

# **CSC420: Assignment 1**

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## Problem 1

1. The computational cost for  $h * I$  when  $h$  is not separable is  $O(n^2m^2)$ .

This because each pixel in  $I$  gets computed for  $m^2$  time, and there are  $n^2$  pixels in total.

2. The computational cost for  $h * I$  when  $h$  is not separable is  $O(m^22n)$ .

## Problem 2

Canny Edge Detection Steps:

1. Filter the image with derivative of Gaussian in both horizontal and vertical directions.
  - The purpose of this is to smooth the image and remove the noise.
  - To do this, we apply Gaussian filter to convolve with the image.
2. Find the magnitude and direction for the gradients
  - The purpose of this is to find the possible edges
  - To do this, we apply edge detection filters (for example, Sobel) with different directions and convolve with the image.
3. Non-maximum suppression
  - Get rid of the spurious response from edge detection produced by noise.
  - To do this, we only take local maximum or minimum of the edges.
4. Linking and Thresholding
  - The purpose of this is to connect the unlinked edges.
  - To do this, define 2 thresholds low and high. We use the high threshold's results to start the edge curves and use low threshold's results to connect the unlinked edges.

## Problem 3

*Pseudocode*

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**Algorithm 1** Process(A, B)

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```
1: if  $A = B$  then
2:    $C =$  empty list
3:   return true
4: else
5:   while  $A \neq \emptyset$  do
6:     Do something
```

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## Problem 4

Listing 1: Caption

```
def function(a):
    return a
```