

Let X be a matrix with singular value decomposition $X = U\Sigma V^T$. Which of the following are true for all X ?

Select one or more:

- ☒ a. The first column of V is an eigenvector of $X^T X$ ✓
- ☐ b. $\text{rank}(X) = \text{rank}(\Sigma)$
- ☒ c. The singular values and the Eigenvalues $X^T X$ are the same ✓
- ☒ d. If all the singular values are unique, then the SVD is unique. ✗

Your answer is partially correct.

You have correctly selected 2.

The correct answers are: $\text{rank}(X) = \text{rank}(\Sigma)$

, The first column of V is an eigenvector of $X^T X$

, The singular values and the Eigenvalues $X^T X$ are the same

QUESTION 3

Correct

Mark 1.00 out of 1.00

🚩 Flag question

In **Canny edge detection**, we will get more discontinuous edges if we make the following change to the hysteresis thresholding:

Select one:

- ☐ a. decrease the high threshold
- ☐ b. increase the high threshold
- ☐ c. decrease the low threshold
- ☐ d. decrease both thresholds
- ☒ e. increase the low threshold ✓

Your answer is correct.

The correct answer is:

increase the low threshold

In which of the following scenarios can you use a weak perspective camera model for the target object?

Select one:

- ☐ a.
A squirrel passing quickly in front of you.
- ☐ b.
A car beside you when you are driving.
- ☒ c.
An airplane flying at a very high attitude
- ☐ d.
The Hoover tower when you are taking a photo of it right in front of it.

Your answer is correct.

The correct answer is:

An airplane flying at a very high attitude

QUESTION 5

Complete

Marked out of 4.00

🚩 Flag question

The image below is an image of a 3-pixel thick vertical line.

Show the resulting image (9x9) obtained after convolution of the original with the following approximation of the derivative filter $[-1, 0, 1]$ in the horizontal direction. How many local maxima of the filter response do you obtain?

000111000
000111000
000111000
000111000
000111000
000111000
000111000
000111000
000111000

2. Suggest a filter which when convolved with the same image (9x9) would yield a single maximum in the middle of the line. Demonstrate the result of the convolution on the original image.{hint: the filter is of the form $[x,y,x]$ }

000111000
000111000
000111000
000111000
000111000
000111000
000111000
000111000
000111000

3. What is the difference between Gaussian smoothing and median filtering?
How would you decide to use one vs. another?

 53.jpeg

1. The response of each row after convolution with the above filter will be $0\ 0\ 1\ 1\ 0\ -1\ -1\ 0\ 0$. There are two local extrema at 1 and -1.
2. Convoluting the image with the following filter will yield a single maximum in the middle of the line $g = [1, 2, 1]^T$
3. Median filter is more used for noise removal, more suitable for salt and pepper noise. Gaussian is used for smoothing and it's better when the noise is not spiky.

QUESTION 6

Correct

Mark 1.00 out of 1.00

🚩 Flag question

Which of the following statements are true of a pinhole camera?

Select one or more:

- ☐ a.
A pinhole camera has a fixed focal length, f .
- ☒ b.
Images in a pinhole camera are a **perspective projection**.
✓
- ☒ c.
Images in a pinhole camera are upside down.
✓

Your answer is correct.

The correct answers are:

Images in a pinhole camera are upside down.

Images in a pinhole camera are a **perspective projection**.

QUESTION 7

Correct

Mark 1.00 out of 1.00

🚩 Flag question

The orthographic projection of two parallel lines in the world must be parallel in the image.

Select one:

- ☒ True ✓
- ☐ False

The correct answer is 'True'.

QUESTION 8

Complete

Marked out of 2.00

🚩 Flag question

A scene point at coordinates (400,600,1200) is perspectively projected into an image at coordinates (24,36), where both coordinates are given in millimeters in the camera coordinate frame and the camera's principal point is at coordinates (0,0,f) (i.e., $u_0 = 0$ and $v_0 = 0$). Assuming the aspect ratio of the pixels in the camera is 1, what is the focal length of the camera? (Note: the aspect ratio is defined as the ratio between the width and the height of a pixel; i.e., k_u/k_v .)

 8.jpeg

$u = fx/z$, so $f = uz/x = 24 * 1200 / 400 = 72$ mm.

QUESTION 9

Complete

Marked out of 1.00

🚩 Flag question

Write the expressions for 1d and 2d Fourier and inverse Fourier transform. What is convolution theorem?

 q 09.jpeg

QUESTION 10

Complete

Marked out of 1.00

🚩 Flag question

What is the difference between convolution and correlation? Under what condition is

convolution equivalent to correlation?

 q 10.jpeg