

Name: _____

Score: /15

CSE 5524

Computer Vision for HCI

AU'19

Homework Assignment #2

Due: Tuesday 9/9

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- 1) Perform Gaussian smoothing on `affleck_gray.png` (or `affleck_gray_flip.png`). Try with multiple sigma values, starting with larger values (e.g., from 20 to .5). When does the face become recognizable to your friends? [2 pts]

```
sigma=1.0; % use different values
G = fspecial('gaussian', 2*ceil(3*sigma)+1, sigma);
faceIm=double(imread('affleck_gray.png'));
gIm = imfilter(faceIm, G, 'replicate');
imshow(gIm/255); % double images need range of 0-1
imwrite(uint8(gIm), 'gIm.bmp');
```

NOTE: If you choose to use Python, find similar function calls/operators.

- 2) Write a function to compute and display the 2D Gaussian derivative masks G_x and G_y for a given sigma. Sample the Gaussian derivative/gradient (2D) equation directly (see class notes) at the appropriate x,y locations. Note: each mask is a square 2D matrix. [3 pts]

```
[Gx, Gy] = gaussDeriv2D(sigma);
```

- 3) Compute and display the gradient magnitude of an image (search the web for an interesting image; convert to grayscale if necessary; make sure to upload the image with your code in the Carmen submission). [2 pts]

```
gxIm = Imfilter(Im, Gx, 'replicate');
gyIm = Imfilter(Im, Gy, 'replicate');
magIm = sqrt(gxIm.^2 + gyIm.^2);
imagesc(magIm);
```

- 4) Threshold and display the magnitude image with different threshold T levels. [2 pts]

```
tIm = magIm > T;
imagesc(tIm);
```

[next page]

- 5) Compare the above results with the Sobel masks. [2 pts]

```
Fx = -fspecial('sobel');  
fxIm = imfilter(Im,Fx);  
Fy = fspecial('sobel');  
fyIm = imfilter(Im,Fy);  
magIm = sqrt(fxIm.^2 + fyIm.^2);  
tIm = magIm > T;  
imagesc(tIm);
```

- 6) Run the MATLAB canny edge detector, `edge(Im,'canny')`, on your image and display the default results. How does it compare? [2 pts]
- 7) Turn in all code, test images, printouts of images, and discussion of results. Make a HW2.m script to do the above tasks and call needed functions. Upload your code and selected images to Carmen. [2 pts]