

Name: \_\_\_\_\_

Score:     /10

CSE 5524

Computer Vision for HCI

AU'18

### Homework Assignment #4

Due: Tuesday 9/18

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- 1) Write a function to compute the 7 **similitude** moment shape descriptors. Test and compare results on the rectangle box images 'boxIm[1-4].bmp' on the website. How do they change across the box images? Please make sure your function will work with non-binary (grayscale) imagery (you will need this for later assignments), i.e., do not use Matlab's regionprops function for the mean or area in your calculations. [4 pts]

```
Nvals = similitudeMoments(boxIm1);
```

- 2) Using the datafile (eigdata.txt) provided on the WWW site, perform the following MATLAB commands [1 pt]:

```
%% Load the data
clear; close all;
load eigdata.txt;
X = eigdata;
subplot(2,1,1);
plot(X(:,1),X(:,2),'b. ');
axis('equal');

%% mean-subtract data
m = mean(X);
Y = X - ones(size(X,1),1)*m;
subplot(2,1,2);
plot(Y(:,1),Y(:,2),'r. ');
axis('equal');
```

[ NEXT PAGE ]

- 3) Compute the eigenvalues (V) and eigenvectors (U) of the data (stored in Y) using the function eig() in Matlab (*recall that you use either the covariance matrix or the inverse-covariance matrix of the data – see class notes*). Plot the mean-subtracted data Y and the 2-D Gaussian ellipse axes for given the eigenvectors in U (*you can use the plot command in Matlab for this*). Use the eigenvalues in V to give the appropriate  $3\sigma$  (*standard deviation - not variance!*) length to each axis (*did you compute the eigenvalues from the covariance or inverse covariance of Y? The eigenvalues will be related but different! See class notes*). [4 pts]

[Note: it would also be nice to draw the  $3\sigma$  ellipse around Y if you can – Google ‘matlab ellipse.m’ for some code if you are interested.]

- 4) Rotate Y using the eigenvectors to make the data uncorrelated (i.e., project data Y onto the eigenvectors – see class slides). Plot the results. [2 pts]
- 5) Turn in all code, printouts of images, and discussion of results. Make a *lastname\_osudotnumber\_HW4.fileformat* script to do the above tasks and call needed functions. Upload your code and images to Carmen. [no points for this step anymore – must be done!]

**From now on you MUST submit all code and imagery on Carmen and turn in a paper report in class to receive points on the homework. Any portion missing will result in a 0 for the assignment!**