CPS118 - Term Project – Fall 2017

This project is a team project. It must be done in teams of two or three people (preferably three). Individual submissions will not be accepted. Teammates must be from the same professor's class (not necessarily the same lab section).

On this project you will make calculations and conclusions based on real data collected by the NOAA (The National Oceanic and Atmospheric Administration, an agency of the United States government) on the temperature of the five major great lakes (Ontario, Erie, Huron, Michigan, and Superior).

You can find the actual data files here that contain the *average* temperatures for each day of the year for each of the five great lakes. Data were collected between the years 1992 and 2016 and are in degrees Celsius.

Lake Erie: https://coastwatch.glerl.noaa.gov/statistic/dat/avgtemps-e_1992-2016.dat
Lake Huron: https://coastwatch.glerl.noaa.gov/statistic/dat/avgtemps-h_1992-2016.dat
Lake Michigan: https://coastwatch.glerl.noaa.gov/statistic/dat/avgtemps-m_1992-2016.dat
Lake Ontario: https://coastwatch.glerl.noaa.gov/statistic/dat/avgtemps-o_1992-2016.dat
Lake Superior: https://coastwatch.glerl.noaa.gov/statistic/dat/avgtemps-s_1992-2016.dat

Each day is numbered 1 to 366, 1 being January 1st and December 31st being 366 (as all the average raw data includes a day, Feb 29, for the leap years).

It is up to you to extract the file data and put it into MATLAB.

You are to make a report showing tables, graphs and conclusions based on data using MATLAB functionality.

Required elements:
(each required element should have its own script file)

1. Calculate the yearly average temperature for each of the great lakes, and the yearly average for all five great lakes put together.

2. Indicate which great lake is the coldest and which one is the warmest taking into account the average yearly temperatures. Also indicate which lakes have yearly temperatures above the average of all the lakes and which ones are below that same average.

3. Make a graph of the temperature of each daily average (x=day, y=temp). Make **one graph per lake** to show the yearly temperature tendencies. Label the axes clearly and add titles to your all graphs.

4. Make **one** graph of the temperatures (x=day, y=temp) that shows all five lines on one graph. Each lake will have a different color. Title your graph, label your axes and have a legend.

5. Calculate the summer average (day 172 to day 265) for all 5 lakes (**one average per lake**). Is the order from warmest to coldest the same as with the yearly average calculated in step #1?

6. Make a graph for summer days only (day 172 to day 265) with all 5 lakes on **one** graph. Title your graph, label your axes and have a legend (use the same colors and legend as the graph you made in step #4).

7. Calculate the winter average (days 1 to 79 and days 355 to 366) for all 5 lakes (**one average per lake**). Is the order from warmest to coldest the same as with the yearly average calculated in step #1?

8. Make a graph for winter days only (days 1 to 79 and days 355 to 366) with all 5 lakes on **one** graph. Title your graph, label your axes and have a legend (use the same colors and legend as the graph you made in step #4).

9. Assuming that you can swim comfortably in the lake if the temperature is **above** 20 degrees.

Calculate the number of days in the year you can swim for each of the 5 lakes. Make pie charts of the percentages of total days of the year that you can swim in the lakes. Make one pie chart per lake and put all 5 on the same figure.

10. You know you can create equations to approximate experimental data. Can you deduce some fit between the days and the water temperatures? Can you create an equation that would approximate the results? If yes, what is the equation? Is it the same fit for all the lakes? If not can you provide the formulas (equations) for each of the great lakes? Try your best here using the knowledge from class.

11. Using WordPpress, make a Web page containing your favorite graph from the project and a small text explaining why you chose that particular one. You choice can be based on scientific relevance or simply for its aesthetic values (you think it is the prettiest). Please provide your URL (*yourwebpage*.wordpress.com) in the pdf of your answer for Part 11 so the marker can access your web page.

Important Notes:

I. **All** computations and graphs are to be done with MATLAB only.

II. You are to write a report. Your report must have an introduction about the purpose of the report and its presentation. Present also all team members and specify who did what if applicable.

III. The report must be detailed, well presented and attractive. Don't be afraid to use colours to emphasize parts of the report. Be creative in the use of tables, graphs and images. Points will be awarded to the exactness of the computations, appearance, ease of reading, and the quality of the English language. Be original! Plagiarism will be dealt with severely to the full extent of Ryerson academic integrity regulations.

IV. Your report must have a conclusion, especially about point 10 above in the required elements. You must also report in the conclusion about your experience doing this project and how you would do things differently if you had to do this again.

V. Your report must have a cover page clearly identifying all teammates with names and section numbers. Also on the cover page, indicate the URL of your WordPress page as indicated in point 11 above in the required elements.

VI. Finally, as an appendix, your report must contain **all code sources** of your MATLAB script files. Your report **must be submitted in PDF format** (you can write it using Microsoft Word or OpenOffice/LibreOffice/NeoOffice Writer and export to PDF at the end).

Submission:

1. Project reports are to be submitted in **PDF format** on Brightspace. Only *one* submission per team. Teammates must be clearly identified as per point **V** in the important notes above.

2. Project must be submitted on or before December 4th 2017 @ 23:59. Late assignments will not be accepted for marking. If you are concerned about getting the assignment in on time, submit it early. Technical excuses will not be accepted.