

## Quiz 2 Sample Questions

CSC 4980/6980 Computer Vision Spring 2019

Your Name =

(First Last)

Score =

(Instructor/TA only)

Total questions: 12

Bonus questions: 0

Total points: 100

Bonus points: 0

Show all work clearly and in order. Sketch all relevant graphs and write down all relevant mathematics. Obtain the numerical answer unless specified otherwise.

1. (10 points) Describe clearly all the steps involved in 2D- convolution using an example.
2. (10 points) Describe clearly all the steps involved in 2D- correlation using an example.
3. (10 points) Derive the Gaussian Kernel for the following sizes: 3x3; 5x5; 7x7 for standard-deviation value  $\sigma = 1$  Show the steps clearly. Start with writing down the 2D Gaussian function.
4. (10 points) Derive the Gaussian Kernel for the following sizes: 3x3; 5x5; 7x7 for standard-deviation value  $\sigma = 2$  Show the steps clearly. Start with writing down the 2D Gaussian function.
5. (10 points) Apply a 3x3 Gaussian blurring filter with  $\sigma = 1$  to the image patches shown in Figure 1, Figure 2 and Figure 3. Write down the 3 output image patches. Repeat with  $\sigma = 2$  and compare the output. Comment on what has changed.
6. (10 points) Apply a 5x5 Gaussian mask with  $\sigma = 1$  through CORRELATION to the image patches shown in Figure 1, Figure 2 and Figure 3. Write down the 3 output image patches. Repeat with  $\sigma = 2$  and compare the output. Comment on what has changed.
7. (10 points) Define Gradient Image. What are the key (computed) measures? What are the metric values used to represent a gradient image?
8. (10 points) Find the gradient image represented by its CONTRAST for the image patches shown in Figure 1, Figure 2 and Figure 3. Choose gradient distance of 1 pixel.
9. (10 points) Find the gradient image represented by its ANGLE for the image patches shown in Figure 1, Figure 2 and Figure 3. Choose gradient distance of 1 pixel.
10. (10 points) Repeat problem 8 and 9, for the Gaussian blurred image patches (consider size 3x3 and  $\sigma = 1$ ). Comment on what has changed.
11. (10 points) Write the pseudo-code for detecting an edge.
12. (10 points) Write the pseudo-code for detecting a corner.

250	50	250	50	250
50	250	50	250	50
250	50	250	50	250
50	250	50	250	50
250	50	250	50	250

Figure 1

250	255	250	240	250
101	98	102	120	240
250	110	250	99	250
250	250	101	100	250
250	255	250	255	250

Figure 2

50	50	50	50	50
50	250	250	250	50
50	250	10	250	50
50	250	250	250	50
50	50	50	50	50

Figure 3