

IAM 550 Introduction to Engineering Computing, J. Raeder, Fall 2019
Homework 01
Manipulating large data files

Due: Friday, October 4, 3pm, in the IAM550 drop box

Objectives:

- Be able to manipulate strings.
- Be able to read files.
- Be able to deal with large data sets.
- Be able to extract and manipulate data from files.
- Structured code development.
- Learn how to properly document code with comments.

Deliverables:

- A homework report in the same format as a lab report summarizing your results and including all required files (scripts, plots), but **not any data files**. The report should address the structured development of the code as discussed in class in the “Methods” section. For this report you can leave out the “Conclusions” section, because there aren’t any to speak of. Make sure your name is on *all* pages of your report. Document your scripts profusely with comments. This will be emphasized when grading.

Reading data from ASCII (text) files:

Follow the example (lec08_b.m) given in class and scrutinized in the lab.

- (a) Write a script weather01.m that downloads the weather data for the entire month of June 2019 from the server <http://www.weather.unh.edu/> and produces consolidated output files as described below. Remember that these files are named data/YYYY/DOY.txt on the server where YYYY is the year and DOY is the day of year. Check for yourself if 01/01 is DOY=0 or DOY=1. Different data sources may handle this differently. Your code should only have 3 parameters that are set at the top: (1) start date as YYYY-MM-DD, (2) end date in the same format, and the output file name. Find and use the appropriate MATLAB functions that convert your date format to DOY. Loop over the required days and use string functions to automate the generation of the input file names. Your code should store the downloaded files in a separate folder ‘weather_data’ and never download a file more than once. Process the data so that you get contiguous arrays for time, temperature in C, radiation, and wind speed. The time should be stored as POSIX epoch time (seconds since 1970-01-01T00:00:00). That will make later processing easier (keep the data files, we will use them again). Use the MATLAB ‘save’ function to save the arrays efficiently for later use. You will notice that this code takes a while to run.
- (b) Write a second script weather02.m that reads one of the variables, computes the min, max, and mean (average) of that variable, and plots the data as a curve, and with straight lines showing the min, max, and mean. The plot must be annotated such that it is self-explanatory. Submit one such plot for each of the variables you extracted. For extra credit (10 pts), produce a single plot that has one panel for each of the variables and only one common time axis.

You need to understand the following concepts at a basic level:

- String operations, loops, conditional statements.
- Reading and writing files.
- Plotting 2d data sets.