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NPTEL (https://swayam.gov.in/explorer?ncCode=NPTEL) » Deep Learning for Computer Vision (course)

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Course outline

How does an NPTEL online course work? ()

Week 0 ()

Week 1 ()

Week 2 ()

Edge Detection (unit?unit=29&lesson=30)

Week 2: Assignment 1

The due date for submitting this assignment has passed.

Due on 2023-08-09, 23:59 IST.

As per our records you have not submitted this assignment.

1) Is the given kernel separable? If yes, select the separable version. ***1 point***

$$\frac{1}{256} \times \begin{bmatrix} 1 & 4 & 6 & 4 & 1 \\ 4 & 16 & 24 & 16 & 4 \\ 6 & 24 & 36 & 24 & 6 \\ 4 & 16 & 24 & 16 & 4 \\ 1 & 4 & 6 & 4 & 1 \end{bmatrix}$$

- Yes, $\frac{1}{16} \times \begin{bmatrix} 1 & 4 & 6 & 4 & 1 \end{bmatrix}$
- Yes, $\frac{1}{16} \times \begin{bmatrix} 1 & 2 & 3 & 2 & 1 \end{bmatrix}$
- Yes, $\frac{1}{8} \times \begin{bmatrix} 1 & 1 & 2 & 1 & 1 \end{bmatrix}$
- No

No, the answer is incorrect.
Score: 0

Accepted Answers:
Yes, $\frac{1}{16} \times \begin{bmatrix} 1 & 4 & 6 & 4 & 1 \end{bmatrix}$

2) Consider a 4×4 image, where each pixel uses a 4-bit signed representation (range between -2^3 to $2^3 - 1$). Reverse the contrast of the following image: ***1 point***

$$\begin{pmatrix} -4 & 7 & -1 & 0 \\ -3 & -2 & 6 & 1 \\ -6 & 5 & -7 & 4 \\ -2 & -3 & 0 & -1 \end{pmatrix}$$

- $\begin{pmatrix} 2 & 6 & -1 & 0 \\ -1 & 0 & 1 & 4 \\ 3 & 2 & 2 & 0 \\ 0 & 5 & -1 & 1 \end{pmatrix}$
- $\begin{pmatrix} -2 & -6 & 1 & 0 \\ 1 & 0 & -1 & -4 \\ -3 & -2 & -2 & 0 \\ 0 & -5 & 1 & -1 \end{pmatrix}$
- $\begin{pmatrix} -3 & 8 & 0 & 1 \\ -2 & -1 & 7 & 2 \\ -5 & 6 & -6 & 5 \\ -1 & -2 & 1 & 0 \end{pmatrix}$
- $\begin{pmatrix} 3 & -8 & 0 & -1 \\ 2 & 1 & -7 & -2 \\ 5 & -6 & 6 & -5 \\ 1 & 2 & -1 & 0 \end{pmatrix}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\begin{pmatrix} 3 & -8 & 0 & -1 \\ 2 & 1 & -7 & -2 \\ 5 & -6 & 6 & -5 \\ 1 & 2 & -1 & 0 \end{pmatrix}$

3) Given the 3 × 3 4-bit grayscale image below: ***1 point***

$$\begin{bmatrix} 4 & 5 & 6 \\ 3 & 2 & 7 \\ 5 & 8 & 1 \end{bmatrix}$$

what is the central element after applying linear contrast stretching? (Round off to the nearest integer)

- 1
- 2
- 5
- 6

No, the answer is incorrect.
Score: 0

Accepted Answers:
2

Map the following image operations to their types - provide your answer as integers where 0,1

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and 2 correspond to point, local and global operation respectively. (Assume that the image size is 10x10)

4) Mean of an image:

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 2

0.25 points

5) Convolution with kernel of size 1 × 1:__

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 0

0.25 points

6) Cross-correlation with kernel size 3 × 3:__

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 1

0.25 points

7) Flip an image by 180^o:__

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 0

0.25 points

8) Match the following: ***1 point***

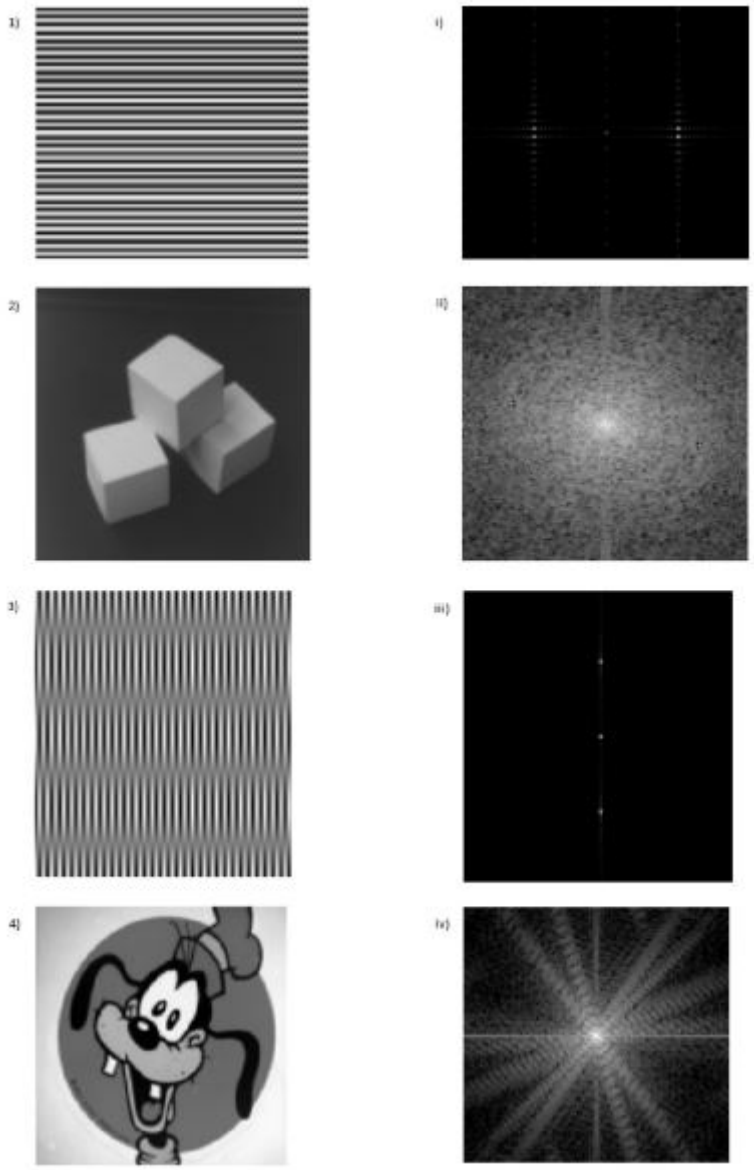
1) Global operation	i) Inner product of two 1D kernels
2) Histogram equalization	ii) Fourier transform
3) Separable 2D kernel	iii) Noise spread
4) Size of Gaussian kernel	iv) Contrast stretching
	v) Gaussian kernel

- 1→ iii, 2→ iv, 3→ i, 4→ ii
- 1→ ii, 2→ iv, 3→ i, 4→ v
- 1→ ii, 2→ iv, 3→ iii, 4→ v
- 1→ ii, 2→ iv, 3→ v, 4→ iii

No, the answer is incorrect.
Score: 0

Accepted Answers:
1→ ii, 2→ iv, 3→ v, 4→ iii

9) Match the following images with their corresponding Fourier Transforms: ***1 point***



- 1→ ii, 2→ iii, 3→ i, 4→ iv
- 1→ i, 2→ ii, 3→ iii, 4→ iv
- 1→ iii, 2→ iv, 3→ i, 4→ ii
- 1→ iii, 2→ iv, 3→ ii, 4→ i

No, the answer is incorrect.
Score: 0

Accepted Answers:
1→ iii, 2→ iv, 3→ i, 4→ ii

10) Consider a 3×3 image (I) and a filter (F) represented as matrices: ***1 point***

$$I = \begin{bmatrix} 1 & 1 & 1 \\ 2 & 2 & 2 \\ 200 & 200 & 200 \end{bmatrix} \text{ and } F = \begin{bmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{bmatrix}$$

What is the value of the central pixel after convolving the image with the filter? Additionally, does the image (I) have a horizontal or vertical edge?

- 0, verical
- -410, vertical
- -410, horizontal
- 0, horizontal

No, the answer is incorrect.
Score: 0

Accepted Answers:
0, horizontal

11) In Harris corner detector, the cornerness measure is defined as: ***1 point***

$det(A) - \kappa \times trace(A)^2 = \lambda_1\lambda_2 - \kappa(\lambda_1 + \lambda_2)^2$, where A comes from the Autocorrelation of the image and λ_1, λ_2 are the eigenvalues of A. Which values of λ_1 and λ_2 among the given options best indicate the presence of a corner?

- 1, 2
- 1, 100
- 100, 104
- 100, 1

No, the answer is incorrect.
Score: 0

Accepted Answers:
100, 104

12) Which of the following options are **false**? (Select all that apply) ***1 point***

- SIFT uses Autocorrelation for detecting corners similar to Harris corner detector.
- SIFT estimates orientations of the key points to make it rotation-invariant
- SURF uses Haar wavelets to get keypoint orientations and is better than SIFT at handling rotation invariance.
- SURF is always better than SIFT on illumination invariance.

No, the answer is incorrect.
Score: 0

Accepted Answers:
SIFT uses Autocorrelation for detecting corners similar to Harris corner detector.
SURF is always better than SIFT on illumination invariance.

13) During the keypoint localization step in SIFT, we get the following Hessian matrix ***1 point***

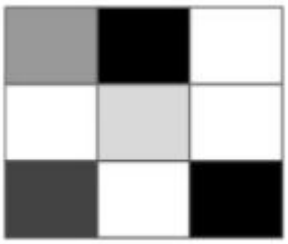
$H = \begin{bmatrix} 8 & 4 \\ 4 & 6 \end{bmatrix}$ for a particular candidate point. Should this keypoint be rejected if the threshold $a = 7$?

- Reject
- Do not Reject

No, the answer is incorrect.
Score: 0

Accepted Answers:
Do not Reject

14) Consider this 3x3 image, where black pixels indicate low intensity and white pixel indicates high intensity.



The LBP descriptor for this image (computed clockwise, from the top left corner) is ___.

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 53

1 point

During the orientation estimation step in SIFT, we obtain an image after convolving it with a Gaussian kernel with appropriate σ value. Consider a 3×3 patch from that image: $\begin{bmatrix} 70 & 80 & 90 \\ 60 & 100 & 70 \\ 35 & 90 & 30 \end{bmatrix}$

15) The magnitude m for the patch is ____.

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 13.84,14.44

0.5 points

16) The orientation θ (in degrees) for the patch is ____.

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 45

0.5 points