MATLAB Tutorial - Input and Output (I/O)

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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 Importing data

There are many different ways to import data into MATLAB, mostly depending on the format of the datafile. Below are a few tips on how to import the most common data formats into MATLAB.

- MATLAB format (*.mat files)

  This is the easiest to import, as it is already in MATLAB format. The function `load(filename)` will do the trick.

- ASCII format (*.txt, *.csv, etc.)

  An easy strategy is to use MATLAB's GUI for data import. To do that, right-click on the datafile in the "Current Folder" window in MATLAB and select "Import data ...". The GUI gives you a chance to select the appropriate delimiter (space, tab, comma, etc.), the range of data you want to extract, how to deal with missing values, etc. Once you selected the appropriate options, you can either import the data, or you can generate a script that imports the data. This is very useful in showing the low-level code that takes care of reading the data. You will notice that the `textscan` is the key function that reads the data into MATLAB.

  Higher-level functions exist for the different datatype: `csvread, xlsread`, etc. As a rule of thumb, it is preferable to use lower-level function are they are "simpler" to understand (i.e., no bells and whistles). "Black-box" functions are dangerous!

- NetCDF format (*.nc, *.cdf)

  MATLAB comes with a netcdf library that includes all the functions necessary to read netcdf files. The most useful ones are:

  - `ncinfo(filename)` – Display information on the netcdf file
  - `ncdisp(filename)` – Display content of the netcdf file
  - `ncread(filename,variablename)` – extract a specific variable from the netcdf file

2 Exporting data

There are many different ways to export data into MATLAB! Below is a few tips on how you can export data from MATLAB into the most common data formats

- MATLAB format (*.mat files)

  The `save` function will do the trick. Type `help save` to see the options available with that function

- ASCII format (*.txt, *.csv, etc.)

  There are too many to list higher-level functions to help you write your data into a text file (usually smaller files, and non software-specific format that makes python users happier!). The main ones could probably be `csvwrite`. Using low-level function is, as usual, recommended. The function `fprintf` is not as user-friendly, but let you control a lot more aspects of your data format.

- NetCDF format (*.nc, *.cdf)

  The netCDF library will allow you to create your own netCDF file. While a bit more tedious to generate, NetCDF files are of great value because it can include all the metadata necessary to read/understand/process the dataset. MATLAB has a good topic on how to generate a netCDF file:

  `https://www.mathworks.com/help/matlab/import_export/exporting-to-network-common-data-form-netcdf-files.html`