Assignment 1 Solutions

EEL 5934

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Part 1: Interpreting lines of code

A. `mean(randn(1000,1))`
   a. The command `randn` generates an array of random numbers drawn from the normal distribution with size equal to the input size. In this case it creates a 1000x1 array of random numbers. The command `mean` returns the arithmetic mean of the items in the inputted array along the first non-1-sized axis.
   b. The class of the output of this line is a 1x1 array of double-point precision floating point values, the default type outputted by `randn` (preserved by `mean`)
   c. The possible range of values returned by `randn` is *technically* $$ (-\inf, \inf) $$, but numbers with large magnitude have near-zero chance of being drawn.
   d. The mean is not expected to change whether you increase or decrease the number of values generated by `randn` . The mean is always expected to be 0. However, with more values the mean is expected to be closer to the true mean by the law of large numbers.

B. `figure, imshow(imread('peppers.png')), title('Peppers!'), axis image, colorbar`
   a. I explain the function of each command below:
      i. `figure` : create a new figure. In MATLAB this creates a new popup window with the figure in it.
      ii. `imshow` : Draw the inputted array on the current figure as an image
      iii. `imread` : Read the inputted filepath or array as an image. `imread` attempts to interpolate things like the number of channels and image format implicitly
      iv. `title` : Title the current figure with the inputted string. This draws the title above the current figure.
      v. `axis` : Set the axis limits according to the inputted array or style. In this case, using `image` as the style, each axis will have equal unit length and the axes are fitted as tight as possible to the data.
      vi. `colorbar` : Display a vertical colorbar to the right on the current figure, showing the current colormap and the mapping of values to that colormap.
   b. The class of the output of `imread('peppers.png')` is an array of 8-bit precision unsigned integers (assuming `peppers.png` is an 8-bit 3 channel png).
   c. The size of the output of `imread('peppers.png')` is 3xLxW, where L and W are the length and width of `peppers.png` , respectively in pixels.

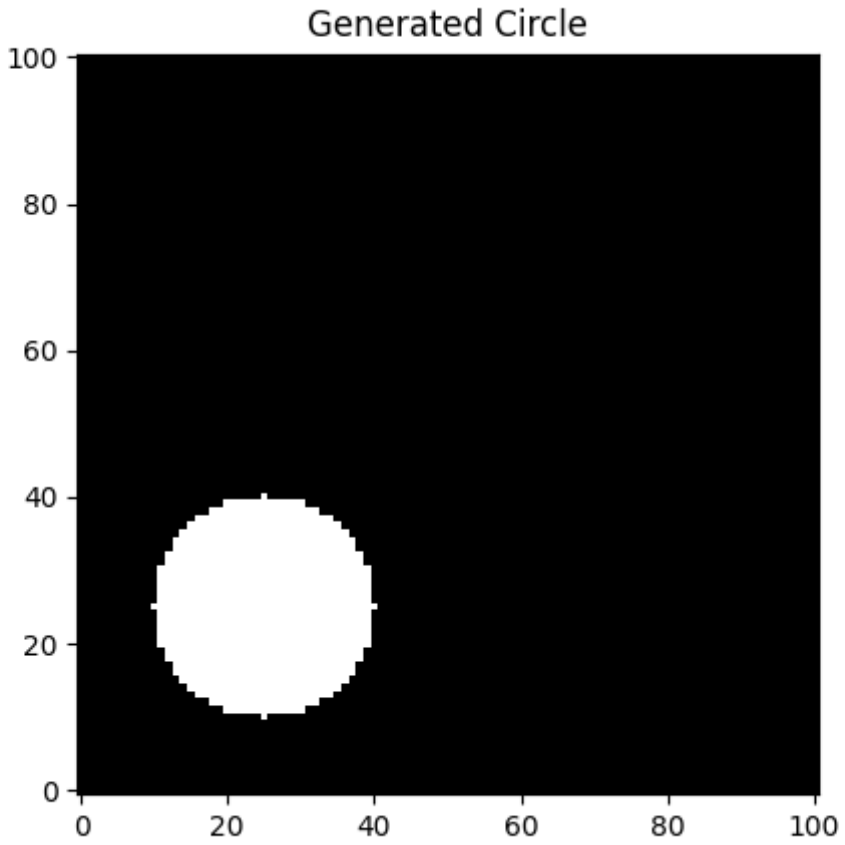
C. `[2, 4, 5, 6] + [1, 3, 5]`
   a. The error message generated by the line is due to an attempt to add 2 matrices of differing sizes: this behaviour is ill-defined since MATLAB cannot perform element-wise addition on the two matrices.

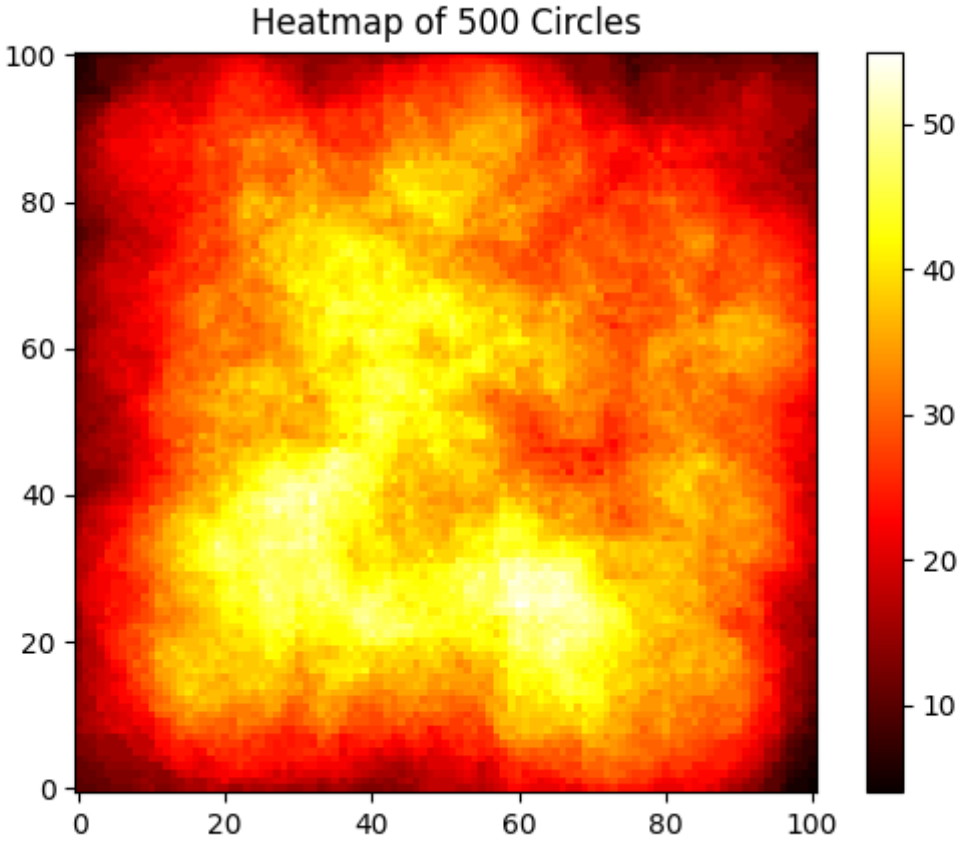
b. The answer to part b is found in the `coding_responses.py` file linked. The output is:

```
C:\Users\founded\PycharmProjects\EEL5934\Assignment_1>python coding_responses.py
[3, 5, 6, 7]
[5, 7, 8, 9]
[7, 9, 10, 11]
```

Part 2: Defining Functions

The answers to part 2 are found in the accompanying Python file `coding_responses.py` . Running this file requires an installation of Python with version 3.11 or later (though it likely works with earlier versions of python), and `matplotlib` and `numpy` packages. The visual outputs are:


Generated Circle
100
80
60
40
20
0
0
20
40
60
80
100


Heatmap of 500 Circles
100
80
60
40
20
0
0
20
40
60
80
100
50
40
30
20
10