

Edge Computing with DSP Acceleration

Lab 2

Department of Electronic and Computer Engineering
National Taiwan University of Science and Technology

完成於PC端模擬未經過硬體加速的物件辨識

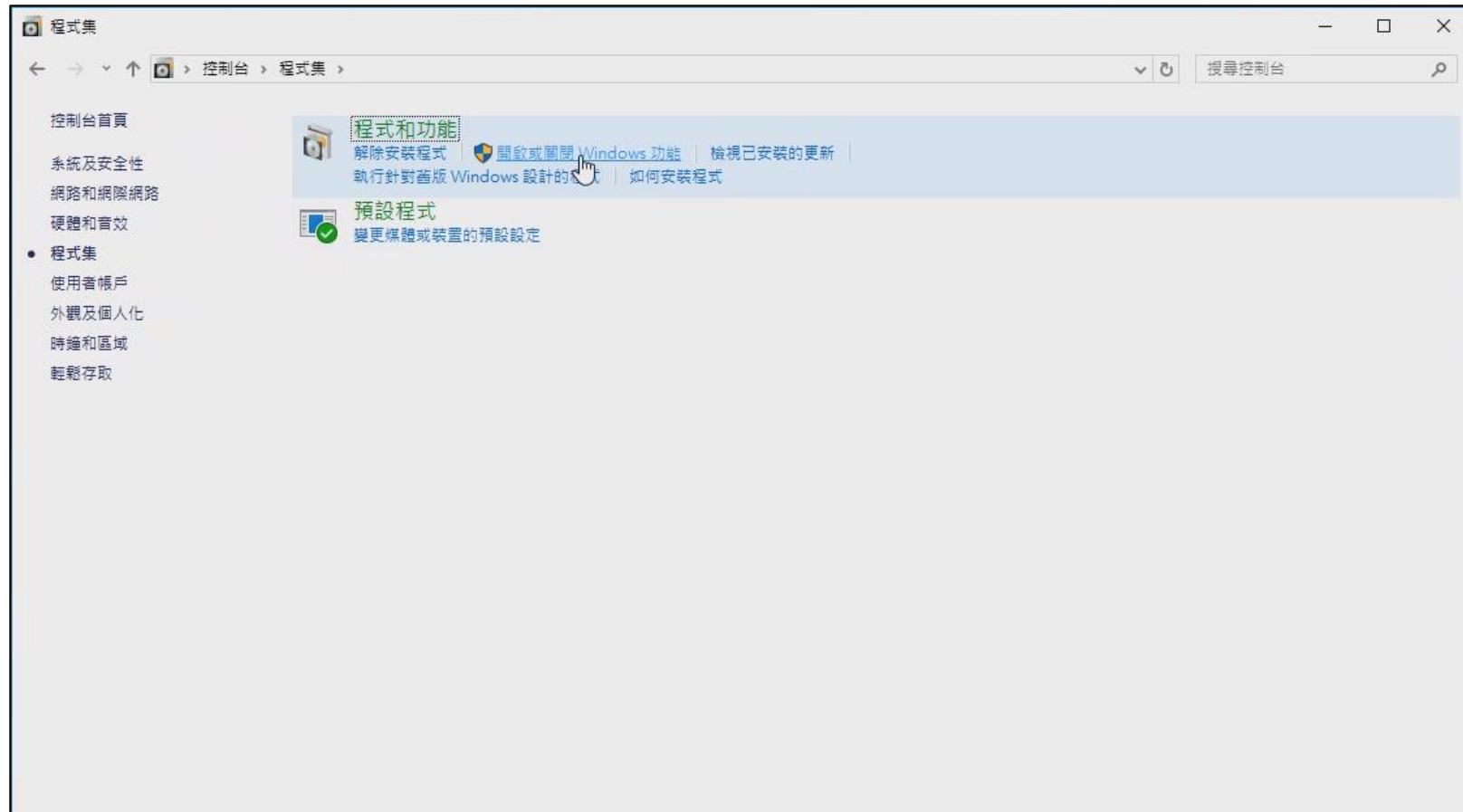
- ❖ 完成物件偵測辨識程式碼
- ❖ 實現於PC端CPU架構完成辨識
- ❖ 紀錄未DSP加速前的FPS等數據



WSL Linux 虛擬機環境設定setup(可選)

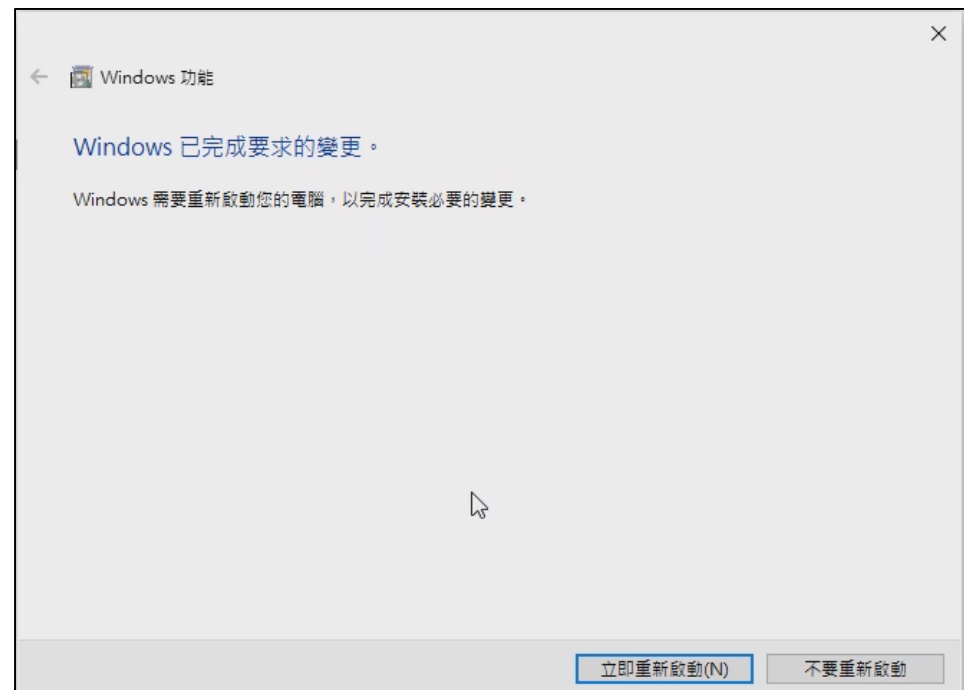
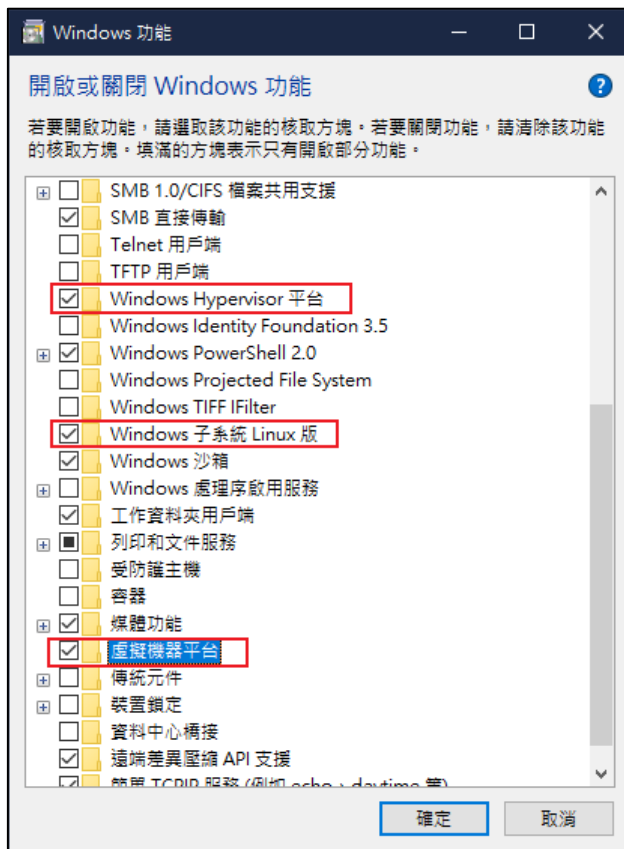
用其他如 Anaconda 環境完成也可以!

➤ 控制台>程式集>開啟或關閉windows功能



WSL 虛擬機環境設定setup

- 勾選框起的三個功能，按下確定後重開電腦
- ※必須在BIOS中開啟虛擬化功能



WSL 虛擬機環境設定setup

打開命令提示字元 輸入：

`wsl --update`

完成安裝後輸入：

`wsl --version`

應該會看到右圖中的輸出

```
C:\Users\user>wsl --update
正在安裝 Windows 子系統 Linux 版。
已完成安裝 Windows 子系統 Linux 版。

C:\Users\user>wsl --version
WSL 版本: 2.0.9.0
核心版本: 5.15.133.1-1
WSLg 版本: 1.0.59
MSRDC 版本: 1.2.4677
Direct3D 版本: 1.611.1-81528511
DXCore 版本: 10.0.25131.1002-220531-1700.rs-onecore-base2-hyp
Windows 版本: 10.0.19045.4046
```

```
C:\Users\user>wsl --status
預設版本: 2
```

輸入 `wsl --status`

應該會看到 預設版本: 2

否則需要檢查BIOS中設定是否正確

輸入 `wsl --install Ubuntu-22.04`
開始安裝Ubuntu 22.04的虛擬機

```
C:\Users\user>wsl --install Ubuntu-22.04
安裝: Ubuntu 22.04 LTS
Ubuntu 22.04 LTS 已安裝。
正在啟動 Ubuntu 22.04 LTS...
Installing, this may take a few minutes...
```

WSL 虛擬機環境設定setup

在看到Enter new UNIX username時

請輸入在虛擬機中要使用的使用者名稱(此處為wsl)

```
Installing, this may take a few minutes...
Please create a default UNIX user account. The username does not need to match your Windows username.
For more information visit: https://aka.ms/wslusers
Enter new UNIX username: wsl
```

接著輸入密碼後

就可以看到最下面出現 `$username@$hostname:~$`

※在Unix-like系統中，CLI下輸入密碼大多不會顯示，因此不要懷疑，你已經輸入密碼了

```
Installing, this may take a few minutes...
Please create a default UNIX user account. The username does not need to match your Windows username.
For more information visit: https://aka.ms/wslusers
Enter new UNIX username: wsl
New password:
Retype new password:
passwd: password updated successfully
Installation successful!
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

Welcome to Ubuntu 22.04.3 LTS (GNU/Linux 5.15.133.1-microsoft-standard-WSL2 x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

This message is shown once a day. To disable it please create the
/home/wsl/.hushlogin file.
wsl@jeffPC:~$ |
```


WSL 虛擬機環境設定setup

更新系統套件(可選)

在WSL中輸入:

sudo apt update

並輸入密碼

```
wsl@jeffPC:~$ sudo apt update
[sudo] password for wsl:
Hit:1 http://archive.ubuntu.com/ubuntu jammy InRelease
Get:2 http://archive.ubuntu.com/ubuntu jammy-updates InRelease [119 kB]
Get:3 http://security.ubuntu.com/ubuntu jammy-security InRelease [110 kB]
Get:4 http://security.ubuntu.com/ubuntu jammy-security/main amd64 Packages [1208 kB]
Get:5 http://archive.ubuntu.com/ubuntu jammy-backports InRelease [109 kB]
Get:6 http://archive.ubuntu.com/ubuntu jammy/universe amd64 Packages [14.1 MB]
Get:7 http://security.ubuntu.com/ubuntu jammy-security/main Translation-en [219 kB]
Get:8 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 Packages [1480 kB]
Get:9 http://security.ubuntu.com/ubuntu jammy-security/restricted Translation-en [245 kB]
Get:10 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 Packages [846 kB]
Get:11 http://security.ubuntu.com/ubuntu jammy-security/universe Translation-en [161 kB]
Get:12 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 c-n-f Metadata [16.8 kB]
Get:13 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 Packages [37.1 kB]
Get:14 http://security.ubuntu.com/ubuntu jammy-security/multiverse Translation-en [7476 B]
Get:15 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 c-n-f Metadata [260 B]
Get:16 http://archive.ubuntu.com/ubuntu jammy/universe Translation-en [5652 kB]
Get:17 http://archive.ubuntu.com/ubuntu jammy/universe amd64 c-n-f Metadata [286 kB]
Get:18 http://archive.ubuntu.com/ubuntu jammy/multiverse amd64 Packages [217 kB]
Get:19 http://archive.ubuntu.com/ubuntu jammy/multiverse Translation-en [112 kB]
Get:20 http://archive.ubuntu.com/ubuntu jammy/multiverse amd64 c-n-f Metadata [8372 B]
Get:21 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [1424 kB]
Get:22 http://archive.ubuntu.com/ubuntu jammy-updates/main Translation-en [279 kB]
Get:23 http://archive.ubuntu.com/ubuntu jammy-updates/restricted amd64 Packages [1508 kB]
Get:24 http://archive.ubuntu.com/ubuntu jammy-updates/restricted Translation-en [249 kB]
Get:25 http://archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages [1052 kB]
Get:26 http://archive.ubuntu.com/ubuntu jammy-updates/universe Translation-en [237 kB]
Get:27 http://archive.ubuntu.com/ubuntu jammy-updates/universe amd64 c-n-f Metadata [22.1 kB]
Get:28 http://archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 Packages [42.1 kB]
Get:29 http://archive.ubuntu.com/ubuntu jammy-updates/multiverse Translation-en [10.1 kB]
Get:30 http://archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 c-n-f Metadata [472 B]
Get:31 http://archive.ubuntu.com/ubuntu jammy-backports/main amd64 Packages [41.7 kB]
Get:32 http://archive.ubuntu.com/ubuntu jammy-backports/main Translation-en [10.5 kB]
Get:33 http://archive.ubuntu.com/ubuntu jammy-backports/main amd64 c-n-f Metadata [388 B]
Get:34 http://archive.ubuntu.com/ubuntu jammy-backports/restricted amd64 c-n-f Metadata [116 B]
Get:35 http://archive.ubuntu.com/ubuntu jammy-backports/universe amd64 Packages [24.3 kB]
Get:36 http://archive.ubuntu.com/ubuntu jammy-backports/universe Translation-en [16.5 kB]
Get:37 http://archive.ubuntu.com/ubuntu jammy-backports/universe amd64 c-n-f Metadata [644 B]
Get:38 http://archive.ubuntu.com/ubuntu jammy-backports/multiverse amd64 c-n-f Metadata [116 B]
Fetched 29.8 MB in 10s (2927 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
79 packages can be upgraded. Run 'apt list --upgradable' to see them.
```

接著輸入

sudo apt update

在看到”Do you want to continue?”時

輸入Y並按下Enter開始更新

```
wsl@jeffPC:~$ sudo apt upgrade
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Calculating upgrade... Done
The following packages will be upgraded:
base-files bind9-dnswtills bind9-host bind9-libs binutils binutils-common binutils-x86-64-linux-gnu
coreutils curl distro-info distro-info-data iptables irqbalance less libbinutils libc-bin libc6
libcryptsetup12 libctf-nobfd0 libctf0 libcurl3-gnutls libcurl4 libgnutls30 libip4tc2 libip6tc2
libldap-2.5-0 libldap-common libnss-systemd libpam-modules libpam-modules-bin libpam-runtime
libpam-systemd libpam0g libperl5.34 libpython3.10 libpython3.10-minimal libpython3.10-stdlib
libsqlite3-0 libssh-4 libssl3 libsystemd0 libudev1 libuv1 libxml2 libxtables12 locales login
motd-news-config openssh-client openssl passwd perl perl-base perl-modules-5.34 python-apt-common
python3-apt python3-cryptography python3-distro-info python3-distupgrade
python3-software-properties python3-update-manager python3.10 python3.10-minimal
software-properties-common systemd systemd-hwe-hwdb systemd-sysv systemd-timesyncd tar tcpdump
tzdata ubuntu-release-upgrader-core udev update-manager-core vim vim-common vim-runtime vim-tiny
xxd
79 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
49 standard LTS security updates
Need to get 59.8 MB of archives.
After this operation, 56.3 kB of additional disk space will be used.
Do you want to continue? [Y/n] Y
```

建議完成這一步，
確保後面的步驟不會出錯

Pyenv 環境setup

➤ 以下指令皆輸入在WSL中

輸入以下指令安裝Python 環境管理器依賴的套件:

```
sudo apt update
sudo apt install -y make curl wget git llvm tk-dev xz-utils libssl-dev graphviz
sudo apt install -y build-essential libbz2-dev libffi-dev liblzma-dev libxmlsec1-dev
sudo apt install -y libncursesw5-dev libreadline-dev libsqlite3-dev libxml2-dev
sudo apt install -y libffi-dev libjpeg-dev zlib1g-dev graphviz-dev protobuf-compiler
```

```
wsl@jeffPC:~$ sudo apt update
sudo apt install build-essential curl libbz2-dev libffi-dev liblzma-dev libncursesw5-dev libreadline-d
ev libsqlite3-dev libssl-dev libxml2-dev libxmlsec1-dev llvm make tk-dev xz-utils wget curl
sudo apt install -y libffi-dev libjpeg-dev zlib1g-dev graphviz graphviz-dev protobuf-compiler
Hit:1 http://security.ubuntu.com/ubuntu jammy-security InRelease
Hit:2 http://archive.ubuntu.com/ubuntu jammy InRelease
Hit:3 http://archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:4 http://archive.ubuntu.com/ubuntu jammy-backports InRelease
Reading package lists... 92%
```


Pyenv 環境setup

輸入以下指令安裝python環境管理器:

```
curl -L https://github.com/pyenv/pyenv-installer/raw/master/bin/pyenv-installer | bash
```

```
echo '# pyenv settings ' >> ${HOME}/.bashrc
echo 'command -v pyenv >/dev/null || export PATH=":${HOME}/.pyenv/bin:$PATH"' >> ${HOME}/.bashrc
echo 'eval "$(pyenv init -)"' >> ${HOME}/.bashrc
echo 'eval "$(pyenv virtualenv-init -)"' >> ${HOME}/.bashrc
echo '' >> ${HOME}/.bashrc
```

```
exec ${SHELL}
```

```
wsl@jeffPC:~$ curl -L https://github.com/pyenv/pyenv-installer/raw/master/bin/pyenv-installer | bash

echo '# pyenv settings ' >> ${HOME}/.bashrc
echo 'command -v pyenv >/dev/null || export PATH=":${HOME}/.pyenv/bin:$PATH"' >> ${HOME}/.bashrc
echo 'eval "$(pyenv init -)"' >> ${HOME}/.bashrc
echo 'eval "$(pyenv virtualenv-init -)"' >> ${HOME}/.bashrc
echo '' >> ${HOME}/.bashrc

exec ${SHELL}
```

| % Total | % Received | % Xferd | Average Speed | Time | Time | Time | Current | |
|---------|------------|---------|---------------|--------|----------|----------|----------|-------|
| | | | Dload | Upload | Total | Spent | Left | Speed |
| 0 | 0 | 0 | 0 | 0 | --:--:-- | --:--:-- | --:--:-- | 0 |
| 100 | 2827 | 100 | 2827 | 0 | 2918 | 0 | --:--:-- | 9299 |

```
Cloning into '/home/wsl/.pyenv'...
```

Yolo 環境setup

輸入以下指令安裝python3.10並建立名為”yolo”的隔離環境:

```
pyenv install 3.10
pyenv virtualenv 3.10 yolo
pyenv rehash
pyenv activate yolo
pip install --upgrade pip setuptools
```

```
wsl@jeffPC:~$ pyenv install 3.10
pyenv virtualenv 3.10 yolo
pyenv rehash
pyenv activate yolo
pip install --upgrade pip setuptools
Downloading Python-3.10.14.tar.xz...
-> https://www.python.org/ftp/python/3.10.14/Python-3.10.14.tar.xz
Installing Python-3.10.14...
Installed Python-3.10.14 to /home/wsl/.pyenv/versions/3.10.14
Requirement already satisfied: pip in ./pyenv/versions/3.10.14/envs/yolo/lib/python3.10/site-packages (23.0.1)
Collecting pip
  Downloading pip-24.0-py3-none-any.whl (2.1 MB)
    2.1/2.1 MB 4.5 MB/s eta 0:00:00
Requirement already satisfied: setuptools in ./pyenv/versions/3.10.14/envs/yolo/lib/python3.10/site-packages (65.5.0)
Collecting setuptools
  Downloading setuptools-69.2.0-py3-none-any.whl (821 kB)
    821.5/821.5 kB 1.1 MB/s eta 0:00:00
Installing collected packages: setuptools, pip
Attempting uninstall: setuptools
  Found existing installation: setuptools 65.5.0
  Uninstalling setuptools-65.5.0:
    Successfully uninstalled setuptools-65.5.0
Attempting uninstall: pip
  Found existing installation: pip 23.0.1
  Uninstalling pip-23.0.1:
    Successfully uninstalled pip-23.0.1
Successfully installed pip-24.0 setuptools-69.2.0
```

Yolo 環境setup

輸入以下指令安裝opencv-contrib-python:
pip3 install opencv-contrib-python

```
(yolo) wsl@jeffPC:~$ pip3 install opencv-contrib-python
Collecting opencv-contrib-python
  Downloading opencv_contrib_python-4.9.0.80-cp37-abi3-manylinux_2_17_x86_64.manylinux2014_x86_64.whl.metadata (20 kB)
Collecting numpy>=1.21.2 (from opencv-contrib-python)
  Downloading numpy-1.26.4-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x86_64.whl.metadata (61 kB)
    61.0/61.0 kB 882.6 kB/s eta 0:00:00
  Downloading opencv_contrib_python-4.9.0.80-cp37-abi3-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (68.3 MB)
    68.3/68.3 MB 28.1 MB/s eta 0:00:00
  Downloading numpy-1.26.4-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (18.2 MB)
    18.2/18.2 MB 34.0 MB/s eta 0:00:00
Installing collected packages: numpy, opencv-contrib-python
Successfully installed numpy-1.26.4 opencv-contrib-python-4.9.0.80
```

輸入以下指令創建資料夾並下載檔案:

```
mkdir yolo
cd yolo
wget https://pjreddie.com/media/files/yolov3-tiny.weights
wget https://raw.githubusercontent.com/pjreddie/darknet/master/cfg/yolov3-tiny.cfg
wget https://raw.githubusercontent.com/pjreddie/darknet/master/data/coco.names
```

```
(yolo) wsl@jeffPC:~$ mkdir yolo
cd yolo
wget https://pjreddie.com/media/files/yolov3-tiny.weights
  https://raw.githubusercontent.com/pjreddie/darknet/master/cfg/yolov3-tiny.cfg
  https://raw.githubusercontent.com/pjreddie/darknet/master/data/coco.names
--2024-03-23 04:20:25-- https://pjreddie.com/media/files/yolov3-tiny.weights
Resolving pjreddie.com (pjreddie.com)... 162.0.215.52
Connecting to pjreddie.com (pjreddie.com)|162.0.215.52|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 35434956 (34M) [application/octet-stream]
Saving to: 'yolov3-tiny.weights'

yolov3-tiny.weights      100%[=====] 33.79M  5.41MB/s   in 8.6s
2024-03-23 04:20:35 (3.91 MB/s) - 'yolov3-tiny.weights' saved [35434956/35434956]

--2024-03-23 04:20:35-- https://raw.githubusercontent.com/pjreddie/darknet/master/cfg/yolov3-tiny.cfg
Resolving raw.githubusercontent.com (raw.githubusercontent.com)... 185.199.108.133, 185.199.111.133, 185.199.109.133,
...
Connecting to raw.githubusercontent.com (raw.githubusercontent.com)|185.199.108.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 1915 (1.9K) [text/plain]
Saving to: 'yolov3-tiny.cfg'

yolov3-tiny.cfg          100%[=====] 1.87K  --.-KB/s   in 0s
2024-03-23 04:20:35 (9.19 MB/s) - 'yolov3-tiny.cfg' saved [1915/1915]

--2024-03-23 04:20:35-- https://raw.githubusercontent.com/pjreddie/darknet/master/data/coco.names
Resolving raw.githubusercontent.com (raw.githubusercontent.com)... 185.199.108.133, 185.199.111.133, 185.199.109.133,
...
Connecting to raw.githubusercontent.com (raw.githubusercontent.com)|185.199.108.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 625 [text/plain]
Saving to: 'coco.names'

coco.names               100%[=====] 625  --.-KB/s   in 0s
2024-03-23 04:20:35 (69.9 MB/s) - 'coco.names' saved [625/625]

(yolo) wsl@jeffPC:~/yolo$ ls
coco.names yolov3-tiny.cfg yolov3-tiny.weights
```

完成 main.py code

載入模型與Video
完成程式功能

```

1  import cv2
2  import numpy as np
3  import time
4
5  # Load ./yolov3-tiny.weights, yolov3-tiny.cfg
6  net = cv2.dnn.readNet("", "")
7  classes = []
8  with open("coco.names", "r") as f:
9      classes = [line.strip() for line in f.readlines()]
10 layer_names = net.getLayerNames()
11 output_layers = [layer_names[i - 1] for i in net.getUnconnectedOutLayers()]
12 colors = np.random.uniform(0, 255, size=(len(classes), 3))
13 cv2.setNumThreads(0)
14 # Loading camera
15 cap = cv2.VideoCapture('')
16
17 font = cv2.FONT_HERSHEY_PLAIN
18 starting_time = time.time()
19 frame_id = 0
20 while cap.isOpened():
21     _, frame = cap.read()
22     frame_id += 1
23
24     height, width, channels = frame.shape
25     # Detecting objects
26     blob = cv2.dnn.blobFromImage(frame, 0.00392, (416, 416), (0, 0, 0), True, crop=False)
27
28     net.setInput(blob)
29     outs = net.forward(output_layers)
30
31     # Showing informations on the screen
32     class_ids = []
33     confidences = []
34     boxes = []
35     for out in outs:
36         for detection in out:
37             scores = detection[5:]
38             class_id = np.argmax(scores)
39             confidence = scores[class_id]
40             if confidence > 0.2:
41                 # Object detected
42                 center_x = int(detection[0] * width)
43                 center_y = int(detection[1] * height)
44                 w = int(detection[2] * width)
45                 h = int(detection[3] * height)
46

```

執行 main.py code 觀測結果

python3 main.py

(yolo) wsl@jeffPC:~/yolo\$ python3 main.py



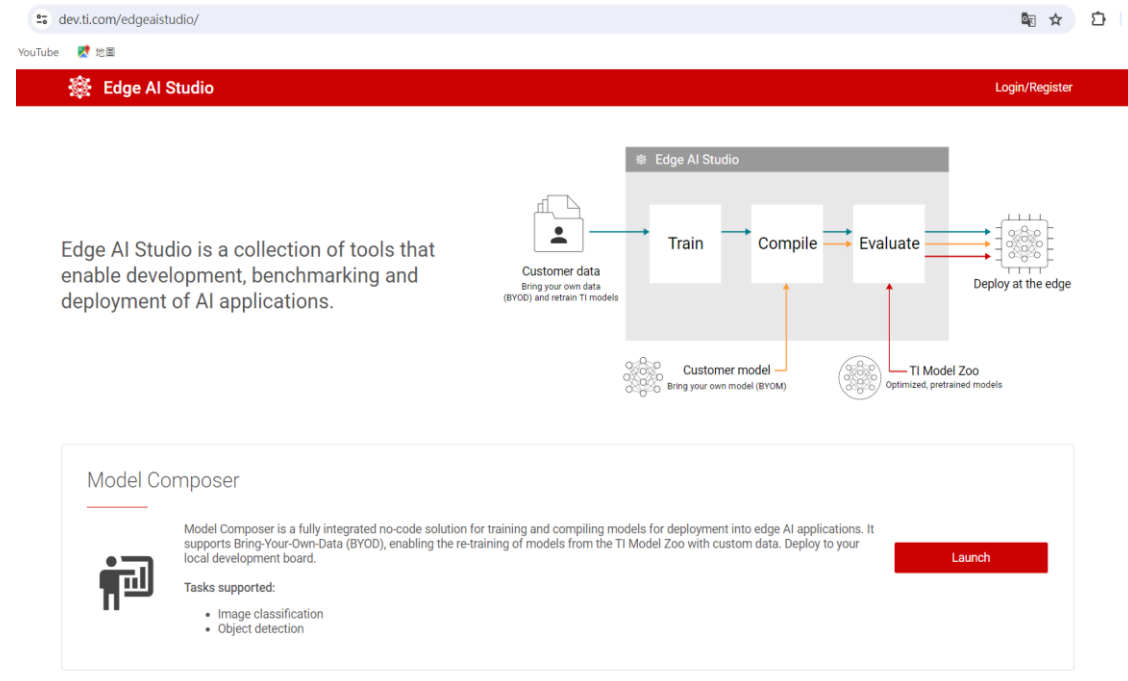
Edge AI Studio

網址: <https://dev.ti.com/edgeaistudio/>

■ TDA4VM AI Application

➤ TI提供的線上模型訓練平台，基於嵌入式系統實現的模型架構

- Model Composer
- Model Analyzer
- Model Maker

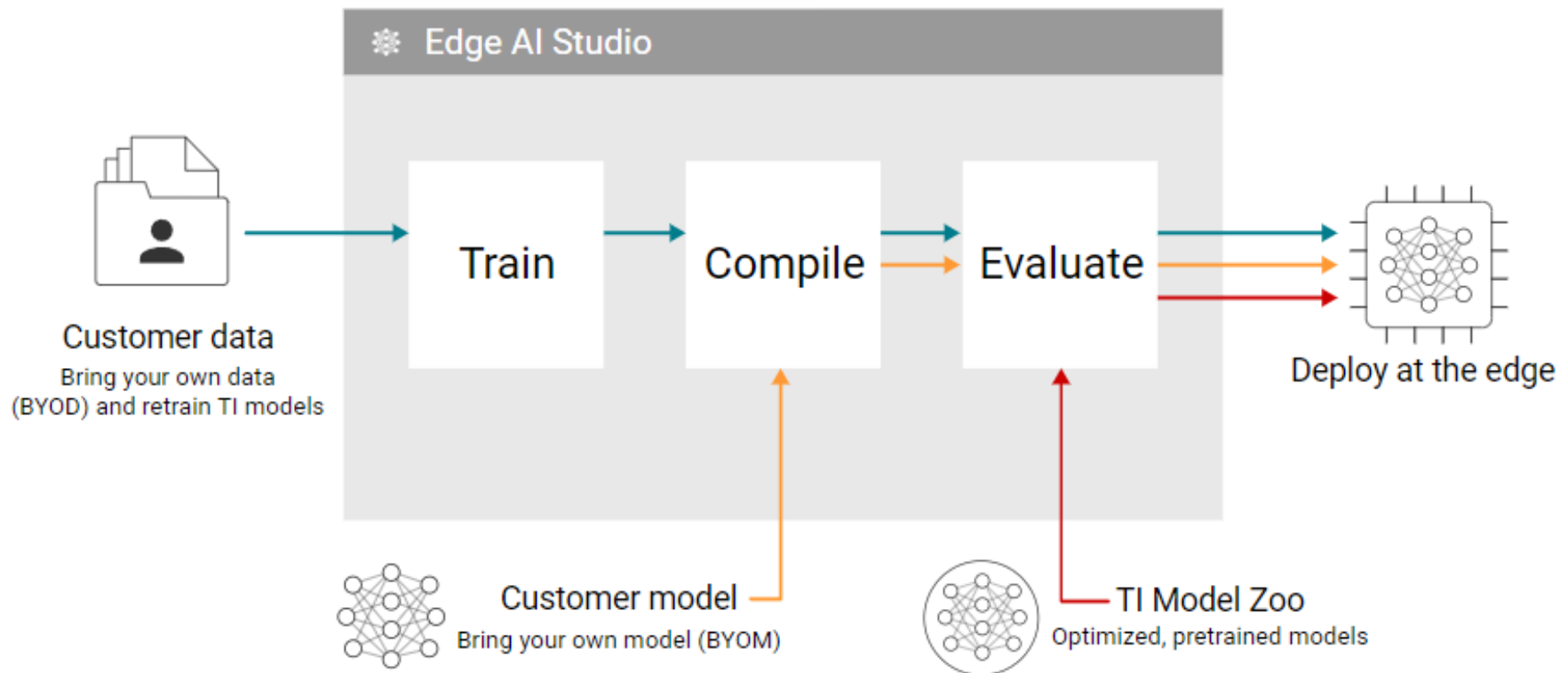


Edge AI Studio

網址: <https://dev.ti.com/edgeaistudio/>

■ TDA4VM AI Application

- 根據平台硬體條件限制，根據訓練參數訓練可順暢運行之模型種類，並經過訓練編譯成功Deploy至Edge 平台



Edge AI Studio

■ TDA4VM TIDL Model Composer

Welcome to Model Composer

Train, Compile and Deploy models

Start

Get started by creating a new project, selecting an example or importing an existing project from your local machine.

Example Project

New Project

Import Project

Recent

Project

edgeai

Dataset

- > Capture - Device, PC webcam, Upload
- > Annotate - labels, bounding boxes
- > Import pre-annotated dataset

Image Details

- 105 Images Added
- 105 out of 105 Images Annotated

Compile

- > Compile the trained model
- > Download compiled model artifacts

yolox_s_lite

- Calibration frames: --
- Calibration iterations: --
- Tensor bits: --

Model selection

- > Select model and device

yolox_s_lite

- Model Selected: yolox_s_lite
- Device selected: AM62A

Live preview

- > Select the trained model and device
- > Run the model inference on device and preview the results

yolox_s_lite

- Session ID: --

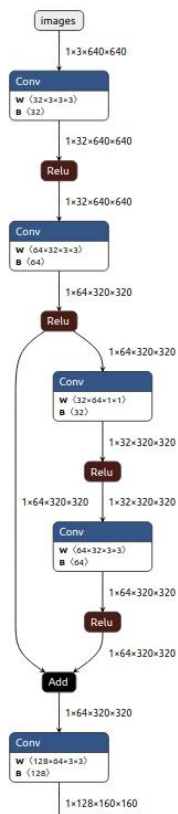
Train

Deploy

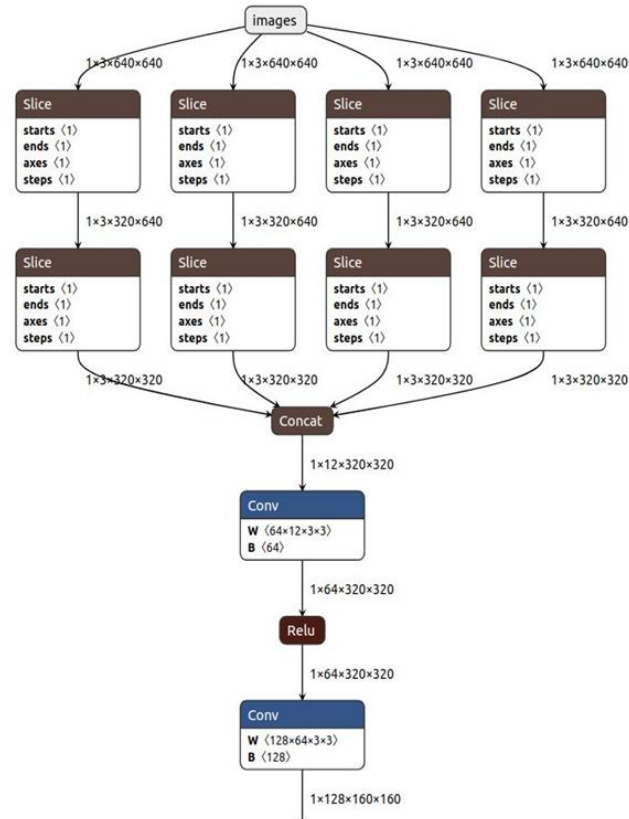
Edge AI Studio

■ TDA4VM TIDL Model Training

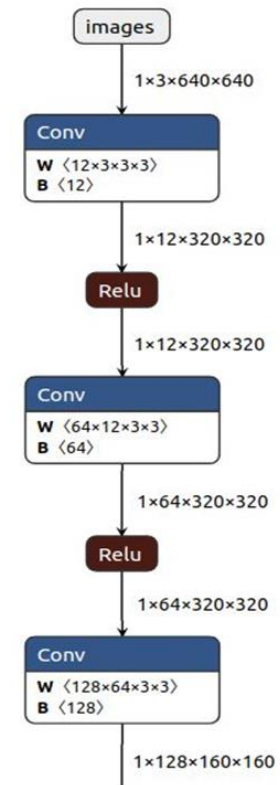
➤ 模型種類: YOLOv3、YOLOv5、YOLOv5-ti-lite



YOLOV3



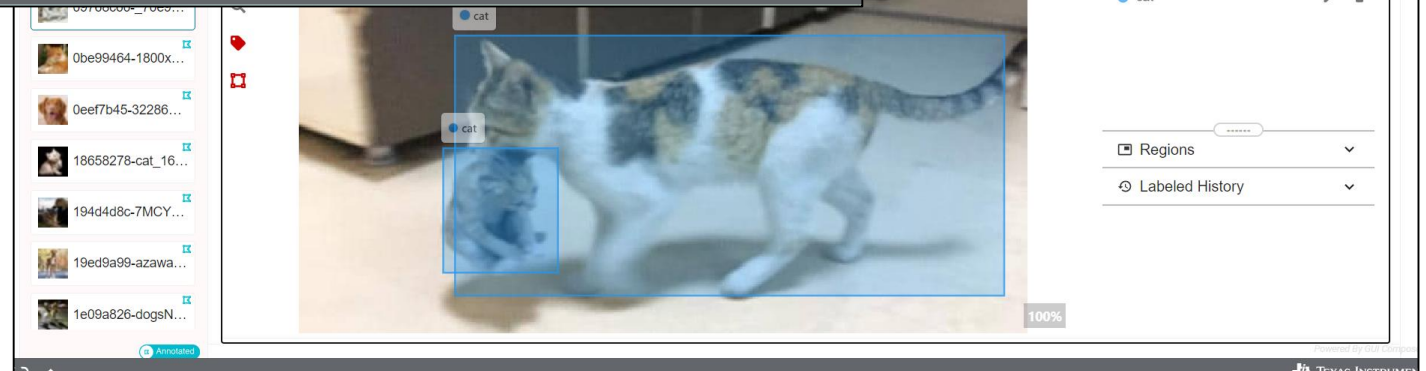
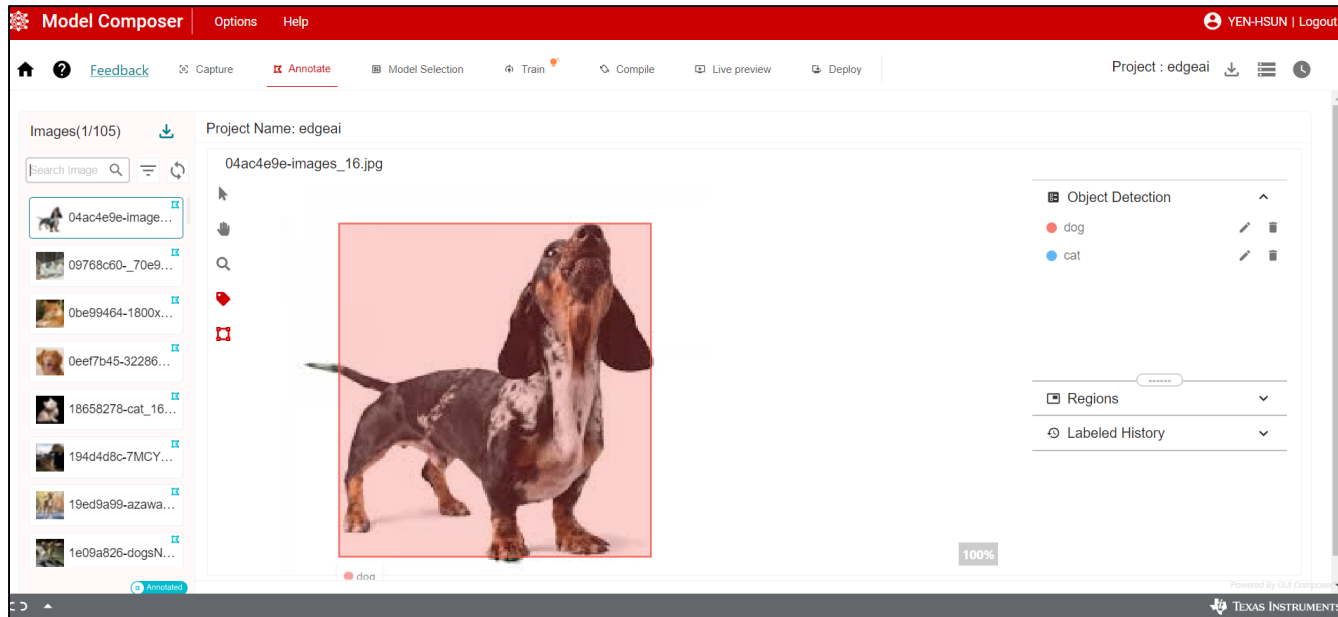
YOLOV5 official



YOLOV5-ti-lite

Edge AI Studio

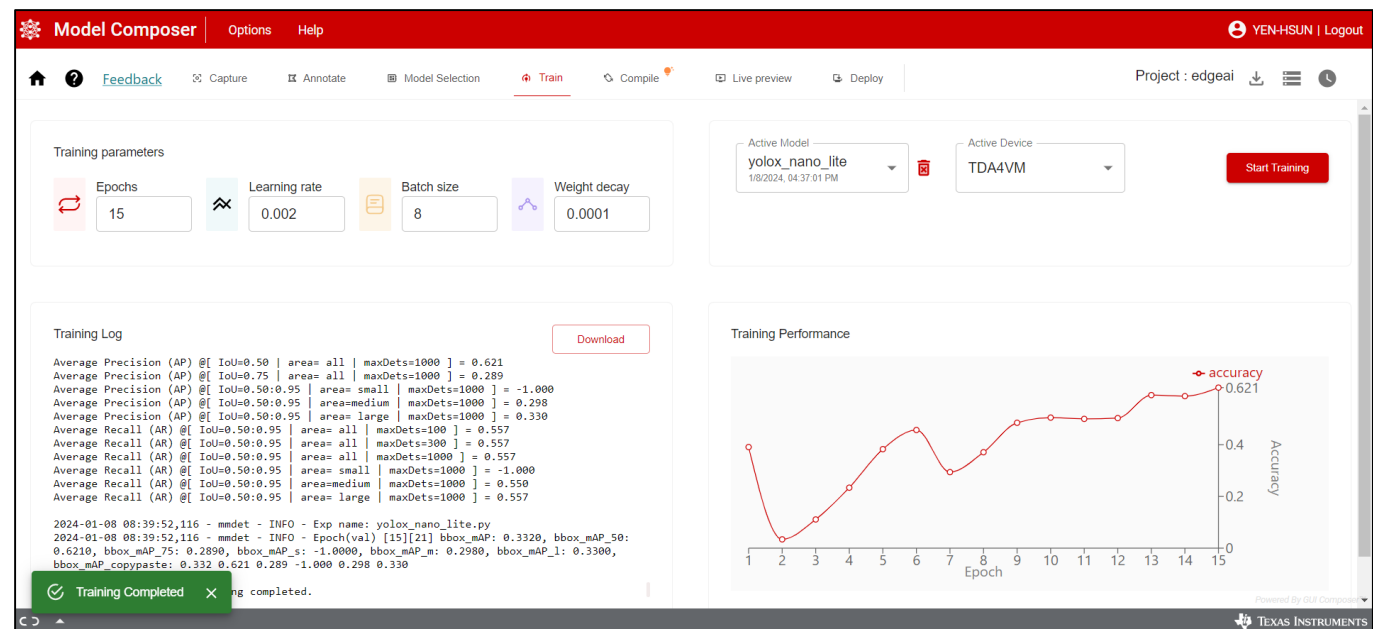
■ TDA4VM Model Label



Edge AI Studio

■ TDA4VM Model Training Parameter

- Epoch: 次數
- Learning rate: 學習率
- Batch Size: 批次大小
- Weight Decay: 權重衰減指數



Edge AI Studio

■ TDA4VM Model Compiling

- 基於板子型號去做Evaluate縮減模型，達到可運行之數據完成模型之訓練，且編譯成功

The screenshot displays the Edge AI Studio Model Composer interface. The top navigation bar includes 'Model Composer', 'Options', and 'Help'. The main interface is divided into several sections:

- Compilation parameters:** Includes a 'Preset' dropdown set to 'Default Preset' and a table of parameters: Calibration Frames (10), Calibration Iterations (10), Detection Threshold (0.6), Detection Top K (200), and Tensor Bits (8).
- Active Model:** Shows 'yolox_nano_lite' with a timestamp '1/8/2024, 04:37:01 PM'.
- Active Device:** Shows 'TDA4VM'.
- Start Compiling:** A red button to initiate the compilation process.
- Compile Log:** A text area showing the progress of the compilation, including a 'Download' button. The log includes information about the inference path, accuracy, and completion status.
- Post Compilation Accuracy:** Displays 'accuracy_ap50% : 8.17 %' with a 'Download Artifact to PC' button.
- Compiled Model Prediction:** Shows a sample image of two dogs with bounding boxes, indicating successful model prediction.

The bottom right corner of the interface mentions 'Powered By GUI Composer'.

Lab2:ARM Processor神經網路與TDA4VM模型

■ 書面報告完成事項

- 完成運行CPU未經DSP加速之成果圖和數據
- Edge AI Composer訓練之成果報告:
 - 根據模型參數調整結果與理論完成報告
 - 完成基於TDA4VM平台之輕量化模型訓練與編譯
 - 依照報告內容給分: 理論結合實作、參數的原理

參考資料與文獻

- [1] [TDA4VM Processors datasheet \(Rev. K\)](#)
- [2] [J721E DRA829/TDA4VM Processors Silicon Revision 1.1/1.0 \(Rev. D\)](#)
- [3] [DRA829/TDA4VM Technical Reference Manual \(Rev. C\)](#)
- [4] [Jacinto7 AM6x, TDA4x, and DRA8x High-Speed Interface Design Guidelines \(Rev. A\)](#)
- [5] [TMS320C6652 and TMS320C6654 Fixed and Floating-Point Digital Signal Processor datasheet \(Rev. E\)](#)
- [6] [TMS320C6652/54/55/57 Multicore Fixed and Floating-Point DSP SR1.0 \(Rev. C\)](#)
- [7] [SK-TDA4VM User's Guide \(Rev. D\)](#)
- [8] [J721EXSKG01EVM EU Declaration of Conformity \(DoC\) \(Rev. A\)](#)
- [9] [DMA Controller Module \(Chapter Excerpt From MSP430x5xx Family, SLAU208\) \(Rev. F\)](#)
- [10] [AM437x Sitara™ Processors datasheet \(Rev. E\)](#)
- [11] [AM437x and AMIC120 ARM® Cortex™-A9 Processors Technical Reference Manual \(Rev. I\)](#)
- [12] [TMS320C6000 DSP Cache User's Guide \(Rev. A\)](#)