CSCI 1320 Computer Science I: Engineering Applications Fall 2018
Instructor: Zagrodzki
Assignment 6
Due Sunday, October 28, by 6pm

A. Working with data files in MATLAB (70 points)

Large amounts of data can become useful if the information is organized and presented visually. Following are the goals of this assignment:

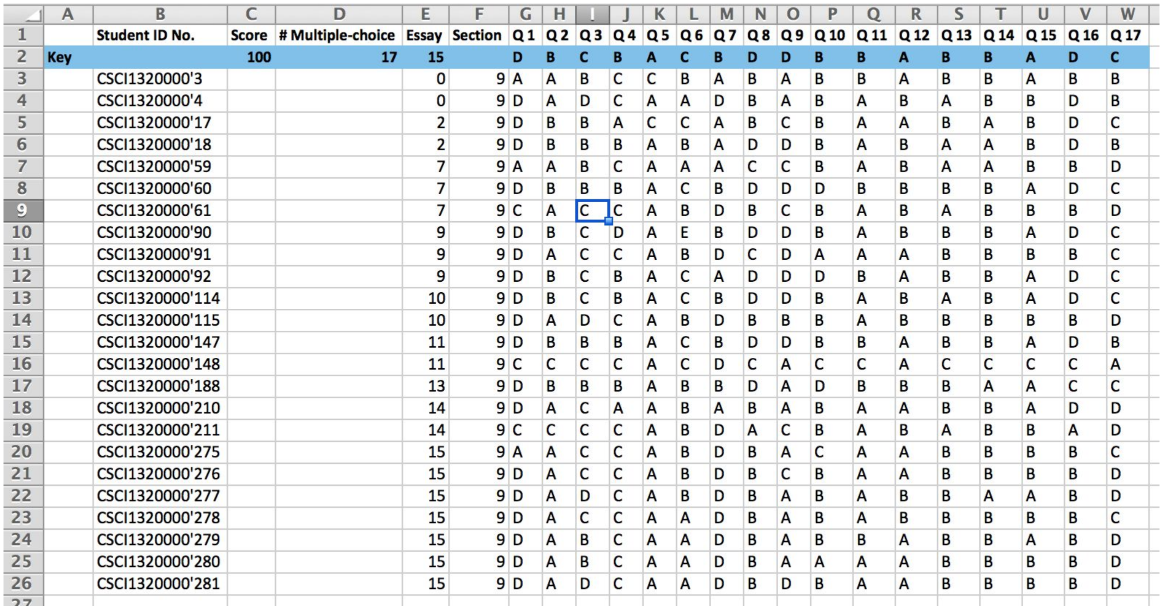
1. Read in data files. Use *xlsread* MATLAB function to read in an Excel spreadsheet. Perform some initial cleaning on the imported data, and then save the cleaned data in MATLAB's native data format.
   http://www.mathworks.com/help/matlab/ref/xlsread.html
   https://www.mathworks.com/help/matlab/ref/save.html

2. Write a program that loads the cleaned data and uses it to calculate the grade for each student.

During the Fall 2015 semester, 101 CU Boulder students took a quiz. The quiz consisted of 17 multiple-choice questions, and 1 essay question. Your task is to compute the final quiz scores and to plot a histogram of the scores.

What is given?
You are given one file named *section9_data.xlsx* which contains (see figure below):

I. The answer key for the multiple-choice part of the quiz (cells G2:W2),
II. The student ID numbers (column B),
III. The score the students received for the Essay portion of the quiz (column E),
IV. The section number (column F),
V. The student answers to each of the 17 multiple-choice questions (columns G through W).



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1		**Student ID No.**	**Score**	**# Multiple-choice**	**Essay**	**Section**	**Q 1**	**Q 2**	**Q 3**	**Q 4**	**Q 5**	**Q 6**	**Q 7**	**Q 8**	**Q 9**	**Q 10**	**Q 11**	**Q 12**	**Q 13**	**Q 14**	**Q 15**	**Q 16**	**Q 17**
2	**Key**		**100**	**17**	**15**		**D**	**B**	**C**	**B**	**A**	**C**	**B**	**D**	**D**	**B**	**B**	**A**	**B**	**B**	**A**	**D**	**C**
3		CSCI1320000'3			0	9	A	A	B	C	C	B	A	B	A	B	B	A	B	B	A	B	B
4		CSCI1320000'4			0	9	D	A	D	C	A	A	D	B	A	B	A	B	A	B	B	D	B
5		CSCI1320000'17			2	9	D	B	B	A	C	C	A	B	C	B	A	A	B	A	B	D	C
6		CSCI1320000'18			2	9	D	B	B	B	A	B	A	D	D	B	A	B	A	A	B	D	B
7		CSCI1320000'59			7	9	A	A	B	C	A	A	A	C	C	B	A	B	A	A	B	B	D
8		CSCI1320000'60			7	9	D	B	B	B	A	C	B	D	D	D	B	B	B	B	A	D	C
9		CSCI1320000'61			7	9	C	A	C	C	A	B	D	B	C	B	A	B	A	B	B	B	D
10		CSCI1320000'90			9	9	D	B	C	D	A	E	B	D	D	B	A	B	B	B	A	D	C
11		CSCI1320000'91			9	9	D	A	C	C	A	B	D	C	D	A	A	A	B	B	B	B	C
12		CSCI1320000'92			9	9	D	B	C	B	A	C	A	D	D	D	B	A	B	B	A	D	C
13		CSCI1320000'114			10	9	D	B	C	B	A	C	B	D	D	B	A	B	A	B	A	D	C
14		CSCI1320000'115			10	9	D	A	D	C	A	B	D	B	B	B	A	B	B	B	B	B	D
15		CSCI1320000'147			11	9	D	B	B	B	A	C	B	D	D	B	B	A	B	B	A	D	B
16		CSCI1320000'148			11	9	C	C	C	C	A	C	D	C	A	C	C	A	C	C	C	C	A
17		CSCI1320000'188			13	9	D	B	B	B	A	B	B	D	A	D	B	B	B	A	A	C	C
18		CSCI1320000'210			14	9	D	A	C	A	A	B	A	B	A	B	A	A	B	B	A	D	D
19		CSCI1320000'211			14	9	C	C	C	C	A	B	D	A	C	B	A	B	A	B	B	A	D
20		CSCI1320000'275			15	9	A	A	C	C	A	B	D	B	A	C	A	A	B	B	B	B	C
21		CSCI1320000'276			15	9	D	A	C	C	A	B	D	B	C	B	A	A	B	B	B	B	D
22		CSCI1320000'277			15	9	D	A	D	C	A	B	D	B	A	B	A	B	B	A	A	B	D
23		CSCI1320000'278			15	9	D	A	C	C	A	A	D	B	A	B	A	B	B	B	B	B	C
24		CSCI1320000'279			15	9	D	A	B	C	A	A	D	B	A	B	B	A	B	B	A	B	D
25		CSCI1320000'280			15	9	D	A	B	C	A	A	D	B	A	A	A	A	B	B	B	B	D
26		CSCI1320000'281			15	9	D	A	D	C	A	A	D	B	D	B	A	A	B	B	B	B	D

What do you need to do:

1. **Read in the spreadsheet and clean up the data.**
    a. Read in the data using the *xlsread()* MATLAB function.
    b. We only need the I, II, III, and V parts of data. We do not need to keep any of the column titles. Create separate cell arrays that contain only those parts of the data. Even though you are separating your data into multiple arrays, make sure the row numbers will still correspond to the correct student ID numbers, the answer key column numbers correspond to the correct question numbers, etc.. *(You do not need to come up with an algorithm for detecting where the real data starts/ends. You can hard code these indexes.)*
    c. Save *only* the data that is needed in the MATLAB native file format.

2. **Load cleaned data and calculate grades.**
    a. Read in the MATLAB data file you created in previous part.
    b. Calculate each student's grade. The multiple choice part of the quiz should be worth 60% of the grade and the essay should be worth 40%. Use the same letter-grade-to-score mapping as used in our CSCI1320 syllabus.
    c. Display each student's ID along with the grade they received on the quiz.

B. Intro to C++ (30 points)

Earlier on in the semester we wrote simple calculator script in MATLAB. Now, let's do the same in C++.

Problem description: write a program that prompts the user to enter 2 numbers. The two numbers should be stored in variables of floating point type. The results of each of the following operations should be printed to the screen as a part of a meaningful message:

1. adding them together
2. subtracting the second from the first
3. multiplying them together
4. dividing the first by the second
5. the first to the power of the second

(You are welcome to experiment with writing the result of each operation to a variable, or you can just print the results directly.)

NOTE: if your C++ file does not compile with standard g++ compiler in Jupyter Hub you will get a zero on the C++ portion of the assignment (no partial credit). This will be the case with all C++ assignments going forward.

C. Extra Credit (20pts)

Write a **Matlab** function that takes **one input** -- *an MxN matrix* -- and returns **one output** -- *the row number of the matrix with the smallest row sum*.

Function Details

- Name the function `min_row_sum`
- Name the input matrix `A`
- Name the output `min_row`

Note

- You are **NOT** allowed to use any built in function **EXCEPT** for the `size()` function
- You must use **for loops** to solve this problem.

Example

Let `A = [1 2 3; 4 5 6]`

Then `min_row` will be equal to `1`

Submitting the assignment:

Zip all the .m and .cpp files together and submit the resulting *.zip* file through Moodle as Assignment 6 by due date.