

MATLAB Tutorial - Week 2

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NOTE: at any point, typing `help functionname` in the Command window will give you a description and examples for the specified function

1 Scripting

- Typing every command in MATLAB's Command Window is not very practical. Usually, any task that we want MATLAB to complete involves several lines of code (if not hundreds!). For this, we can use the "Editor" to create a "m-file". Click File – New – Blank m-files to open the editor window.
- Create a script that plots the function $\exp(x)$ (`exp()`) on the interval $[-10\ 10]$
- To include comments in your script, use the symbol `'%'`:

```
clear all
% This code plots the exponential function
% Create the x-array
x=-10:0.5:10;
% Plot the function exp()
plot(x,exp(x),'r') % I want it red
```

- `'%%'` at the beginning of a line creates a new "section" to your script. It has no particular use, except to organize your code. You can execute your code section by section, which is often useful when debugging your code, to find where the problem is.

```
clear all
% This code does the exact same thing - in a different way
```

```
%% Create my variables
x=-10:0.5:10;
y=exp(x);
%% Make Plot
plot(x,y,'k')
```

NOTE: I personally always start my scripts by clearing my workspace (`clear all`) and by a description of the code. I strongly encourage you to include comments in your code, it is very tedious to go back to a script you have written a year ago and try to figure out what it does!!

- On the right-hand-side of the editor, “warnings” are indicated (red bars) where MATLAB detects errors in the code (e.g. missing parenthesis, ...)
- Finally, you can (and should) save these m-files to be able to work on it later. You can also “call ” a script to execute it. Try saving the sample code above (`sample_code.m`), clear your workspace and type the name of your script (no need to include the ‘.m’) in the command window. MATLAB automatically executes the code included in the script. You have to make sure the m-file you are calling is in your “Current Folder”! If not, move the file, or change your “Current folder”.

2 Load and save data

- The functions `load()` and `save()` will allow you to load or save your data (go to the help for optional arguments)
- The MATLAB format for data is “.mat” but the function `load()` can also load .txt files, if they are well organized (unfortunately, this rarely happens!). MATLAB has an “Import Wizard” that can help you:

1. Download the data from the weather station on Sable Island for 2012

(https://dl.dropbox.com/u/25195822/MATLAB%20workshop/Tuto-2/Sable_Island_HLY01.txt)

2. Change your “Current Folder” in MATLAB to be in the same folder as ‘Sable_Island_HLY01.txt’
3. Right-click on the txt-file and select “Import Data ...”
4. In the “Import Wizard” window, select the column separator (spaces in this case) and the number of headlines. This is very important as MATLAB needs to know where the data starts.
5. Click Next and then Finish to create 2 variables:

- `data` includes the observations
- `textdata` includes the headlines in a string

NOTE: You can check the box “Generate MATLAB-code”. It will create a m-file with the code that MATLAB used to load your data. It can be useful to see the actual function (i.e. `importdata()`) hidden behind the wizard as sometimes the wizard does not work for your type of data (e.g. mixed fields of integers and strings within the same file). “If you want something to be done properly, do it yourself”

6. Create 3 variables: time (columns 1 through 4), wind speed (column 11) and wind direction (column 13)

```
time=data(:,1:4); % create time matrix
time(:,5:6)=0; % Fills columns 5 and 6 with zeros so the time matrix has 6 columns
([ yyyy mm dd hh mmm sss]). Easier for future conversion
%% Extract winds
WSPD=data(:,11);
WDIR=data(:,13);
```

7. To be able to plot these data, your first need to transform your time matrix from a matrix to an array. `datevec()`, `datenum()` and `datestr()` are very useful to convert times into

different formats. I advise you to go to the help and get familiar with these functions, they are important and always useful functions when working with time series.

```
time=datetime(time) % convert the time matrix to a serial number array, for plotting purposes
```

8. You can also plot several plots in the same figure (`help subplot`)

```
subplot(2,1,1) % Create a figure with 2 rows, 1 column. The 3rd argument specify where you want to insert the plot
plot(time,WSPD,'k');
ylim([0 100]); ylabel('wind speed (km/h)')
subplot(2,1,2) % Second subplot
plot(time,WDIR,'k'); ylabel('wind direction FROM (degrees)')
ylim([0 360]);
```

9. Now use the function `save()` to save a mat-file that includes only the variables `time`, `WDIR` and `WSPD` (`help save`).

```
save('wind_Sable_Island.mat','time','WDIR','WSPD')
```

NOTE: Be sure to keep this mat-file, it will be useful for future tutorials!