



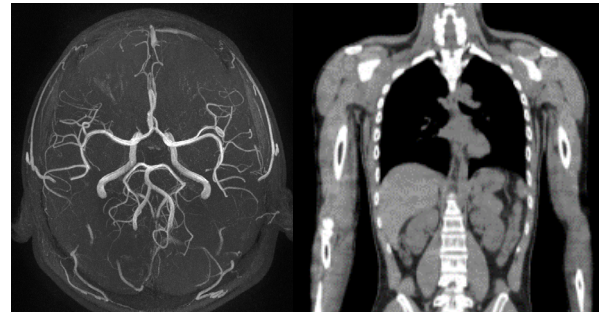
# MATLAB Programming 程式語言



盧家鋒 Chia-Feng Lu, Ph.D.  
Department of Biomedical Imaging  
and Radiological Sciences, NYCU  
[alvin4016@nycu.edu.tw](mailto:alvin4016@nycu.edu.tw)

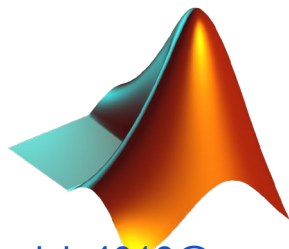
# Intended Learning Outcomes

- ▶ Understand common usages of MATLAB functions.
- ▶ Demonstrate communication and collaboration skills within your study group to analyze images.
- ▶ Apply acquired skills for medical image processing to solve clinical issues.



# TA Groups

**We Can  
HELP!**



[alvin4016@nycu.edu.tw](mailto:alvin4016@nycu.edu.tw)

老師

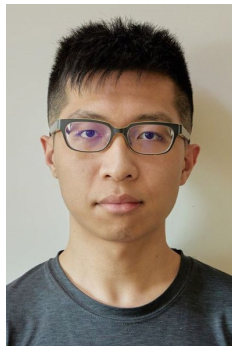


佩萱Avery

[qwer860108@gmail.com](mailto:qwer860108@gmail.com)



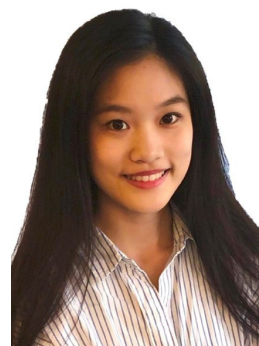
俊儒Jim



柏勳Michael



楊薇Vivian



元琛Iris

# Weekly Highlight on E3

## 112-1 Programming Language

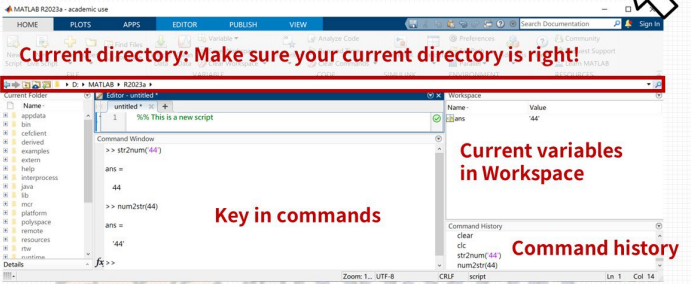
### EMI | MATLAB Basic Language

**Current directory: Make sure your current directory is right!**

**Key in commands**

**Current variables in Workspace**

**Command history**



**Useful Commands:**

- `clc` clear **command window**
- `clear all` clear all the variables in **workspace**

**Useful Functions:**

- `str2num` Convert **string** to **numbers**
- `num2str` Convert **numbers** to **string**

## 112-1 Programming Language

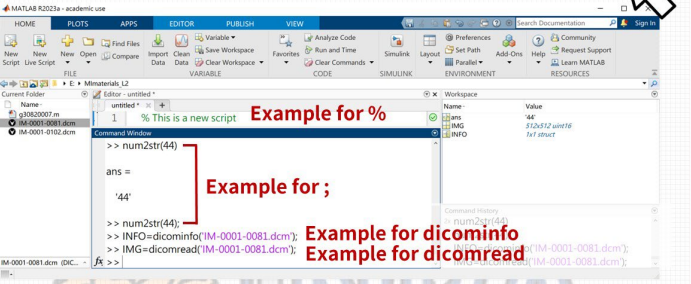
### EMI | DICOM Medical Images

**Example for %**

**Example for ;**

**Example for dicominfo**

**Example for dicomread**

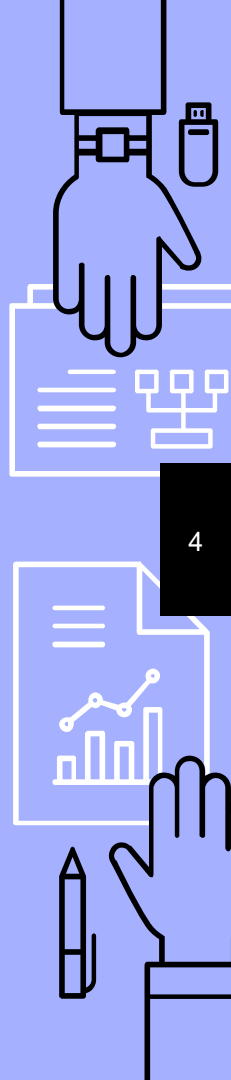


**Useful Commands:**

- `%` Nonexecutable text
- `;` Suppress output of code in command window

**Useful Functions:**

- `dicominfo` Read metadata from DICOM message
- `dicomread` Read DICOM image



# Materials [http://cflu.lab.nycu.edu.tw/CFLu\\_course\\_matlabimage.html](http://cflu.lab.nycu.edu.tw/CFLu_course_matlabimage.html)



Home Contents NAS

## MATLAB Programming for Medical Image Processing and 3D Printing

- CV & Publications
- Members
- Research Interests
- Teaching Materials
- Download Platforms
- Activities
- Relevant Links

- MRI (UG)
- MRM (UG)
- MATLAB programming (UG)**
- Computer Sci. (UG)
- Neuroanatomy (UG)
- Human Dissection (UG)
- Computer Arch. (UG)
- MATLAB GUI (G)
- Signal Processing (G)
- MRI Research (G)
- fNIRS Basics (G)
- fNIRS Workshop (G)
- rs-fMRI Analysis (G)
- Image Processing (R)
- Invited Talks

*Week 2 : Basic language usage - medical image import*

MATLAB 基礎語法 - 醫學影像存取

內容與目標：認識MATLAB基本語法，實作讀取DICOM醫學影像專用格式

[ 課程講義 ] [Lesson2\\_slides.pdf](#)

[ 課程資料 ] [Materials\\_L2.zip](#)

[ 課程影片 ] 請調整為1080p解析度觀看

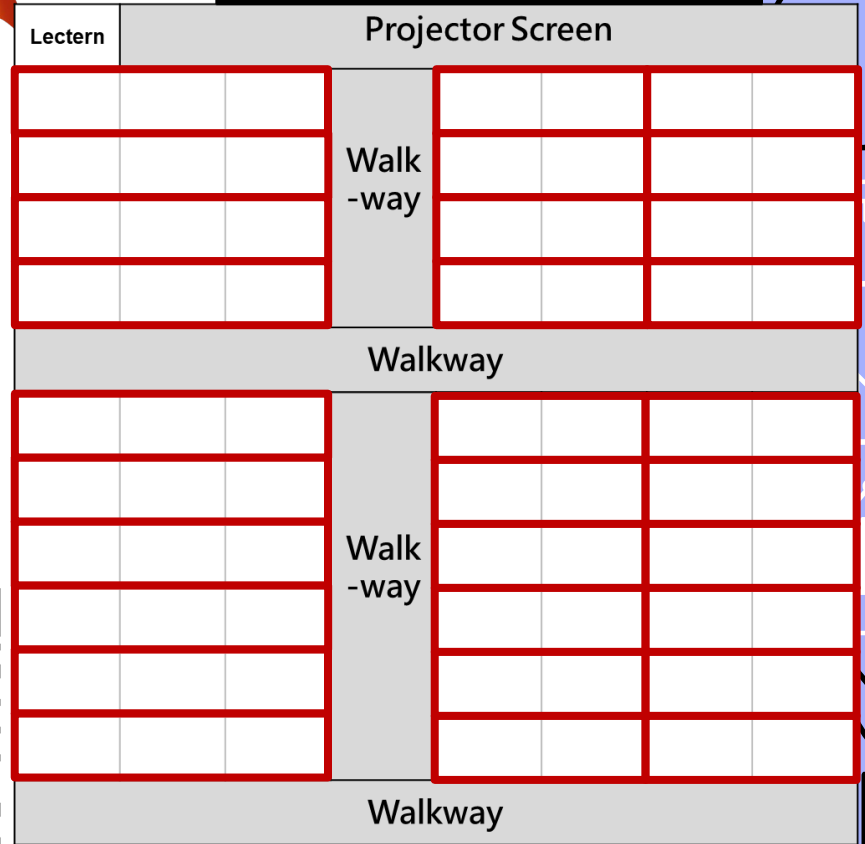
(1) [基礎語法](#) (1:01:00)

(2) [DICOM醫學影像讀取](#) (34:43)

# How do we do it?

- ▶ Lecture  
+ hands-on exercise
- ▶ Study Group (2~3 members)
  - Discuss and complete the weekly exercises and assignments together.

[Registration](#)





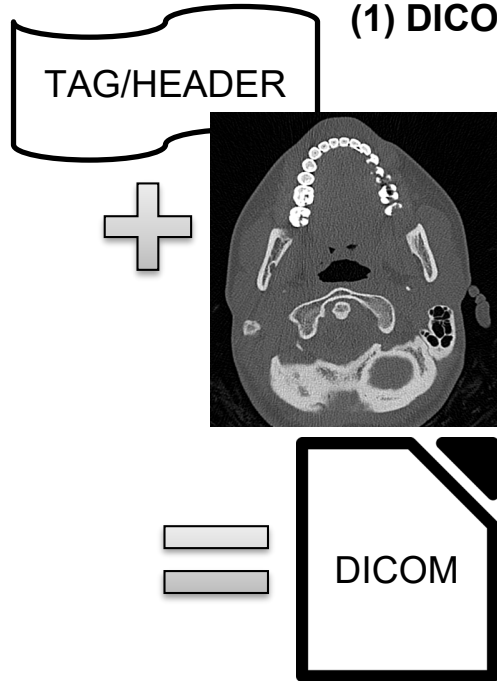
# Syllabus – Medical Image Processing

Week	Topic
1	Course introduction and MATLAB environment
2	Basic language usage - medical image import
3 (9/28)	<b>off</b>
4	Matrix operation and computation - image size and resolution adjustment
5	Structure array - DICOM metadata and contrast adjustment
6	Cell array - read and write Excel file
7	Flow control, for-loop and while-loop - import and calculation of 3-dimensional images
8	Flow control, if-else and switch-case - region of interest and thresholding
<b>9 (11/9)</b>	<b>Midterm computer test</b>

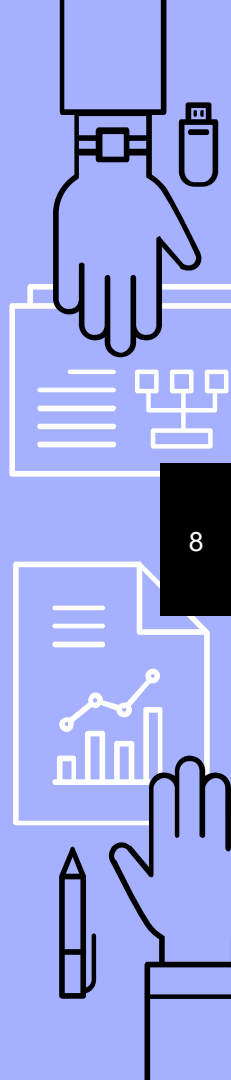
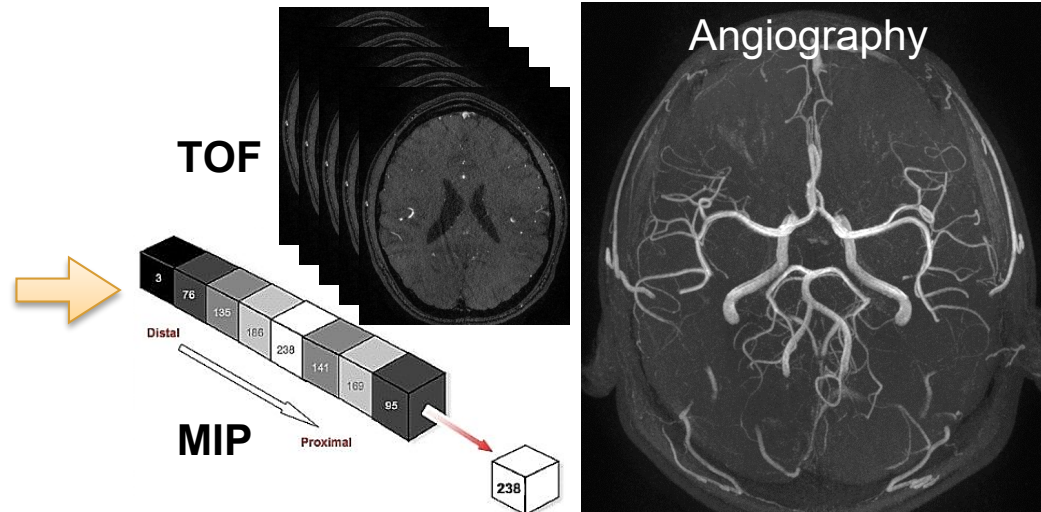


# Medical Image Processing

(1) DICOM format



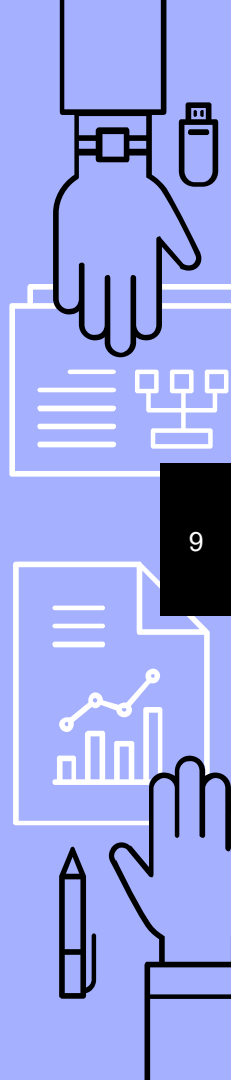
(2) Image processing



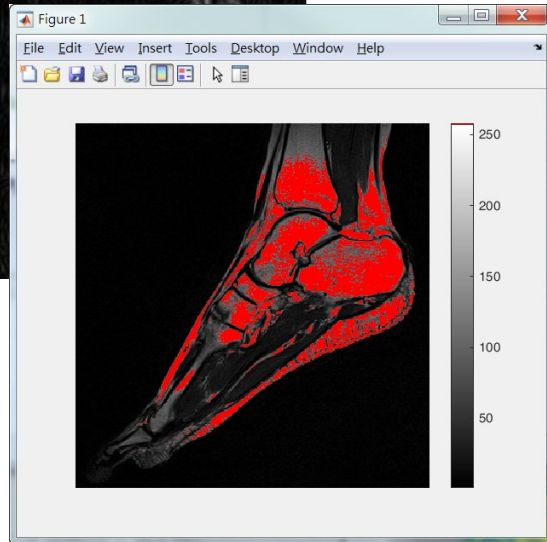
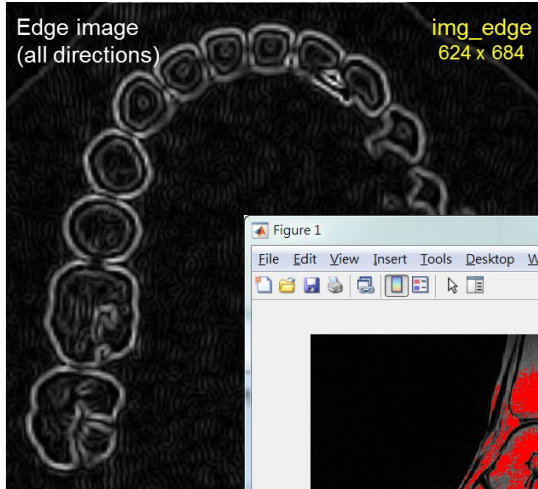


# Syllabus – Graphics and 3D Modeling

Week	Topic
<b>10 (11/16)</b>	<b>Midterm discussion and orientation of final team competition</b>
11	Function - image smoothing and edge detection
12	Graphic structure - lines, bar chart, and data display
13	Graphic structure - image display
14	3D object rendering - surface and volume rendering
<b>15 (12/21)</b>	<b>Review what we've learned</b>
<b>16 (12/28)</b>	<b>Final team competition</b>
17	Self learning: STL file output and 3D model process
18	Self learning: Graphic user interface - App designer



# Graphics and 3D modeling



## Image processing

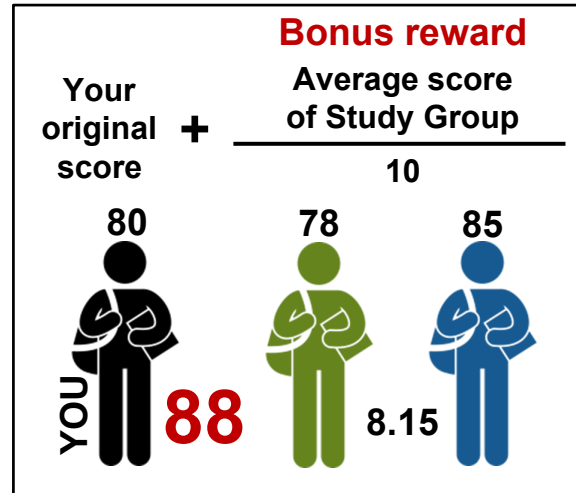


## 3D rendering



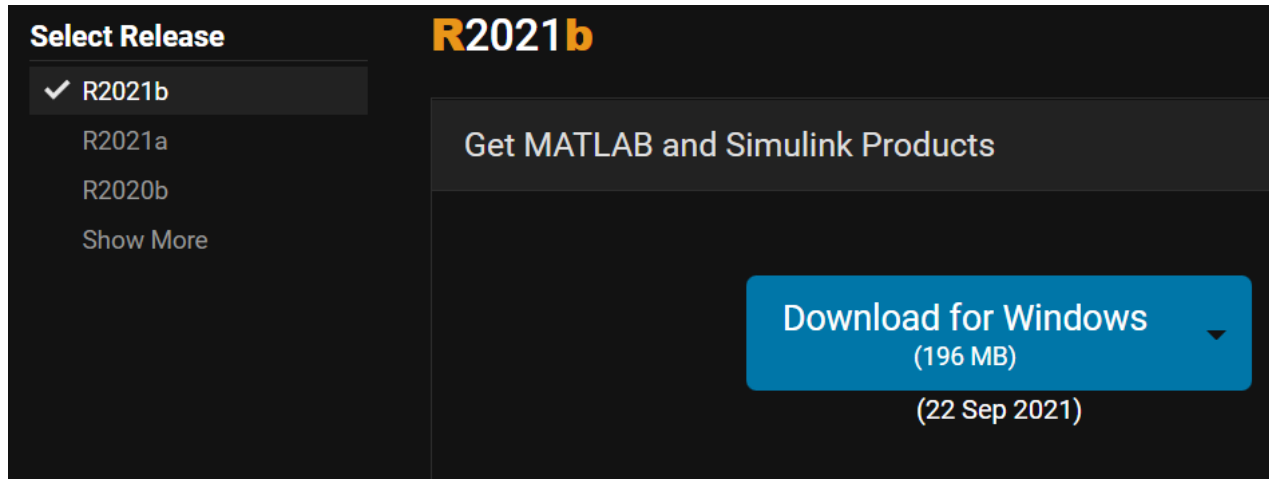
# Assessment

- ▶ Attendance and participation in class activities: 20%
- ▶ Homework: 15%
- ▶ Midterm individual computer test: 35%
  - **Study Group Reward 共學獎勵**
- ▶ Final team competition: 30%



# Install MATLAB on your own computer

- ▶ **MATLAB installation** (stable internet connection is required)
  - Installation guide  
<https://ca.nycu.edu.tw/wp-content/uploads/2021/09/matlab-standalone.pdf>

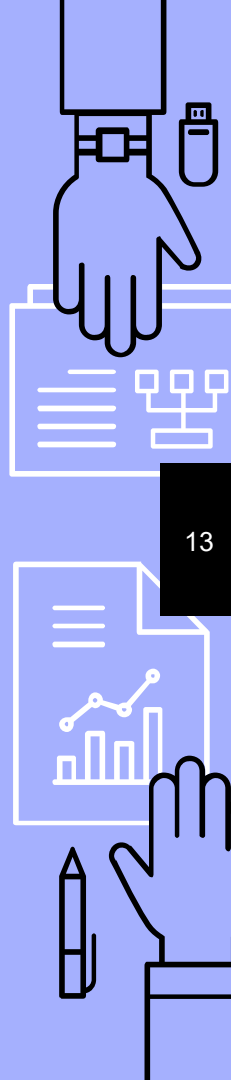




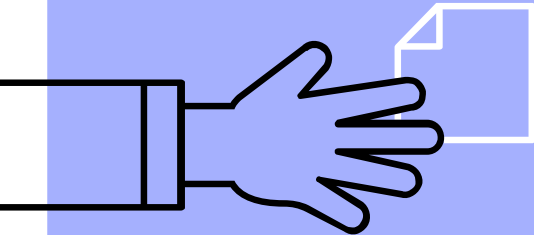
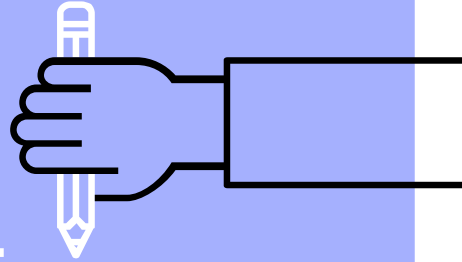
# Install MATLAB on your own computer

## ▶ Required toolbox (around 11GB)

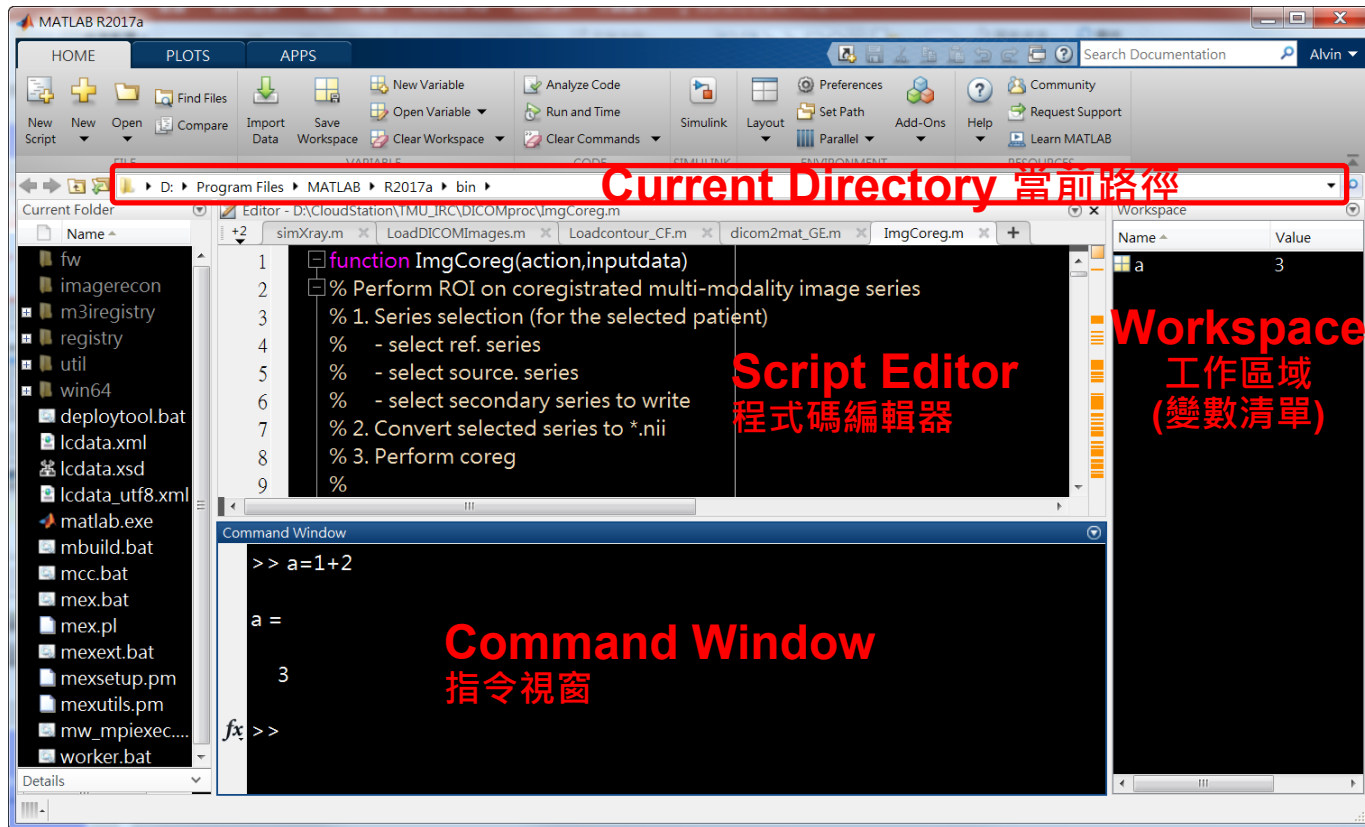
- Bioinformatics Toolbox
- Curve Fitting Toolbox
- Image Acquisition Toolbox
- Image Processing Toolbox
- Optimization Toolbox
- Signal Processing Toolbox
- Statistics and Machine Learning Toolbox



# MATLAB Environment & Homework Upload

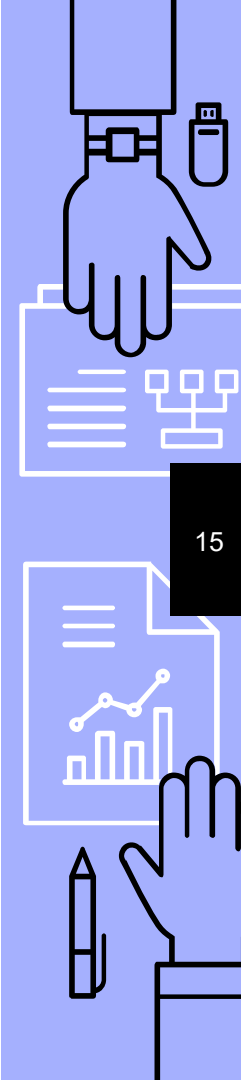


# MATLAB Environment



The screenshot shows the MATLAB R2017a environment with several key components highlighted:

- Current Directory 當前路徑:** A red box highlights the address bar showing the path `D:\Program Files\MATLAB\R2017a\bin`.
- Files in Folder:** A red label points to the file explorer on the left, which lists various files and folders like `fw`, `imagerecon`, `m3registry`, `registry`, `util`, `win64`, `deploytool.bat`, `lcdata.xml`, `lcdata.xsd`, `lcdata_utf8.xml`, `matlab.exe`, `mbuild.bat`, `mcc.bat`, `mex.bat`, `mex.pl`, `mexext.bat`, `mexsetup.pm`, `mexutils.pm`, `mw_mpiexec...`, and `worker.bat`.
- Script Editor 程式碼編輯器:** A red label points to the central editor window showing a MATLAB function `function ImgCoreg(action,inputdata)` with comments: `% Perform ROI on coregistrated multi-modality image series`, `% 1. Series selection (for the selected patient)`, `% - select ref. series`, `% - select source. series`, `% - select secondary series to write`, `% 2. Convert selected series to *.nii`, and `% 3. Perform coreg`.
- Workspace 工作區域 (變數清單):** A red label points to the workspace window on the right, which shows a variable `a` with a value of `3`.
- Command Window 指令視窗:** A red label points to the command window at the bottom, which shows the command `>> a=1+2` and the output `a = 3`.



The image displays the MATLAB R2017a software interface. The top menu bar includes HOME, PLOTS, and APPS. The ribbon contains various toolbars for file operations, workspace management, code execution, and environment settings. The current folder is D:\Program Files\MATLAB\R2017a\bin. The editor window shows a script named `ImgCoreg.m` with the following code:

```
1 function ImgCoreg(action,inputdata)
2 % Perform ROI on coregistrated multi-modality image series
3 % 1. Series selection (for the selected patient)
4 % - select ref. series
5 % - select source. series
6 % - select secondary series to write
7 % 2. Convert selected series to *.nii
```

The workspace window shows a variable `a` with a value of 3. The command history window shows the following commands:

```
global Datas
-Datas.display_WindowCenter(end)
-Datas.display_WindowCenter
global Data_coreg.path
global Data_coreg
Data_coreg.path
%-- 2018/9/13 下午 02:31 --%
clc
a=1+2
fx >> a=1+2
```

The text **Command history** is overlaid in red on the command history window.



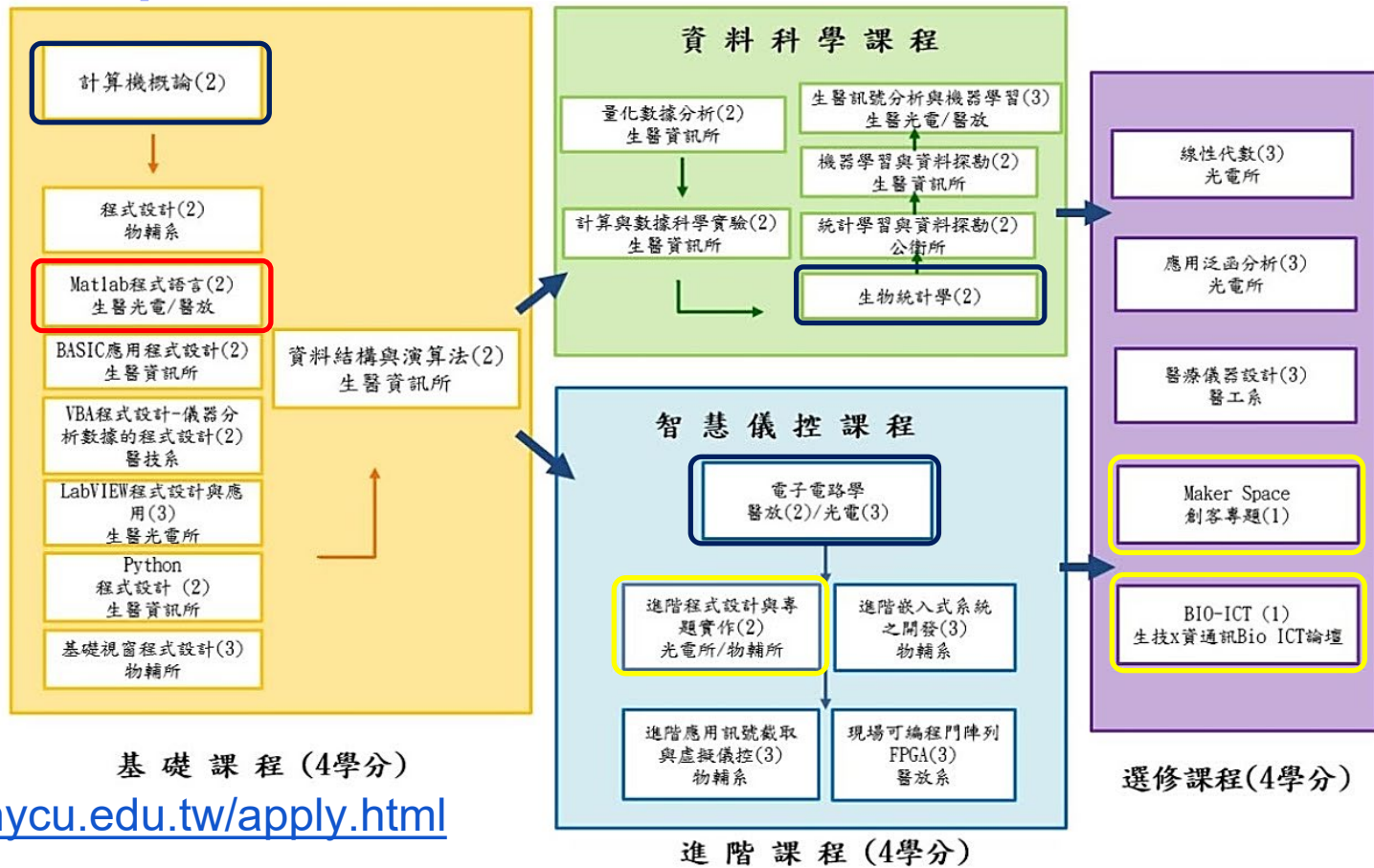


# Homework Upload

- ▶ Please upload weekly assignment to the E3 system  
→ 作業管理 → date (ex: 2023.9.14 Assignment)
- ▶ File name: - **week01hw.m**
- ▶ Add the first line in the week01hw.m
  - % members: student IDs
- **You can complete the weekly assignment with your Study Group right after class (before 18:00).**
- **The upload is due by next Wednesday at noon!**



# Further Development 資料科學與智慧儀控學分學程

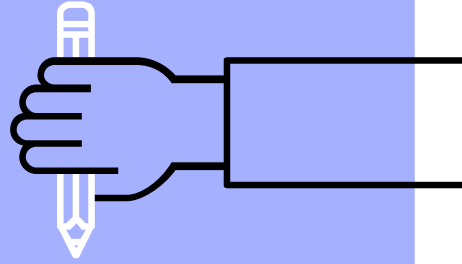


Application form:

<https://dsai.bioph.nycu.edu.tw/apply.html>

基礎課程 (4學分)

進階課程 (4學分)



THE END

[alvin4016@nycu.edu.tw](mailto:alvin4016@nycu.edu.tw)

