COMP1200-MatLab - Lab 07
Due midnight – Thursday – October 27
Submit `devPlan07.txt` , `hubbleData.txt` and `Lab07.c` **via Blackboard**

Before you start writing your program:

Read all of these instructions carefully. The **`devPlan07.txt`** file at the assignment link is an incomplete development plan. You are to save the file and edited it by adding your name and the date and by completing: 1. STATE THE PROBLEM, 2. DESCRIBE THE INPUT AND OUTPUT REQUIREMENTS, and **4. DEVELOP AN ALGORITHM**. Use the development plan as a guide when writing the m-script file solution for the following problem. **This file must be saved as a .txt file.**

3. WORK HAND EXAMPLES is not required; use the sample data in these instructions to check your results.

Parts of your **Lab06.m** may be used as is or modified in **Lab07.m**. Resave save your **Lab06.m** as **Lab07.m** to preserve your **Lab06.m**.

NOTE: You will see later that the spelling and casing of file names is very important in MATLAB. Your submitted file(s) MUST be spelled and cased as instructed. [-5 points per file for not doing so.]

***Problem*:**

***Program*: Lab07.m**

Edwin Hubble used the Mount Wilson Observatory telescopes to measure features of nebulae outside the Milky Way. He found that there is a relationship between a nebula's distance from earth and the velocity with which it was traveling from the earth. Hubble's initial data on 24 nebula is presented in Table 1 in the problem scenario.

The relationship between distance and velocity led scientists to propose that the universe came into being with a Big Bang, a long time ago. If material scattered from the point of the Big Bang traveling at a constant velocity, the distance traveled can be determined.

Using Hubble's data, find the linear equation that estimates the relationship between the velocity and distance readings. Display the data on a graph.

Instructions:

- ☐ Insert comments at the top and throughout each file
  - Include the follow comments at the beginning of this (and ALL) files.
    - **%** your name
    - **%** assignment number
    - **%** date you completed the assignment
    - **%** a short narrative about what the file does
  - Use your development plan as a guide for comments throughout each file

-5 points per file for absence of any of these required comments at the top

- ☐ Use `clc` and `clear all` at the beginning of your program.
- ☐ Use descriptive variable names.
- ☐ Use Sample Input/Output as a guide.
- ☐ No extra output, i.e., use semicolons!

- ☐ Using a data file
  - Protect your program from crashing by checking the file ID. If there is a bad open, print the error message and end the program.

- ☐ Input:
  - Read Hubble's data from `hubbleData.txt`
  - There are five columns of data in the data file. You will read all but only use the velocity and distance in the program computations. Compare `hubbleData.txt` with the table in the scenario for the column content.
  - Read until the **end-of-file** is found
  - Read one value at a time into a matrix with five columns using **row and column indexes**.
  - You know that there are five columns, but you will need to count the rows of data read.

Still using fscanf to read the file.

- ☐ Computation -- Use the matrix name with row and column indexes
  - Create the linear equation that estimates the relationship between the velocity and distance readings.

- ☐ Output -- Use the matrix name with row and column indexes
  - Print the velocities and distances in a two columns with a title and column headings
  - Print slope and y-intercept in the form of a linear equation.
  - Display the data in a scatter plot and line of the graph a linear equation
    - Use the code below to draw a scatter plot for the data pairs
      - Replace **<velocity column>** and **<distance column>** with matrix columns where you save velocity and distance.
        "`hold on`" will draw the line graph on the same figure as the scatter.

```
scatter( <velocity column>, <distance column> )
hold on
```

    - Use the code below to draw a line of the linear equation.
      - Create a vector (**xVelocity**) starting with **minimum** value of Hubble's velocity and ending with the **maximum** value of Hubble's velocity.
      - Compute the values for **yDistance** using the linear equation.

```
plot(xVelocity,yDistance)
```

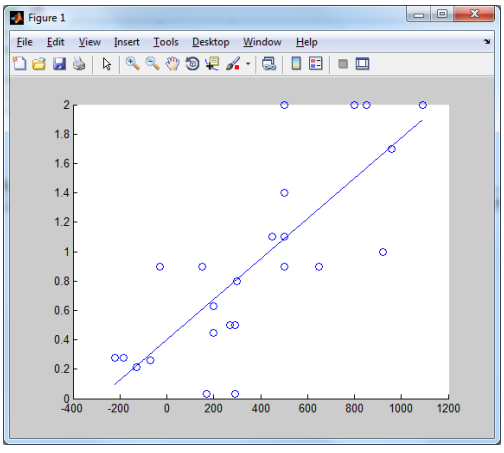
- ☐ Loops:
  - Think carefully about what needs to be done before the loop, in the loop, and after the loop
  - Use a **while loop** for reading the data file.
  - Use **counting loops** when summing data and printing table.
- ☐ Printing:
  - Use **fprintf** for all output.
  - Decimal places:
    - velocity 0
    - distance 3
    - slope 4
    - y-intercept 3
  - Column numbers **right-justified**, i.e., right-aligned
  - No extra blank spaces in the other output.

New commands
`feof, fopen`
`fscanf`
`scatter, hold on, plot`

Revisit
using index with a matrix, Ch.4

Sample Input/Output:

```
   NEBULA INPUT DATA
VELOCITY  DISTANCE
 km/sec  106 parsecs
   170       0.032
   290       0.034
  -130       0.214
      . . .
   500       2.000
   850       2.000
   800       2.000
  1090       2.000
```




```
LINEAR EQUATION: distance = 0.0014 * velocity + 0.399
```

Submit via Blackboard:

`devPlan07.txt`	Software development method
`Lab07.m`	MATLAB script file
`hubbleData.txt`	Data file