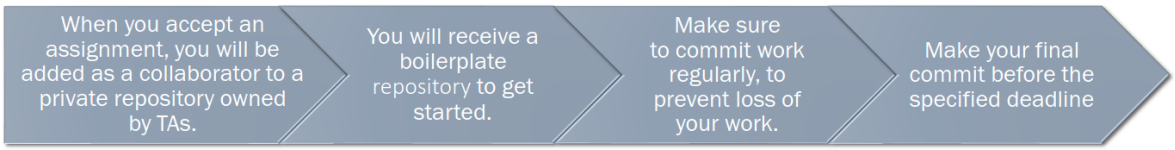
Intro to Matlab and GitHub

DSP for Matlab - https://www.mathworks.com/help/dsp/

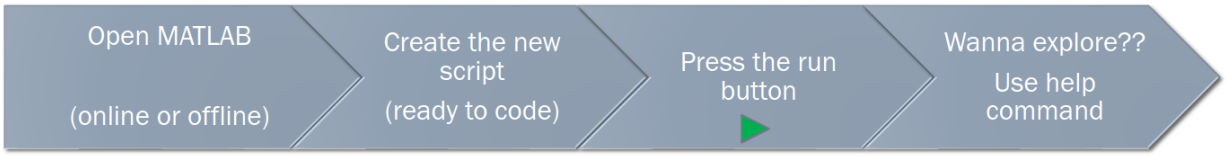
How to use



We will have access to the state of the repository at the time of deadline. Any later commits will not be considered.

Matlab

MATLAB



Matrix:

A matrix in MATLAB is a two-dimensional array of elements arranged in rows and columns. It can be thought of as a collection of vectors of the same length.

Creating Matrices and operations:

Similar to vectors, there are several ways to create matrices in MATLAB:

```
% 3x3 matrix
matrix = [1, 2, 3;
          4, 5, 6;
          7, 8, 9];

% Identity matrix of size 4x4
identity_matrix = eye(4);

% Matrix of ones of size 2x3
ones_matrix = ones(2, 3);

% Matrix of zeros of size 3x2
zeros_matrix = zeros(3, 2);

% Element-wise addition of two vectors
result_vector = vector1 + vector2;

% Matrix multiplication
result_matrix = matrix1 * matrix2;

% Transpose of a matrix
transpose_matrix = matrix';


% Define two matrices for element-wise multiplication
matrix1 = [1, 2; 3, 4];
matrix2 = [5, 6; 7, 8];

% Element-wise multiplication using the .* operator
result_matrix = matrix1 .* matrix2;
5) linspace(1, 101, 10) generates linearly equaled 10 points between 1 and 101 [1 , 11, 21…101]
6) Indexing -> 1:10 = natural numbers from 1 to 10 [1,2,3..10]
```

cos(x)	Cosine	abs(x)	Absolute value
sin(x)	Sine	sign(x)	Signum function
acos(x)	Arc cosine	max(x)	Maximum value
asin(x)	Arc sine	min(x)	Minimum value
angle(x)	Phase angle	ceil(x)	Round towards *+1*
conj(x)	Complex conjugate	floor(x)	Round towards *¡1*
exp(x)	Exponential	round(x)	Round to nearest integer
sqrt(x)	Square root	rem(x)	Remainder after division
log(x)	Natural logarithm	log10(x)	Common logarithm

If-else statements:

```
% Input a number from the user
number = input('Enter a number: ');

% Check the value of the number and provide different messages accordingly
if number > 0
    disp('The number is positive.');
elseif number < 0
    disp('The number is negative.');
else
    disp('The number is zero.');
end
```

For loops (avoid unnecessary for-loops, use indexing) (don’t use i and j)

```
for k = 1:10
    a(k) = 1 + k;
end
```

Functions

- Functions are different from the main script where the functions are called.
- Function name = Function script name

MATLAB Code for the Function:

Save the following code in a file named - `calculate_area.m`

```
function area = calculate_area(length, width)
    % Function to calculate the area of a rectangle
    area = length * width;
end
```

Main script

```
% Script to calculate the area of a rectangle

% Input the length and width of the rectangle
length = 5;
width = 3;

% Call the function to calculate the area
area = calculate_area(length, width);

% Display the result
disp(['The area of the rectangle is: ', num2str(area)]);
```

GitHub

- Create a GitHub account with student ID
- Linux (Debian)
  Command: sudo apt-get install git
- MacOS
  - `$ brew install git`
- Then run the following commands
  - git config --global user.name “<your username>”
    git config --global user.email <your email ID>

Personal auth Token or ssh

- Generate a Personal auth token
- Copy and save it somewhere, as it disappears after generation
- PAT is recommend as ssh is blocked on LAN
- Use a vpn to unblock if using ssh

Important Commands

- Git clone
  - git clone <repo link>
  - git add <file names> or else use
  - git add . (to include all files)
- Git commit
  - git commit -m “<commit message>”
- git pull
- git push

Make sure to always PULL before to PUSH to avoid merge conflicts !!!

Demo questions

1. Initialize a random 5x5 matrix (call it A). Do following without using for-loops.

   (a) Extract the bottom right 3x3 sub-matrix (call it B) of this matrix.

   (b) Compute and print sum of all the entries of B (using only the sum() command).

```
Initialize the time variable t = 0:0.01:1. Do following without using for-loops.
```

2. (a) Generate and plot the signals sin(t), exp(t), exp(-|t|), exp(-t*t).

   (b) Repeat for time in the range t = -10:0.1:10.

   (Figure out how to create plots by reading the documentation)