a neat block diagram.	BTL-6	Create
16.	Critically analyze the ethical issues involved in face recognition technologies.	BTL-5	Evaluate
17.	Compare traditional methods of gesture recognition with deep learning approaches.	BTL-5	Evaluate

UNIT-V: VIDEO ANALYTICS

Video Processing – use cases of video analytics-Vanishing Gradient and exploding gradient problem-ResNet architecture-ResNet and skip connections-Inception Network-GoogleNet architecture-Improvement in Inception v2-Video analytics-ResNet and Inception v3.

PART – A

Q.No	Questions	BT Level	Competence
1.	What are 4 use cases of video analytics?	BTL1	Remembering
2.	What are two powerful Deep Learning architectures?	BTL2	Understanding
3.	How is video analytics used in crowd management?	BTL2	Understanding
4.	Define transfer learning in video analytic.	BTL1	Remembering
5.	Which is the heart of the residual networks?	BTL1	Remembering
6.	What is video processing?	BTL1	Remembering
7.	Explain the improvements in inception v2.	BTL2	Understanding
8.	What is the improvement in inception v3 when compared to inception v1 networks?	BTL2	Understanding
9.	What is meant by vanishing gradient?	BTL2	Understanding
10.	What is identity mapping?	BTL2	Understanding
11.	Differentiate ResNet and GoogleNet architectures.	BTL2	Understanding
12.	Define exploding gradient.	BTL1	Remembering
13.	What is a residual networks and their role in video analytics.	BTL1	Remembering
14.	What are the learning methods a neural network trained on?	BTL1	Remembering
15.	Analyze how the ResNet solves the vanishing gradient problem?	BTL2	Understanding
16.	Define skip connection	BTL1	Remembering
17.	Explain the steps in video classification using Deep Learning.	BTL2	Understanding
18.	Discriminate local minima and global minima.	BTL2	Understanding
19.	Express the job of backpropagation algorithm.	BTL2	Understanding
20.	Develop the basic neural architecture having an input layer, hidden layers, and an output layer.	BTL2	Understanding
21.	State the applications of ResNet	BTL1	Remembering
22.	Design the two versions of the Inception module in ResNet.	BTL2	Understanding
23.	Differentiate the different activation functions used in neural networks?	BTL2	Understanding
24.	List the applications of Inception v3.	BTL2	Understanding

PART-B

1.	Explain the basic steps of video processing.	BTL3	Applying
2.	Examine in detail about fundamental design principles under the GoogleNet. architecture and how do they enable efficient processing in deep neural networks.	BTL5	Evaluating
3.	Identify the convolution blocks, pooling blocks and softmax blocks and explain the properties of the network in which it resides.	BTL3	Applying
4.	Describe in detail about inception v3.	BTL3	Applying

5.	Infer skip connections in the ResNet architecture contribute to improve the performance of deep neural networks and give examples of how this technique is applied in practical image recognition tasks.	BTL3	Applying
6.	Discuss in detail about the inception network?	BTL3	Applying
7.	Analyze how the inception v2 improves performance in tasks like image classification and object detection.	BTL4	Analyzing
8.	Explain with examples of how video analytics is used across industries like retail, healthcare and transportation and explain its impact on operations and decision-making?	BTL3	Applying
9.	Illustrate in detail about the following: i) Few suggested solutions for the vanishing gradient. (8) ii) Solution to exploding gradient problem. (8)	BTL3	Applying
10.	Analyze the following concepts: i) ResNet and skip connections. (8) ii) Inception network. (8)	BTL4	Analyzing
11.	Explain the following: i) Two versions of the Inception module. (8) ii) Few challenges that are faced while training on deep networks(8)	BTL4	Analyzing
12.	Differentiate between inception v2 and inception v3.	BTL4	Analyzing
13.	Evaluate the performance of ResNet and Inception architectures for video analytics by comparing their architecture, computational efficiency, and applications	BTL5	Evaluating
14.	Design a deep learning-based smart traffic video analytics system using ResNet and Inception networks, and justify the selected architecture for real-time applications.	BTL6	Creating
15.	Discuss in detail about the utilization of deep Learning-based capabilities across domains and business functions.	BTL3	Applying
16.	Illustrate ResNet architecture applied to enhance image-classification tasks with real world examples of its effectiveness.	BTL3	Applying
17.	Summarize the improvements in inception v2 network.	BTL5	Evaluating