

5524 Quiz Results for Utkarsh Pratap Singh Jadon (jadon.1)

❗ Correct answers are no longer available.

Score for this quiz: **69** out of 69

Submitted Dec 6, 2022 at 2:08pm

This attempt took 73 minutes.

Question 1

1 / 1 pts

A covariance matrix K can be factored using PCA into matrices of the Eigenvectors Q and Eigenvalues S . The Eigenvalues of K and $\text{inverse}(K)$ are the same values.

☐ True

☒ False

Question 2

1 / 1 pts

Any image compression method that can recover the exact original image is considered as a lossy compression method.

☐ True

☒ False

Question 3

1 / 1 pts

With the color-to-grayscale NTSC conversion formula, which color component has the least weight?

☐ Green

☐ Red

☒ Blue

Question 4

1 / 1 pts

The Bayer Filter, used in cameras to capture RGB color using a single CCD, has a filter pattern containing the most filters associated with passing which band of light?

☐ White

☐ Blue

☒ Green

☐ Black

☐ Red

Question 5

1 / 1 pts

What two morphological operations (name them) in order are used to “Open” a binary region?

☐ Dilation, Dilation

☐ Dilation, Erosion

☐ Erosion, Erosion

☒ Erosion, Dilation

Question 6

1 / 1 pts

What is the lower/upper output bounds for the TANH activation function used in neural networks?

☐ -Inf to 0

☒ -1 to +1

☐ -1 to 0

☐ 0 to Inf

☐ 0 to +1

Question 7

1 / 1 pts

Aspect ratio is ratio of _____ of image.

☐ height to width

☒ width to height

☐ number of pixels to number of colors

Question 8**1 / 1 pts**

How many gray levels are there for an unsigned 8-bit pixel?

☒ 256☐ 127☐ 128☐ 1024☐ 255☐ 1023**Question 9****1 / 1 pts**

In the Normalized Direct Linear Transform (for computing the Homography), the data points are scaled so their average distance to the origin is ____.

☐ 1☒ $\sqrt{2}$ ☐ 0☐ .5☐ 2**Question 10****1 / 1 pts**

Which locations (#1-#8) are the 4-connected neighbors of the center pixel x?

| | | |
|---|---|---|
| 1 | 2 | 3 |
| 4 | x | 5 |
| 6 | 7 | 8 |

☐ 1, 2, 3, x

☐ No answer text provided.

☒ 2, 4, 5, 7

☐ 2, 3, 6, 7

☐ 1, 3, 6, 8

☐ 1, 2, 7, 8

Question 11

1 / 1 pts

Provide the missing value in this classic 3 x 3 Fy Sobel gradient mask (without the proper scale/normalization value).

-1 -(?) -1

0 0 0

1 (?) 1

☐ 1

☐ 4☒ 2☐ 0**Question 12****1 / 1 pts**

Which color space has Euclidean distance properties that are similar to human perception?

☐ HSI☒ LAB☐ RGB☐ YUV**Question 13****1 / 1 pts**

The MEDIAN filtering mask is separable.

☐ True☒ False**Question 14****1 / 1 pts**

Using a two-class classifier for detecting X and Y, the PRECISION for class X using the classifier is given as “the number of correctly detected X examples” divided by “the actual number of X examples”.

☐ True

☒ False

Question 15

1 / 1 pts

Training a standard classification Neural Network (or a simple Perceptron) is a form of “Unsupervised” Learning (not “Supervised”).

☐ True

☒ False

Question 16

1 / 1 pts

As presented in class, Hinton’s definition of “Deep Learning” requires a minimum of how many "hidden" layers?

☐ 10

☐ 100

☐ 3

☒ 2

☐ 1

☐ 0**Question 17****1 / 1 pts**

What is the lower/upper output bounds for the sigmoid activation function used in neural networks?

☒ 0 to +1☐ -1 to +1☐ -1 to 0☐ -Inf to 0☐ 0 to Inf**Question 18****1 / 1 pts**

A Homography matrix transformation for two images is appropriate when the corresponding points reside on any non-planar surface.

☐ True☒ False**Question 19****1 / 1 pts**

Structure and depth are inherently ambiguous from single view. The imaging technique that uses optical illusion to make an object “appear” to

be more distant/close or smaller/larger, is called _____ perspective.

- ☐ homography
- ☐ limited
- ☒ forced
- ☐ stereo
- ☐ epipolar
- ☐ homogeneous

Question 20

1 / 1 pts

When training a neural network, what is the training period called that updates all weights after examining all examples?

- ☒ Epoch
- ☐ Weight decay
- ☐ Validation
- ☐ Normalization
- ☐ Momentum
- ☐ Interval
- ☐ Dropout

Question 21**1 / 1 pts**

The 2-D Laplacian filter is a non-oriented, _____ filter

☒ 2nd derivative

☐ 1st derivative

Question 22**1 / 1 pts**

A “perceptron” neural network represents a linearly separable function/classifier.

☒ True

☐ False

Question 23**1 / 1 pts**

If matrix A is “symmetric”, it has real-valued Eigenvalues and its Eigenvectors can be chosen to be orthonormal.

☒ True

☐ False

Question 24**1 / 1 pts**

For a square matrix M , what is $\text{Trace}(M)$ in terms of the Eigenvalues?

- ☒ Sum of Eigenvalues
- ☐ Ratio of Eigenvalues
- ☐ Product of Eigenvalues
- ☐ Count (or number) of Eigenvalues

Question 25

1 / 1 pts

_____ is a process for Neural Networks for transforming the output Softmax to be more representative of the true posterior probability.

- ☐ Cross-entropy
- ☐ Entropy
- ☐ Weight decay
- ☐ Dropout
- ☐ Momentum
- ☒ Calibration

Question 26

1 / 1 pts

With a very large input to a sigmoid function, the derivative of the sigmoid (for that input) is close to the value of 1.

☐ True☒ False**Question 27**

1 / 1 pts

Which of these three template matching algorithms is generally most robust to lighting changes?

☐ SAD☐ SSD☒ NCC**Question 28**

1 / 1 pts

Does “Gaussian filtering” tend to smooth-over or preserve “edges”?

☐ preserve☒ smooth-over**Question 29**

1 / 1 pts

For a square matrix M , what is $\text{Determinant}(M)$ in terms of the Eigenvalues?

☒ Product of Eigenvalues

☐ Count (or number) of Eigenvalues

☐ Ratio of Eigenvalues

☐ Sum of Eigenvalues

Question 30

1 / 1 pts

When initializing the weights in a neural network, we prefer them to be large positive values.

☐ True

☒ False

Question 31

1 / 1 pts

Given parallel optical axes between two cameras, one need only search “to the right” in the right image from starting point taken from the left image when finding the stereo correspondence.

☐ True

☒ False

Question 32

1 / 1 pts

Which tracking method, Covariance or Mean-shift, finds the best match by minimizing a cost/distance?

- ☒ Covariance
- ☐ Both maximize, neither minimize
- ☐ Mean-Shift
- ☐ Both minimize, neither maximize

Question 33**1 / 1 pts**

Does “Median filtering” tend to smooth-over or preserve “edges”?

- ☐ smooth-over
- ☒ preserve

Question 34**1 / 1 pts**

The Laplacian/Error pyramid is better than the original image for compression because the error signals in the pyramid are distributed over a broader range of values than original image.

- ☐ True
- ☒ False

Question 35**1 / 1 pts**

The Epipolar constraint reduces the correspondence problem for a stereo image pair such that a point in one image corresponds to a search WHERE? in the other image.

- ☒ along a line
- ☐ in a local $n \times n$ neighborhood
- ☐ in the same image plane

Question 36

1 / 1 pts

Smoothing then differentiating (2-steps) is same as convolving with the derivative of a smoothing kernel (1 step).

- ☒ True
- ☐ False

Question 37

1 / 1 pts

The MEAN (AVERAGE) filtering mask is separable.

- ☒ True
- ☐ False

Question 38

1 / 1 pts

Derivative (gradient) masks should contain values that sum to _____.

☐ 1

☒ 0

Question 39

1 / 1 pts

For homography matrix H that transforms points from Image1 to Image2, what is the homography matrix that goes from Image2 to Image1?

☐ $\text{determinant}(H)$

☐ $\text{transpose}(H)$

☐ $\text{normalize}(H)$

☒ $\text{inverse}(H)$

Question 40

1 / 1 pts

In the covariance tracking method, if the feature vector used for each pixel in a 10×10 target patch region is $f = [x, y, F_x, F_y, R, G, B, u, v]$, what is the final size (dimensions) of the covariance matrix for that patch region?

_____ x _____

☐ 10×5

☐ 2×2

☐ 5 x 5☐ 10 x 10☐ 5 x 10☒ 9 x 9☐ 1 x 1**Question 41****1 / 1 pts**

What is the lower/upper output bounds for the ReLU activation function used in neural networks?

☐ -1 to 0☐ -1 to +1☒ 0 to Inf☐ -Inf to 0☐ 0 to +1**Question 42****1 / 1 pts**

Given the linear equation $\mathbf{Ax} = \mathbf{0}$, where $\mathbf{A} = (\mathbf{B}^T * \mathbf{B})$, (as in the camera calibration and registration slides), the least-squares solution of \mathbf{x} is the Eigenvector of \mathbf{A} corresponding to which Eigenvalue?

☐ Largest Eigenvalue

☒ Smallest Eigenvalue

Question 43**1 / 1 pts**

Smoothing (blur) masks should contain values that sum to _____.

☐ 0

☒ 1

Question 44**1 / 1 pts**

The technique of hysteresis thresholding is part of the Canny edge detector, and uses _____(how many)_____ threshold(s)?

☐ 1

☐ 3

☒ 2

☐ 0

Question 45**1 / 1 pts**

Computer vision is the process of discovering from image/video: WHAT is present in the world, WHERE it is, and

_____.

- ☒ what it is doing
- ☐ what is the size of it
- ☐ how to recognize it
- ☐ how it should see

Question 46**2 / 2 pts**

Transform the homogeneous coordinate (250, 175, 10) into its corresponding inhomogenous coordinate.

- ☐ (2.5, 1.75)
- ☐ (250, 175)
- ☒ (25, 17.5)
- ☐ (.25, .175, 1)
- ☐ (250, 175, 1)

Question 47**2 / 2 pts**

Given a particular standard deviation of $s=1.2$ for a Gaussian smoothing mask, what is the mask size for a 2 standard deviation coverage?

- ☐ 8 x 8
- ☐ 9 x 9

☐ 2×2 ☐ 4×4 ☐ 5×5 ☐ 1×1 ☐ 3×3 ☐ 6×6 ☒ 7×7 **Question 48****2 / 2 pts**

Give the Gradient Descent formula for updating parameter \mathbf{w} (to $\mathbf{w_new}$) using the error gradient $\mathbf{G_w}$ (with respect to \mathbf{w}) and learning rate \mathbf{m} .

*use * to multiply*

use / to divide

☐ $w_new = w * m + G_w$ ☒ $w_new = w - m * G_w$ ☐ $w_new = w - m / G_w$ ☐ $w_new = w^m + G_w$ ☐ $w_new = m - w * G_w$ ☐ $w_new = w + m * G_w$

Question 49**2 / 2 pts**

What is the formula inside the double summation for the $u_{(2,3)}$ **Central** moment for a non-binary image $I(x, y)$:

$$u_{(2,3)} = \text{SUM}_x \text{SUM}_y [????]$$

The possible terms are x , y , mx (mean of x), my (mean of y), and $I(x,y)$ (image intensity at x,y)

use $*$ to multiply

use $/$ to divide

use $^$ to raise to a power (e.g., x^2 is $x*x$)

☒ $(x-mx)^2 * (y-my)^3 * I(x,y)$

☐ $x^2 * y^3 * I(x,y)$

☐ $mx^2 * my^3 * I(x,y)$

☐ $(x + y)^{(2+3)} * I(x,y)$

Question 50**2 / 2 pts**

Give the 1-D **squared** Mahalanobis distance of variable $x=3$ to a model having standard deviation $s=2$ and mean $mx=1$.

☐ 4

☒ 1

☐ 5☐ 6☐ 0☐ 2☐ 3**Question 51****2 / 2 pts**

In terms of gradients (F_x , F_y , F_t), give the ratio that specifies the signed “magnitude” of Normal Flow.

*use * to multiply*

use / to divide

☐ $F_x * u + F_y * v + F_t$ ☐ $-F_t$ ☐ $F_x * F_x + F_y * F_y$ ☐ $\text{sqrt}(F_x * F_x + F_y * F_y)$ ☒ $-F_t / \text{sqrt}(F_x * F_x + F_y * F_y)$ ☐ $F_t / \text{sqrt}(F_x * F_x + F_y * F_y)$ **Question 52****2 / 2 pts**

Give the formula (only for x , not for y) of the “pinhole camera” perspective transformation (with focal-length f) of a 3D point (X,Y,Z) to its image coordinate (x, y) .

$x =$

*use * to multiply*

use / to divide

☐ $f*Z$

☐ Z/f

☐ $X*Z$

☐ $f*Z/X$

☐ $f*X$

☐ $X*Z/f$

☒ $f*X/Z$

☐ X/Z

Question 53

2 / 2 pts

Write the formula for disparity D in terms of corresponding x -coordinates in the left (x_l) and right image (x_r).

$D =$

*use * to multiply*

use / to divide

☐ $x_r * x_l$

☐ x_l / x_r

☐ $x_r - x_l$

☒ $x_l - x_r$

Question 54

2 / 2 pts

When employing the Harris Corner Point Detector, the Eigenvalues of the gradient matrix can be used to indicate whether there is a corner, edge, or flat region present. Which of the below Eigenvalue pairs (v_1 , v_2) is best representative of an “Edge” location.

☐ $v_1 = 1.0, v_2 = 1.0$

☒ $v_1 = 1.0, v_2 = 0.1$

☐ $v_1 = 0.1, v_2 = 0.1$

☐ $v_1 = 1.0, v_2 = 0.9$

Question 55

2 / 2 pts

If a full-resolution image is of size 800 x 1000 pixels, what is the size of a “quarter-resolution” image?

☐ 250 x 250

☐ 400 x 500

☒ 200 x 250

Question 56

2 / 2 pts

Assume you are employing the FAST corner detector to determine if a pixel X with a value of 100 is a corner point. Below are the values of the ordered pixels on the border of the circle centered at X.

67 75 131 125 140 135 69 65 67 110 145 141 100 68 69 69

Is X a FAST corner point if the intensity threshold $T = 30$ and the contiguous pixel count n must be at least $n^* = 4$?

☒ Yes, it IS a corner point

☐ No, it is NOT a corner point

Question 57

2 / 2 pts

Write the formula for depth Z as a function of focal length f , baseline T , and disparity D .

$Z =$

*use * to multiply*

use / to divide

☐ $f \cdot D / T$

☐ T^*D/f ☐ $f/(D^*T)$ ☒ f^*T/D ☐ f^*D^*T Quiz Score: **69** out of 69