

CS1115 Lab 8 (October 18, 2012)

Completing the lab is very important, but your work is not graded and it is not submitted. If you finish before the hour is over, then you can leave early or you can work on the "Finished Early" problems. If you do not finish the problems before the end of class, then be sure to ask enough questions so that you can complete the exercises in the next day or two on your own.

1. Normalizing a Matrix

Write a script that uses `randn` to generate a 10-by-5 random matrix **A** and then computes another 10-by-5 matrix **B** with the property that $b_{ij} = (a_{ij} - \mu_j)/\sigma_j$ where μ_j is the average of all the entries in column j and σ_j is their standard deviation. Recall that the standard deviation of a length- n vector x is given by

$$\sigma = \sqrt{(x_1 - \mu)^2 + \dots + (x_n - \mu)^2} \quad \mu = (x_1 + \dots + x_n)/n$$

2. Modify the MinEllipse GUI

Download `MinEllipse.m` and `MinEllipse.fig`. Play with the GUI for a few minutes to appreciate what it does. (a) The opening function sets up 4 random points. The vectors `handles.u` and `handles.v` house this "GUIDATA". Modify it so that sets up 50 random points. Half should be in the square with vertices (0,0), (1,0), (1,1), and (0,1) and half should be in the square with vertices (0,0), (-1,0), (-1,-1), and (0,-1). (b) Modify the `a_slider` callback function and the `b_slider` callback function so that it is never possible to have $b > a$. For example, after a new a -value is established, the `a_slider` callback should set the `Max` property of `b_slider` should to a . Likewise, after a new b -value is established, the `b_slider` call back should set the `Min` property of `a_slider` to b .

3. Finished Early?

Download `MyMagic.m` and complete its implementation so that it does the same thing as the built-in function `Magic`:

```
>> A = magic(5)
```

A =

```
    17    24     1     8    15
    23     5     7    14    16
     4     6    13    20    22
    10    12    19    21     3
    11    18    25     2     9
```

In general, `magic(n)` is an n -by- n matrix made up of the first n^2 integers with the property every row, column, and diagonal adds up to the same thing. If $n = 5$, then the "magic sum" is 65. Starting with a "1" in the middle of the top row, the "fill-it-in" process keeps moving "northeastward" unless it is "blocked" or falls off the top or right edge. Take it from there!

Please delete your files from the computer before you leave the lab!