

# 實習題目 - 4

## AI 手寫辨識

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溫進坤

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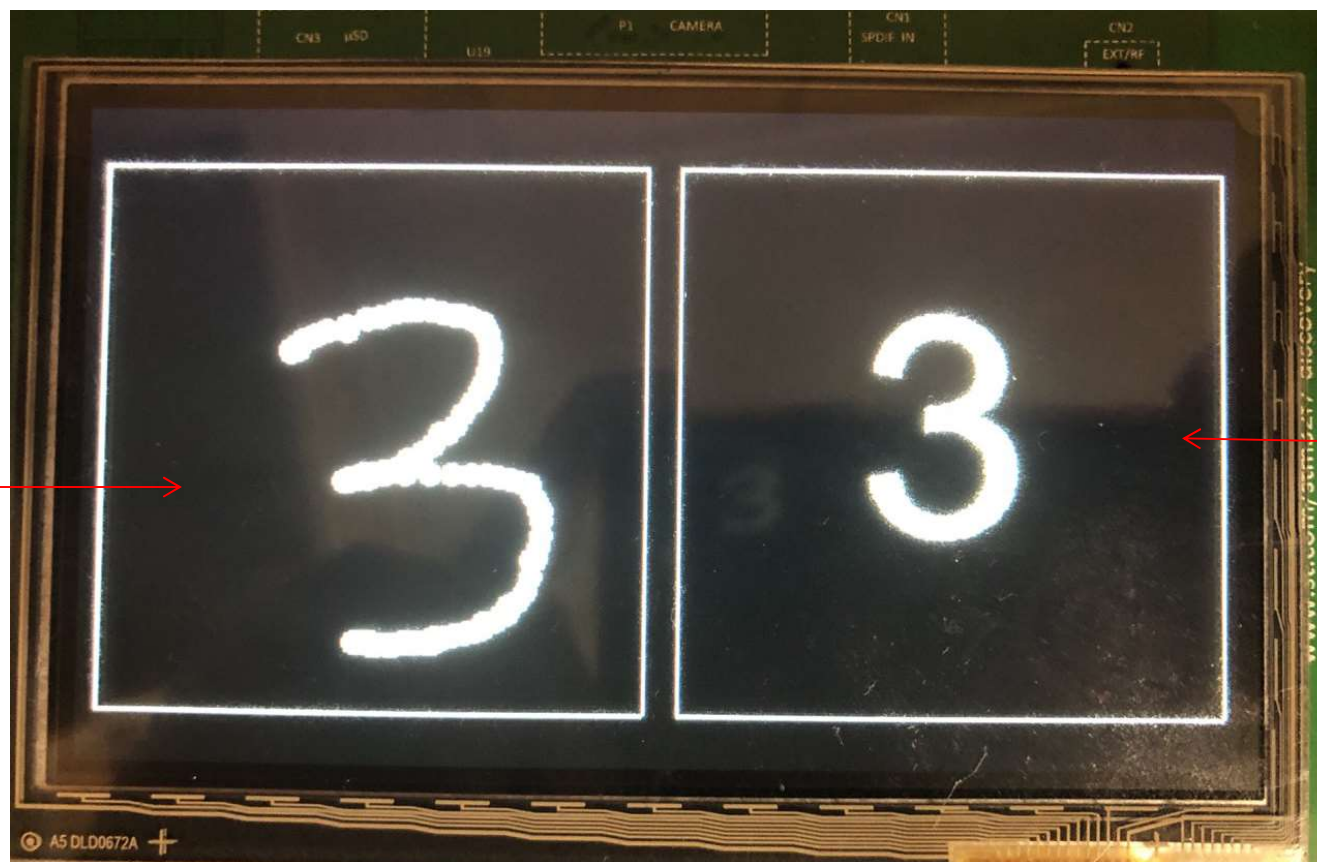
# 題目功能

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- 初始畫面顯示左右兩個框，左邊為手寫板，右邊為按鈕和結果
- 未在手寫板寫東西時，點擊右邊按鈕不會有反應
- 手寫板部分顯示手寫觸控痕跡
- 在手寫板寫入後，點擊右邊框內，進行AI判斷並將結果顯示於右邊框內，顯示字形為Font57
- 當再次點擊右邊框內，清除螢幕並回到初始畫面

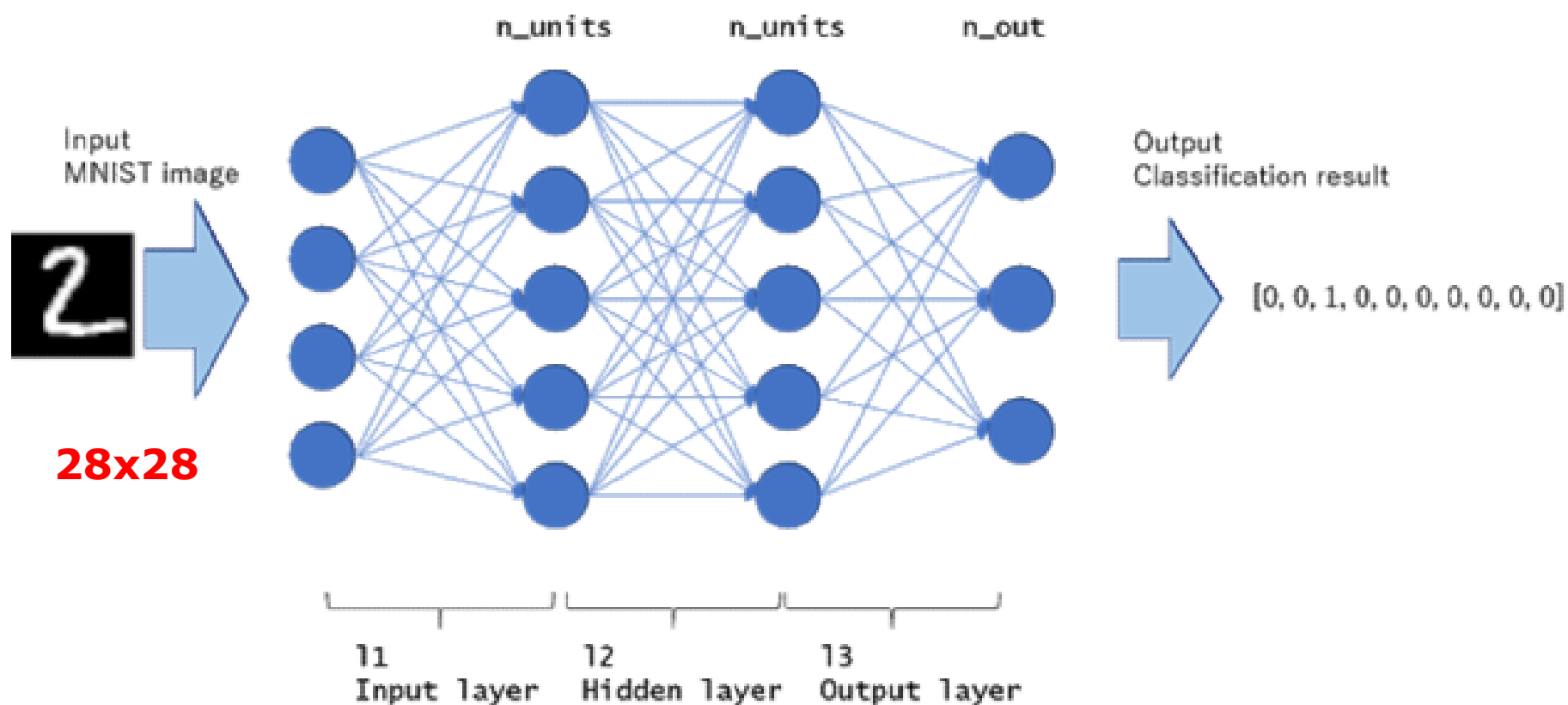
# 執行畫面

手寫板



結果

# CNN 數字辨識



# AI Model製作

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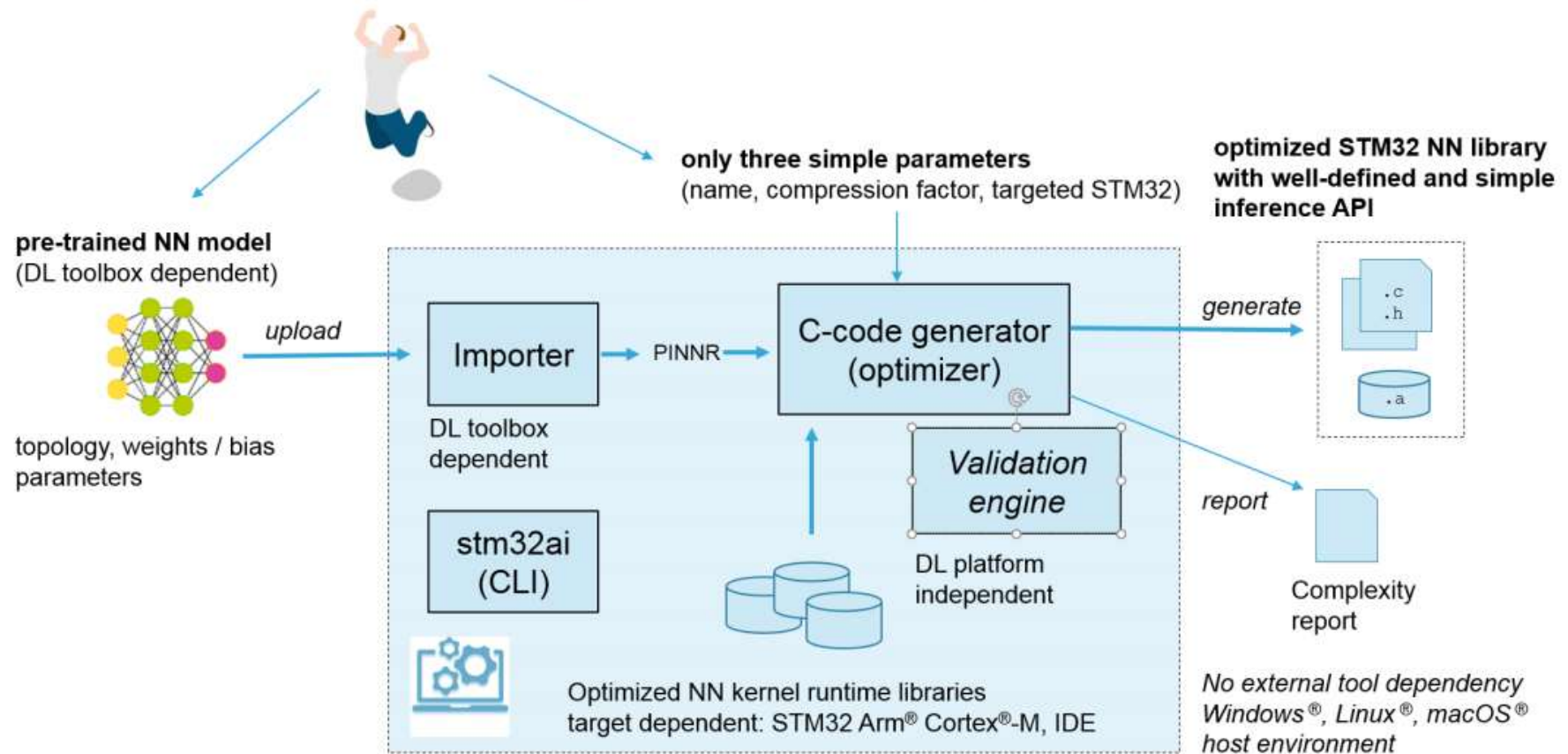
training

model.h5

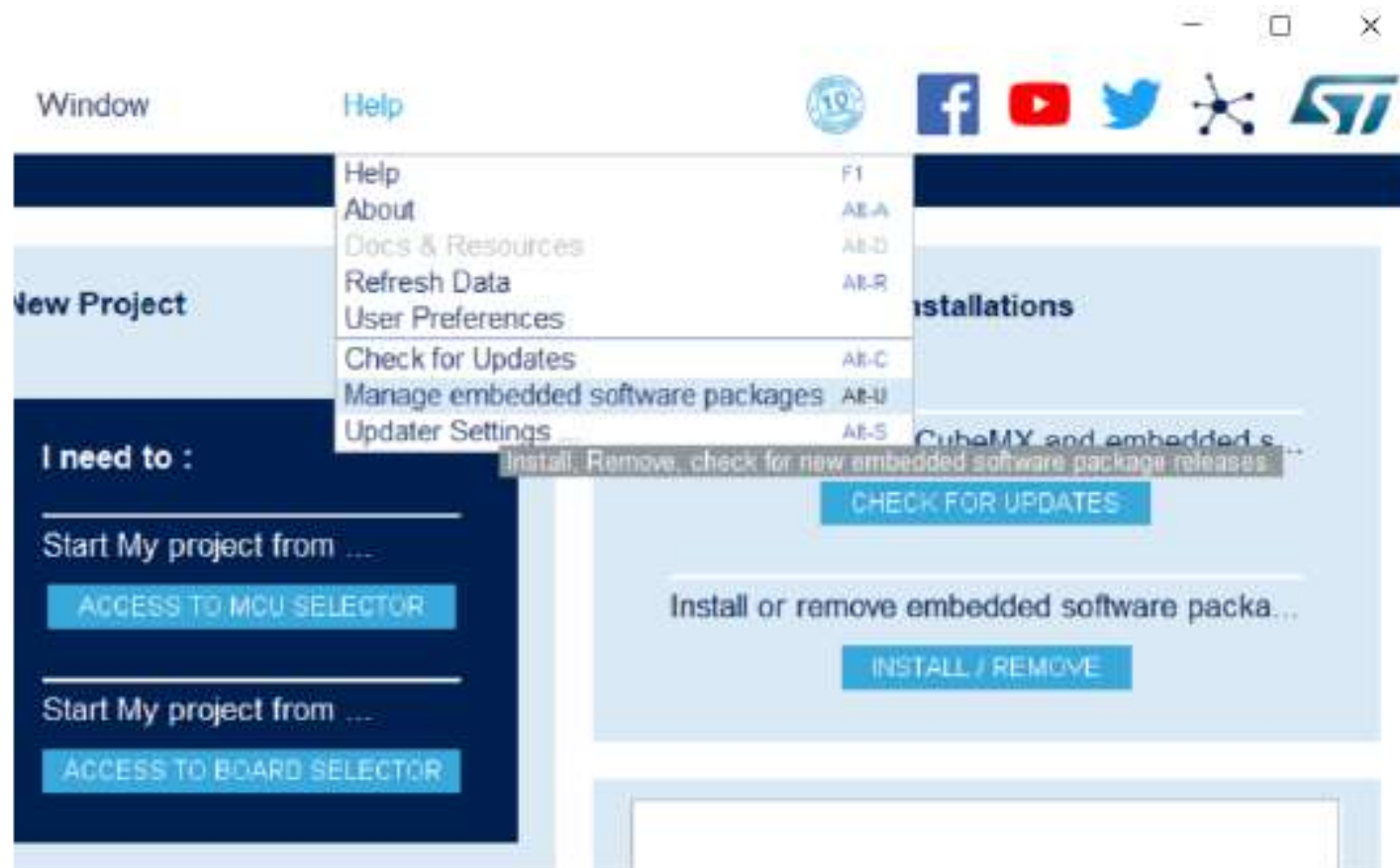
MNIST

# X-CUBE-AI core engine

Figure 1. X-CUBE-AI core engine

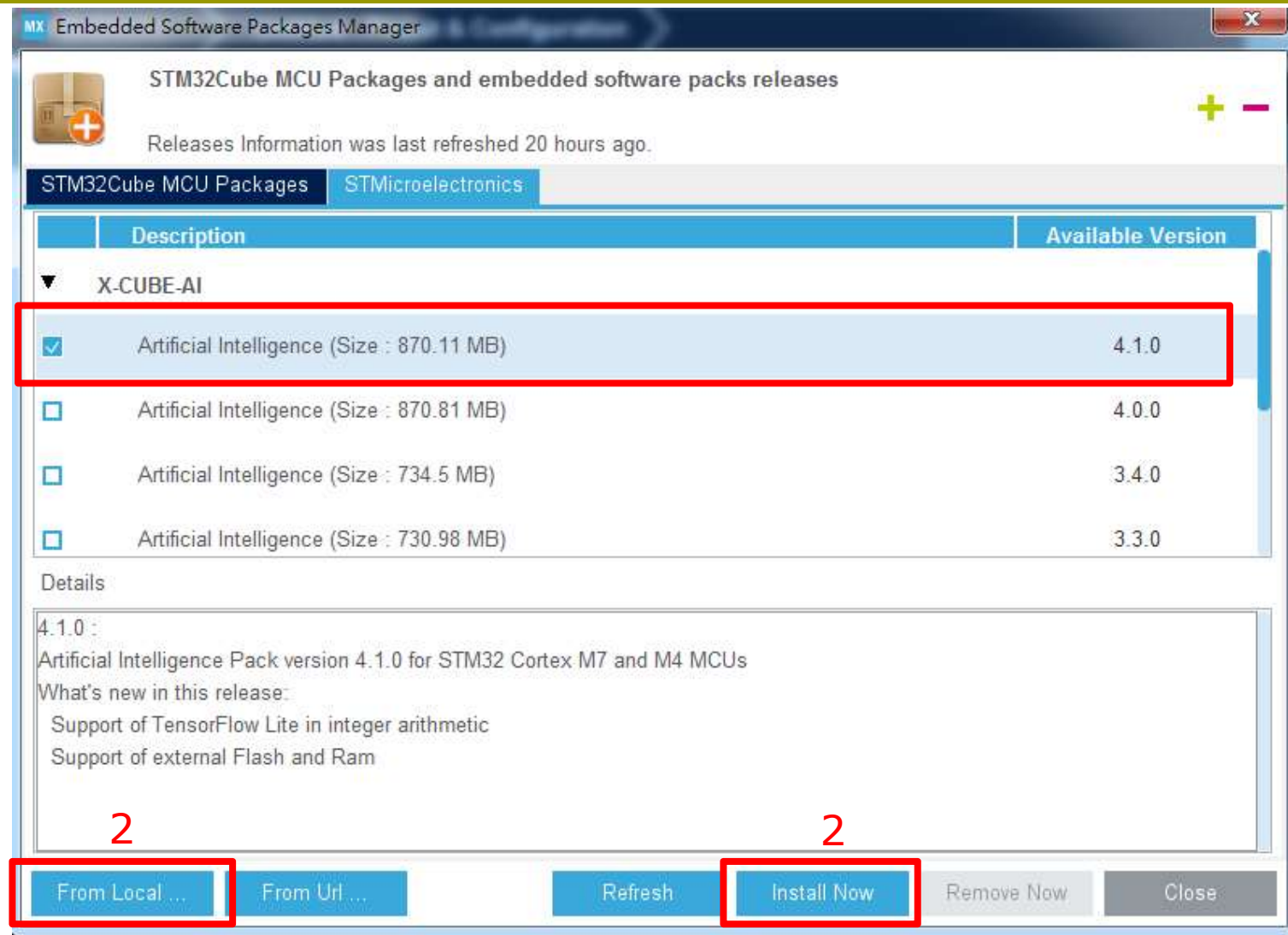


# Install X-Cube-AI



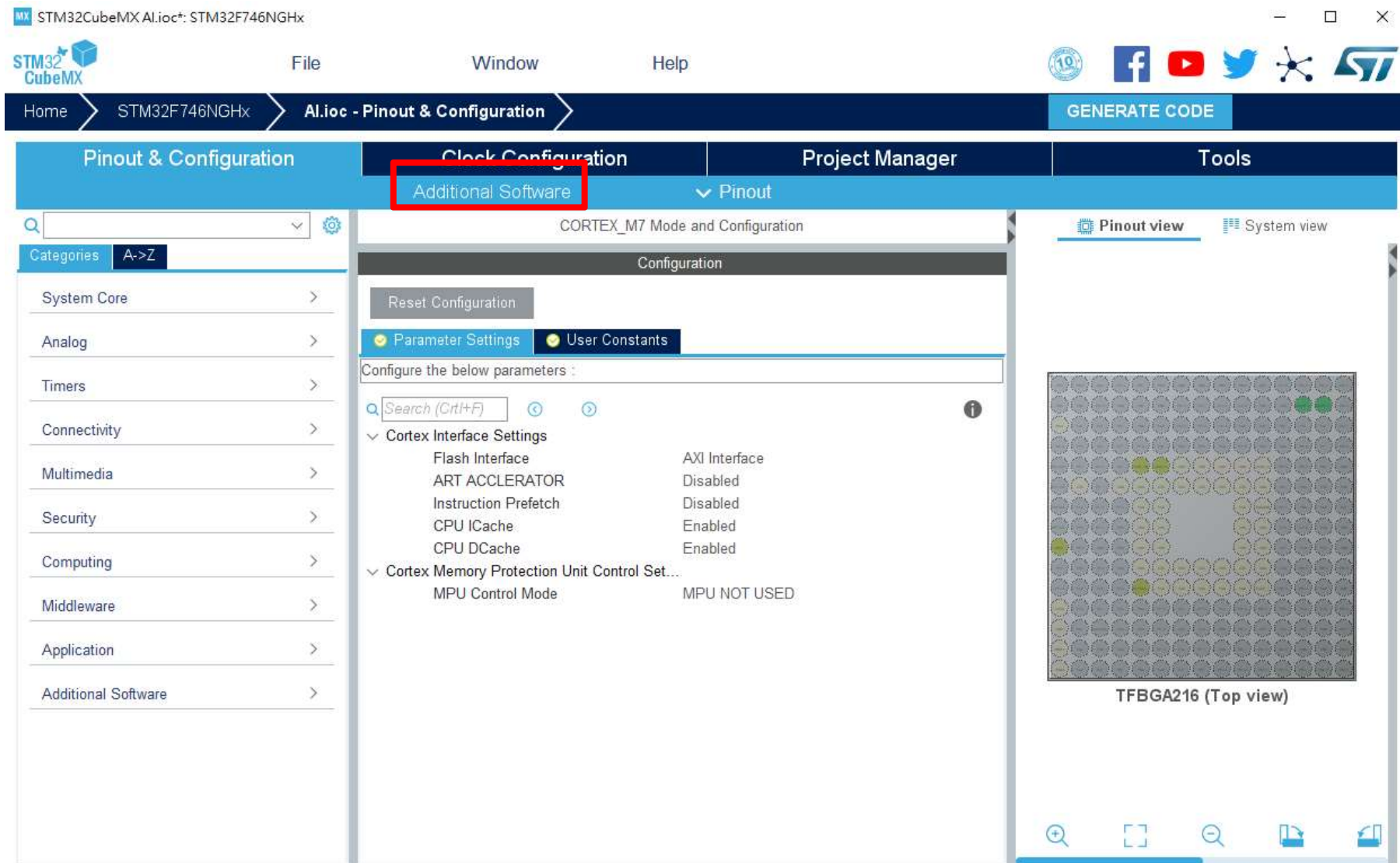
From the menu, select [**Help**] > [**Manage embedded software packages**] or directly click on the [**INSTALL/REMOVE**] button.

# Install X-Cube-AI..





# Cube Setting-1



# Cube Setting-2

MX Additional Software Components selection

Filters

Search

Pack Vendor

Software Component Class

Packs

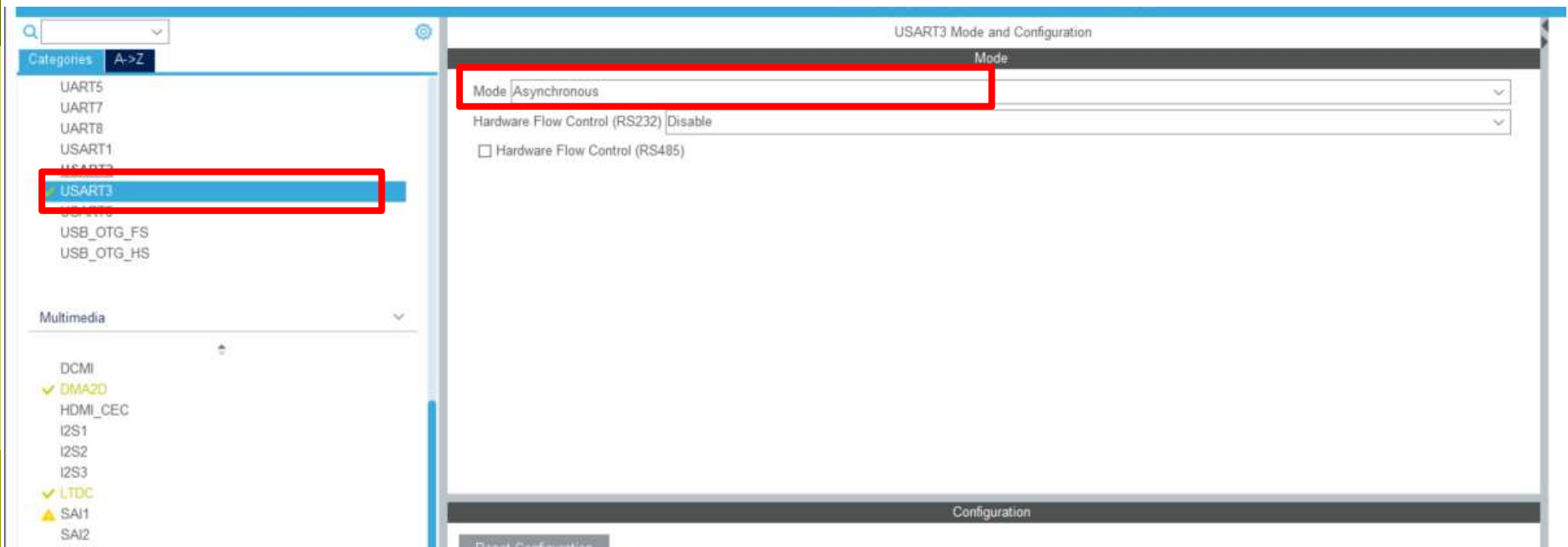
Collapse all

Pack / Bundle / Component	Version	Selection
✓ STMicroelectronics.X-CUBE-AI	4.0.0	
✓ Artificial_Intelligence_Application		
Application		Validation
✓ Artificial_Intelligence_X-CUBE-AI		
Core		✓
> STMicroelectronics.X-CUBE-BLE1	4.4.0	
> STMicroelectronics.X-CUBE-GNSS1	3.0.0	
> STMicroelectronics.X-CUBE-MEMS1	6.2.0	
> STMicroelectronics.X-CUBE-NFC4	1.4.0	

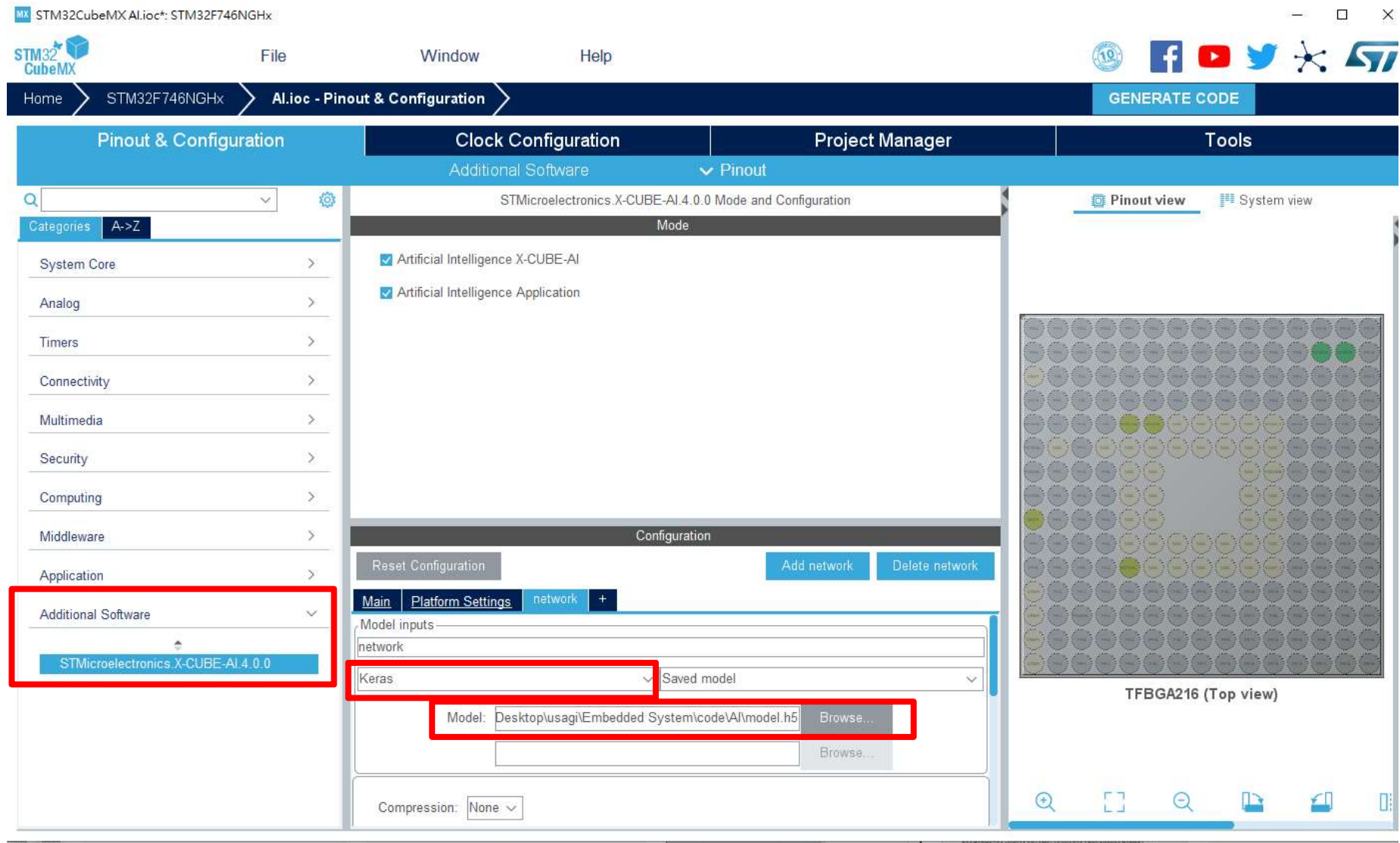
Show/hide filters Show/hide details Show/hide dependencies

Ok Cancel

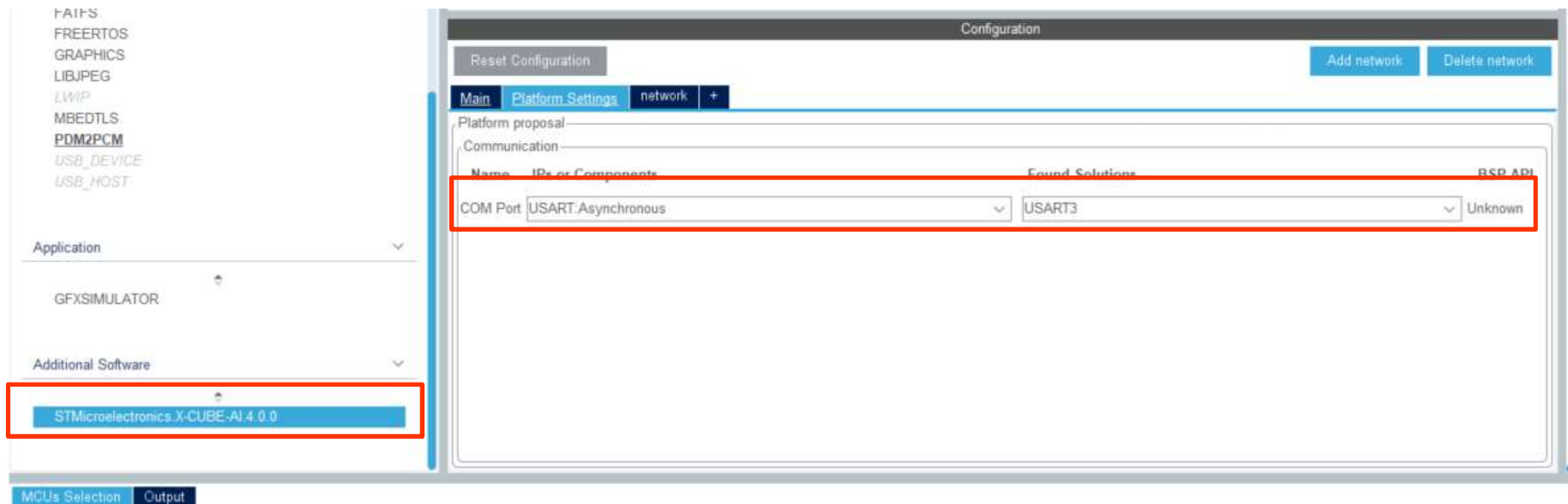
# Cube Setting-3



# Cube Setting-4



# Cube Setting-5



# Cube Setting-6

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## □ 開啟LTDC

- FMC -> SDRAM1
- DMA2D
- LTDC

# AI run

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- AI\_API\_ENTRY ai\_i32 ai\_network\_run(ai\_handle network, const ai\_buffer\* input, ai\_buffer\* output)

```
void MX_X_CUBE_AI_Process(void)
{
    aiValidationProcess();
    /* USER CODE BEGIN 1 */
    /* USER CODE END 1 */
}
```

# AI init

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- ❑ AI\_API\_ENTRY ai\_error ai\_network\_create(ai\_handle\* network, const ai\_buffer\* network\_config)
- ❑ AI\_API\_ENTRY ai\_bool ai\_network\_init(ai\_handle network, const ai\_network\_params\* params)

```
void MX_X_CUBE_AI_Init(void)
{
    MX_UARTx_Init();
    aiValidationInit();
    /* USER CODE BEGIN 0 */
    /* USER CODE END 0 */
}
```



# AI 參考資料

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- ❑ Getting started with X-CUBE-AI Expansion Package for Artificial Intelligence (AI) :  
[https://www.st.com/content/ccc/resource/technical/document/user\\_manual/group1/69/bb/ec/5d/78/16/43/ce/DM00570145/files/DM00570145.pdf/jcr:content/translations/en.DM00570145.pdf](https://www.st.com/content/ccc/resource/technical/document/user_manual/group1/69/bb/ec/5d/78/16/43/ce/DM00570145/files/DM00570145.pdf/jcr:content/translations/en.DM00570145.pdf)
- ❑ STMicroelectronics\X-CUBE-AI\4.0.0\Middlewares\ST\AI\SystemPerformance\Src\aiSystemPerformance.c
- ❑ [https://www.st.com/content/st\\_com/en/stm32-ann.html](https://www.st.com/content/st_com/en/stm32-ann.html)

# LCD touch

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- ❑ stm32746g\_discovery\_ts.c
- ❑ uint8\_t BSP\_TS\_Init(uint16\_t ts\_SizeX, uint16\_t ts\_SizeY)
- ❑ uint8\_t  
BSP\_TS\_GetState(TS\_StateTypeDef \*TS\_State)

# BSP

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- ❑ stm32746g\_discovery.c
- ❑ stm32746g\_discovery\_lcd.c
- ❑ stm32746g\_discovery\_ts.c
- ❑ stm32746g\_discovery\_sdram.c
- ❑ Components/common/ts.h
- ❑ Components/ft5336.c

# 會使用到的.c

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- App\_x-cube-ai.c
  - AI相關function
- Stm32746g\_discovery\_lcd.c
  - LCD 初始化、畫圖
- stm32746g\_discovery\_ts.c
  - 觸控

# 計分方式

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1. 程式完成後請助教確認功能是否正確，並給予完成順序號。
2. 檢查後立即將所有程式壓縮7z檔後上傳至 Moodle[繳交作業]，並在檔名依序寫上實習題目號碼、完成順序號、學號。  
(檔名:Lab\_4\_No\_xx\_學號.7z)
1. 計分標準依完成順序及程式內容給分，若發現程式有互相抄襲狀況，該兩人分數皆為0分。

## 參考資料

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- Getting started with STM32F746G discovery software development tools.pdf
- STM32F746xx\_HAL\_User\_Manual.chm
- Description of STM32F7xx HAL drivers.pdf
- [embedded\\_client\\_api.html](#)