## Intro to MATLAB

## Learning Objectives

* Get to know the MATLAB environment
* Assign values to variables
* Learn about MATLAB arrays
* Load data, perform operations on arrays of data
* Display simple graphs.

**Part 1 – The MATLAB Environment**

Current Folder

Command Window

Workspace => Temporary memory

Search Documentation

**Part 2 – Assigning Variables**

Assigning a variable, explain semi-colon

X = 1;

Y = 1;

Z = X + Y;

Variable names must begin with a letter, and can contain numbers or underscores

Variable arithmetic (plus, negative, divide, multiply)

Vectors (row, column, transpose, size) - use [ ]

X = [1 2 3];

Matrices

X = [1 2 3; 4 5 6];

Characters and strings – use ‘ ‘

X = 'hello Matlab';

%% Challenge 1

% Make a variable called 'age\_2015' and set it equal to your current age.

% Make another variable called 'age\_2025', set this variable to Age\_2015

% plus 10.

% Make another variable (Choose a name) and set it equal to half your age.

**Part 3 – Loading Data**

Inflammation data (each row: individual patient, each column: consecutive day)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Day 1 | Day 2 | Day 3 | … | Day 40 |
| Patient 1 | … |  |  |  |  |
| Patient 2 |  | … |  |  |  |
| Patient 3 |  |  | … |  |  |
| … |  |  |  | … |  |
| Patient 60 |  |  |  |  | … |

“read csv” in documentation – string as input

Look at csv

patient\_data = csvread('inflammation-01.csv');

**Indexing Data – “Taking Slices”**

Look at the first patient, first day – use matrix\_name(row index, column index )

Patient1\_Day1 = patient\_data(1,1);

Look at second patient, all days

Patient2\_AllDays = patient\_data(2,:);

Look at all patients, day 5 through to 10

AllPatients\_5Days = patient\_data(:,[5,6,7,8,9,10]);

AllPatient\_5Days = patient\_data(:,5:10);

More vector making

AllNumbers = 1:10; % start:step:end

EverySecondNumber = 1:2:10;

Look at all patients, every second day

AllPatients\_AlternateDays = patient\_data(:,1:2:end);

CHALLENGE:

%% NEED A BETTER CHALLENGE

**RECAP**

Define vectors and matrices with [ ]

Define strings and characters with ‘ ‘, and squish them together with [ ]

Index a matrix or vector with ( )

**Part 4 – Analysing Data**

Finding the mean of the inflammation on all days – use documentation

mean(patient\_data(:))

 maximum, minimum and standard deviation

max(patient\_data(:))

min(patient\_data(:))

std(patient\_data(:))

We can also save multiple values to variables

Display the max for patient 1

Patient1\_Max = max(patient\_data(1,:))

**Part 5 – Displaying Data**

We have a lot of dimensions to look at. A good place to start is visualizing

Show them the plot tab

Heat map

imagesc(patient\_data)

Of course we can also perform calculations on different dimensions

This is each patients average inflammation calculated over 40 days

mean(patient\_data, 1)

Dimension 2

This is the average inflammation across the 60 patients on each day

mean(patient\_data, 2)

Look at avg inflammation over time using the plot GUI

ave\_inflammation = mean(patient\_data);

CHALLENGE:

%% Challenge 3 - Part 3

% You saw how to calculate the mean inflammation for different

% dimensions

% Now create a variable that contains the maximum inflammation on each day

% and another with the maximum for each patient

% HINT: Using max on different dimensions is not exactly the same as mean -

% check the documentation!!

%% EXTENSION

% Plot your result

% Repeat for min and std.