Computer Vision and Image Processing: HW 1

Spatial Pyramid Matching for Scene Classification

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Q1.0

What properties do each of the filter functions (see Figure 3) pick up? You should group the filters into broad categories (i.e., all the Gaussians). Answer in your write-up.

A1.0

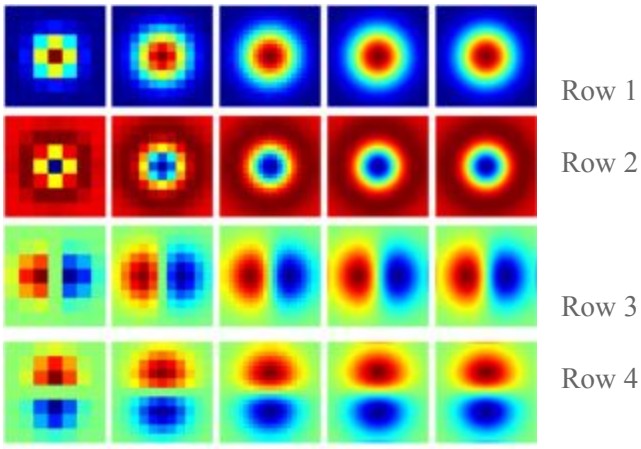


Figure 3: The provided multi-scale filter bank.

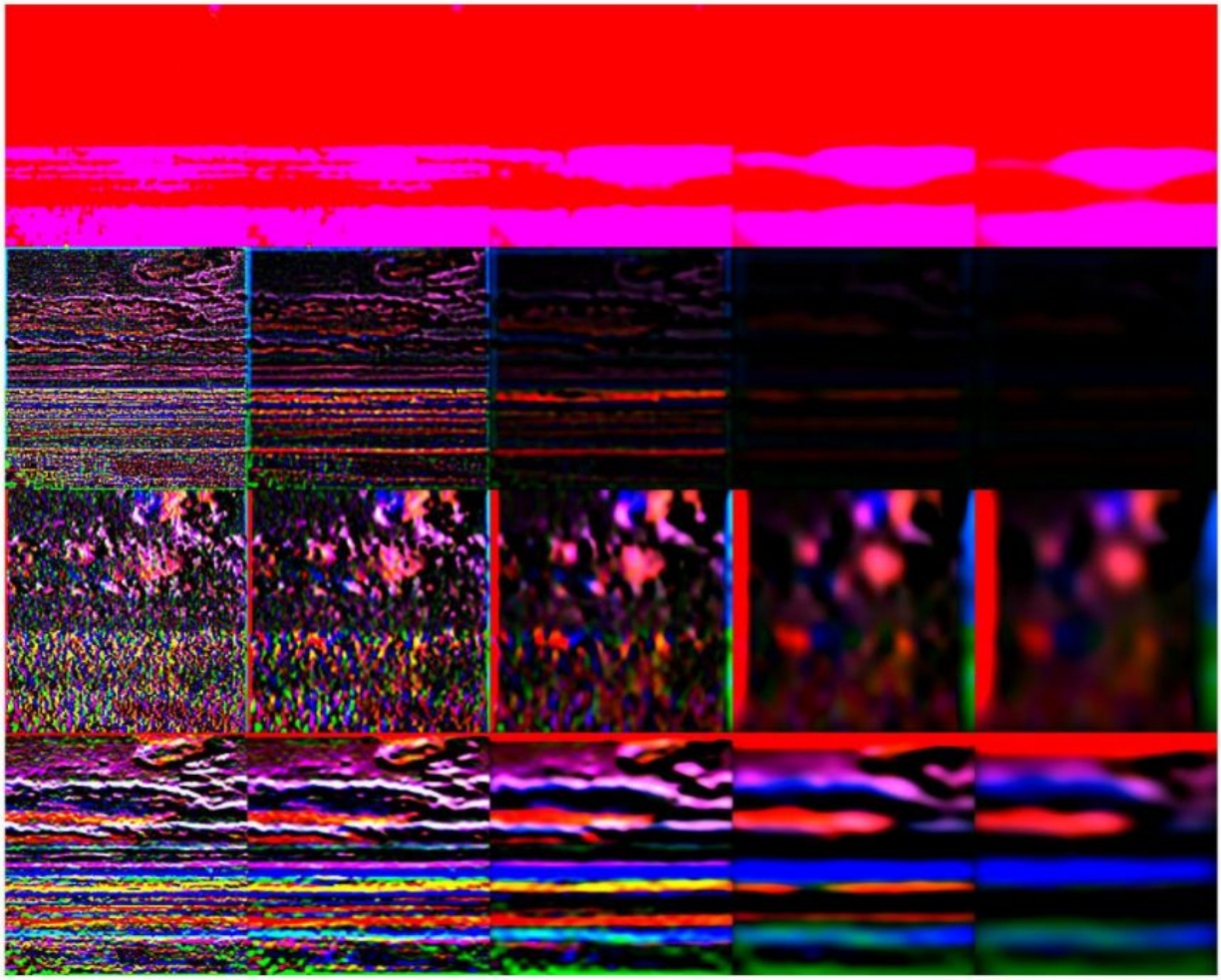
Row 1 and Row 2 can be classified as gaussian filters. The first row has increasing weights towards the middle and the second row being an inverse gaussian with weights increasing towards the outer edges.
Also known as the Wald distribution, the inverse Gaussian is used to model nonnegative positively skewed data. Inverse Gaussian distributions have many similarities to standard Gaussian (normal) distributions, which lead to applications in inferential statistics.

Row 3 and Row 4 are edge detection filters. The third row is the vertical edge detector, the foruth row being a horizontal edge detector.

Q1.1

Apply all 20 filters on a sample image, and visualize as a image collage (as shown in Figure 4). Submit the collage of 20 images in the write-up.

A1.1



Q1.3

Visualize three wordmaps of three images from any one of the category and submit in the write-up along with their original RGB image.

A1.3

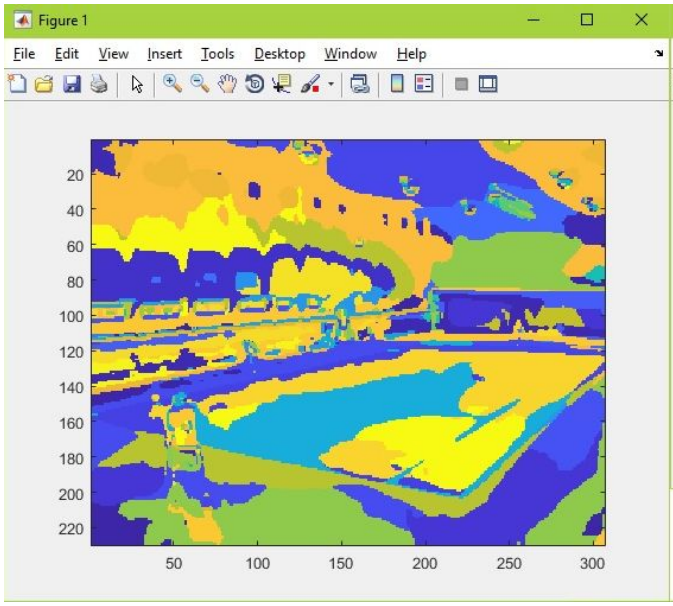


Figure 1
File Edit View Insert Tools Desktop Window Help
20 40 60 80 100 120 140 160 180 200 220
50 100 150 200 250 300

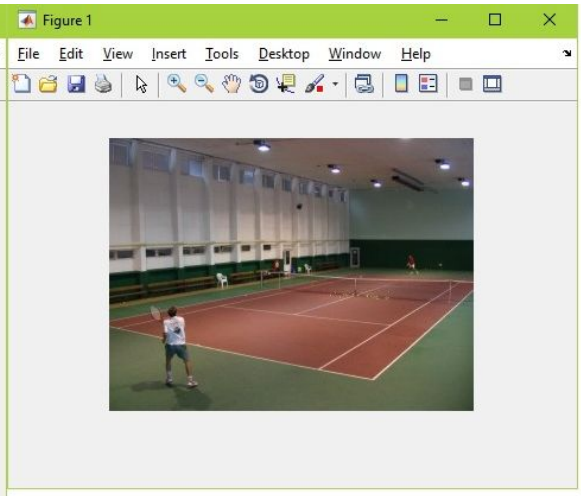


Figure 1
File Edit View Insert Tools Desktop Window Help

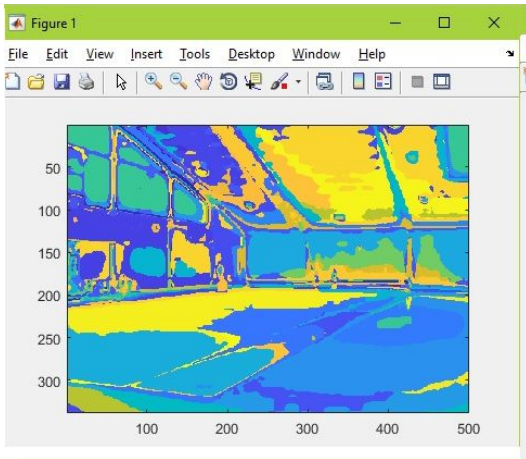


Figure 1
File Edit View Insert Tools Desktop Window Help
50 100 150 200 250 300
100 200 300 400 500

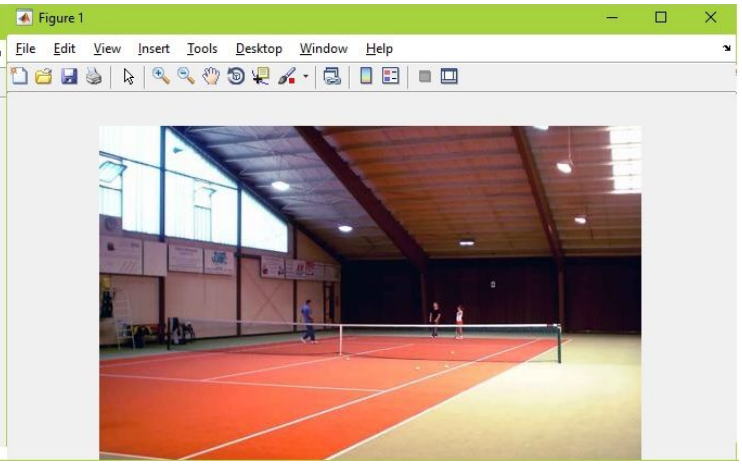


Figure 1
File Edit View Insert Tools Desktop Window Help

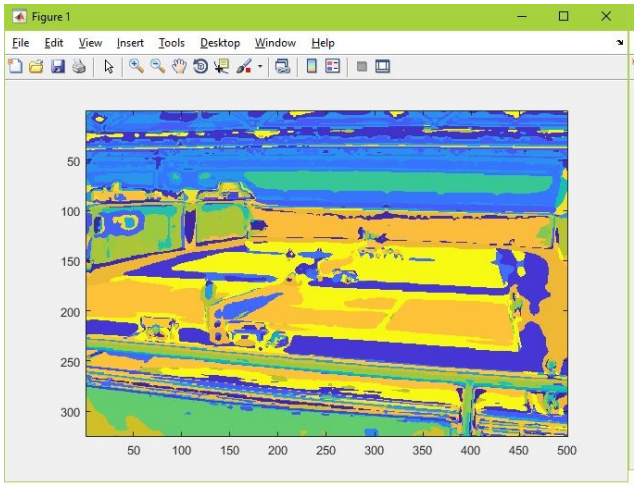


Figure 1
File Edit View Insert Tools Desktop Window Help
50 100 150 200 250 300
50 100 150 200 250 300 350 400 450 500

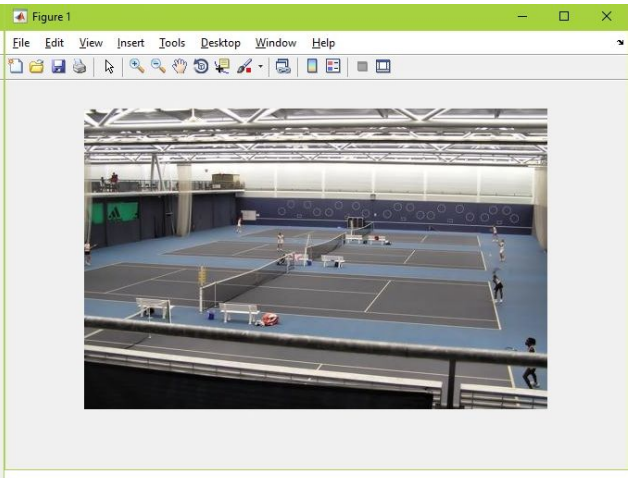
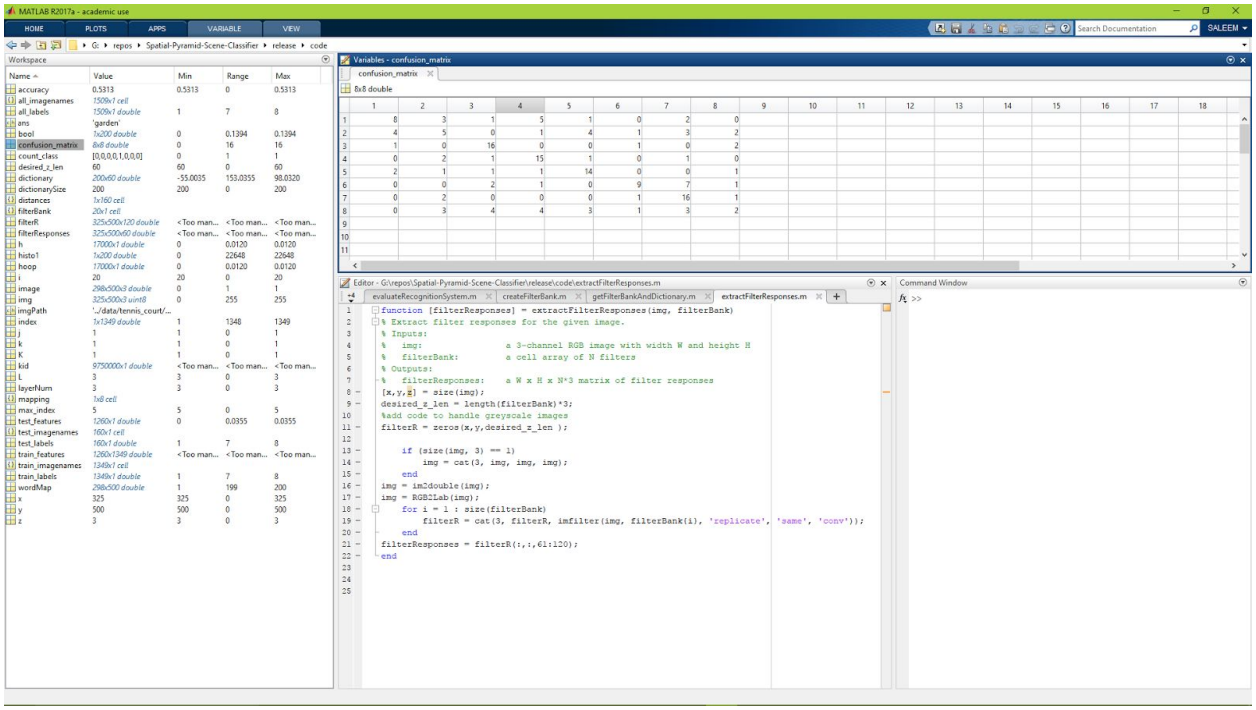


Figure 1
File Edit View Insert Tools Desktop Window Help

Q2.5Confusion Matrix :



8	3	1	5	1	0	2	0
4	5	0	1	4	1	3	2
1	0	16	0	0	1	0	2
0	2	1	15	1	0	1	0
2	1	1	1	14	0	0	1
0	0	2	1	0	9	7	1
0	2	0	0	0	1	16	1
0	3	4	4	3	1	3	2

Q2.6

List some of these classes/samples and discuss why they are more difficult in your write-up.

A2.6

1. The Ocean and Mountain images - maybe because both contain large number of blue pixels - the sky and the water.
2. The tennis_court get wrongly classified as gardens and vice versa. Again because the word map of both contain large number of green - grass pixels
3. Computer labs and Libraries are confusing for the system. - many times the library photos also consist of computers

REFERENCES

https://github.com/xinshuoweng -

for files :

buildRecognitionSystem.m

evaluateRecognitionSystem.m