Assignment 03 (Due: Monday, February 8, 2016)

CSCE 155*N*

1 Lab Objectives

- Further understanding of array and matrix operations
- Formalize science/engineering problems as matrix or array computations

2 Prior to Laboratory

- Review matrix multiplication, inversion, and systems of linear equations
- Read chapters 2.3 & 2.4

3 Topics Covered in Lab

- Matrix Applications and `if` Statements
- Documentation of Programs

4 Activities/Exercises

- Matrix Application: Curve Fitting

4.1 Practice

Type each of the following statements in the command window

4.1.1 `fprintf`

- `fprintf( '%f\r\n' , pi );`
- `fprintf( '%.2f\r\n' , pi );`
- `fprintf( '%05.2f\r\n' , pi );`
- `fprintf( '% 5.2f\r\n' , pi );`
- `fprintf( '% 5d' , 10 );`
- `out = sprintf( '%f' , pi ); disp( out );`
- `out = sprintf( '%.2' , pi ); disp( out );`

- `out = sprintf( '%05.2f' , pi ); disp( out );`
- `out = sprintf( '% 5.2f' , pi ); disp( out );`
- `out = sprintf( '% 5d' , 10 ); disp( out );`

4.2 Before You Begin

- **Download files from** http://cse.unl.edu/~cse155n/labs/03 **to your** `Z:\csce155n` **directory**

4.3 Distance Calculation

- Modify `calculateHammingDistance.m`, so that the function correctly computes the Hamming Distance between two strings.
- Modify `printHammingDistance.m`, so that the function uses `sprintf` to return a string containing the distance between two words with enough total room for 3 digits

4.4 Solving Systems of Linear Equations

- Modify `solveSystem.m`, so that the function returns a column-vector `coefficients` that solves the system of equations defined below

  The below equations are defined for 3 points and a parabola, your function will receive 3 points

- **`xs` and `ys` will be defined as row vectors.**

Systems of linear equations can generally be described in the form

$$\begin{array}{llll} ax_1^2 & +bx_1 & +c & = y_1 \\ ax_2^2 & +bx_2 & +c & = y_2 \\ ax_3^2 & +bx_3 & +c & = y_3 \end{array}$$

As matrices and vectors, this can be represented as

$$\begin{bmatrix} x_1^2 & x_1 & 1 \\ x_2^2 & x_2 & 1 \\ x_3^2 & x_3 & 1 \end{bmatrix} \times \begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix}$$

or $L \times M = N$, which can be rewritten as $M = L^{-1} \times N$. In MATLAB, this can simply be written as `M = L\N`.

4.5 `members03lab.txt`

- Open file `members03lab.txt`
- Replace `bwayne` and `dgrayso` with the `cse.unl.edu` usernames of you and your partner
- Save the File

4.6 `contributions03lab.txt`

- Open file `contributions03lab.txt`
- Write **your** explanation of what you and your partner each contributed to completing the lab
- Save the File

5 Code Documentation

Remember to document your files in the way that we did for the previous labs. It will come in handy when you look back at code after a long time, or when someone else is trying to understand what your code does.

6 What to Submit

You will be submitting five (5) files (`calculateHammingDistance.m`, `printHammingDistance.m`, `solveSystem.m`, `members.txt`, and `contributions.txt`).

7 webgrader and `diffs`

Because the webgrader will test your programs and supply the input, the `diff` program is being used to check for the correctness of your programs. If nothing appears in the `diff` section, that means that your program produced the correct output for the given input.

You must run the webgrader at least once before $11:59:00$**pm on Tuesday night.**

8 Additional Resources

Online MATLAB Documentation
CSE Webhandin
CSE webgrader

9 Think About...

- Can you think of a matrix application in your own field of study?
- What could be graphed from this lab to better illustrate a result?
- What methods have you used to debug (fix errors in) your programs?

10 Point Allocation

Component	Points
`calculateHammingDistance.m`	25
`printHammingDistance.m`	25
`solveSystem.m`	25
`members03lab.txt`	5
`contributions03lab.txt`	5
webgrader PDF	15
Total	100