



Department of Computer Science
& Information Engineering

資 訊 工 程 系

人工智慧與邊緣運算實務

Intel DevCloud 安裝與測試

雲端計算 (Cloud Computing)

訓練 / 推論 / 儲存



雲端伺服器
Cloud Server

邊緣計算 (Edge Computing)

推論

非同步(可離線)

微量推論結果

深度學習模型

推論結果

AI 晶片



聲音 影像 感測器

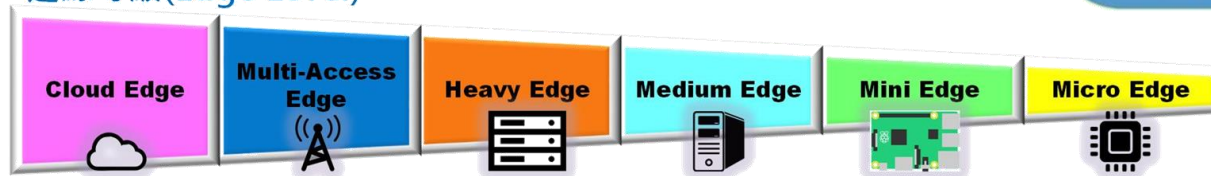
低延遲

高隱私

低成本

巨量通訊

邊緣等級(Edge Level)



資訊工程系 許哲豪 助理教授

簡報大綱

➤ Intel DevCloud簡介

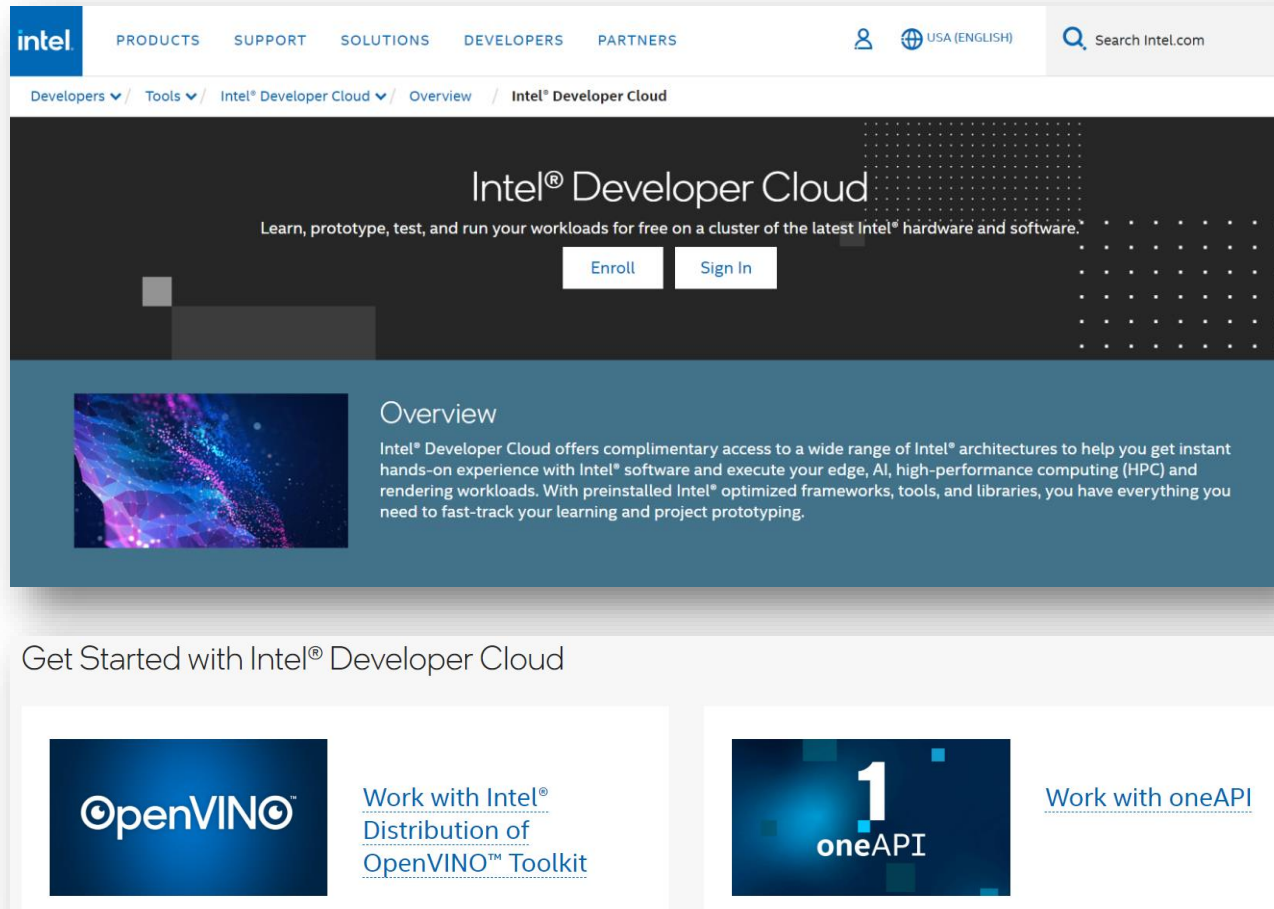
- 帳號申請
- 系統架構
- 支援硬體
- 工作環境
- 預設環境
- 應用範例

➤ 物件偵測範例

- 工作排程指令
- 分派及佇列
- 輸出報表
 - 推論時間
 - 推論速度
 - 儀表板

➤ 運行Tutorials(Notebooks)

Intel DevCloud簡介



- 免費雲端開發環境
類似**Google Colab**
- 預建JupyterLab
- Python開發環境
- 預安裝OpenVINO
- 預安裝各種套件
- 少量免費空間
- 整合多種硬體可供同時測試效能
- 提供豐富可視化圖表方便分析問題

Intel OpenVINO雲端測試服務 <https://devcloud.intel.com/edge/>

DevCloud帳號申請與登入

1. 輸入網址 <https://devcloud.intel.com/edge>



申請帳號 登入帳號

Create an Intel® DevCloud Account

Sign up for immediate access to the latest Intel® hardware and software. No hardware setup.

Intel Employee? Create account here

All fields are required except any fields specifically marked as optional.

Basic Contact Information

First Name	Last Name
Email Address	Username
Password	Confirm Password
Country/Region	

Next Step

填入基本資料

送出

2. 輸入帳號密碼

Intel® DevCloud

Sign In

Intel Customer or Partner?

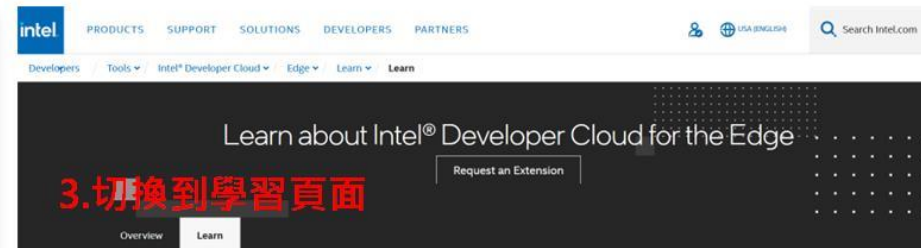
Username

Password

Remember me

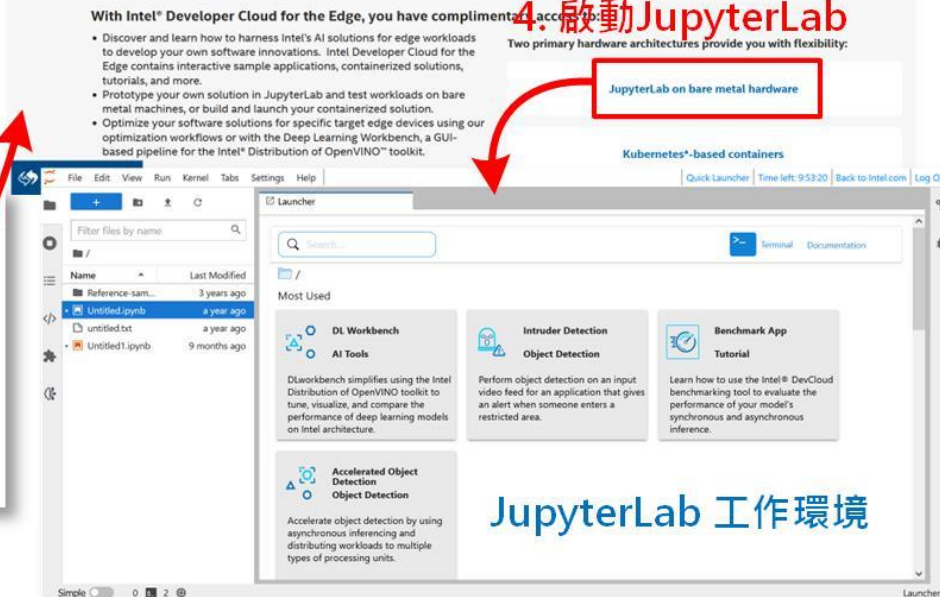
Sign In

Forgot your Intel® username or password?
Contact customer support



3. 切換到學習頁面

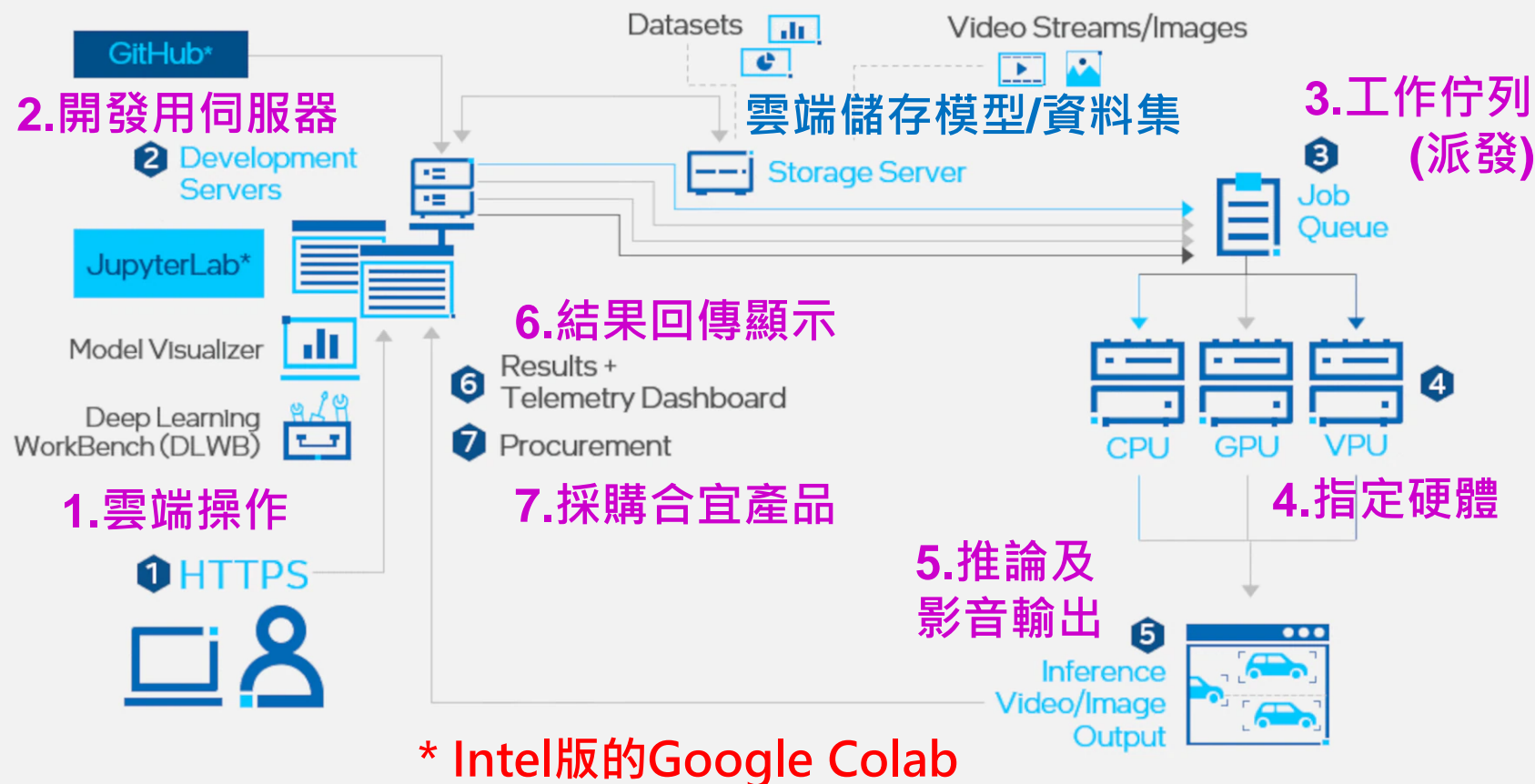
4. 啟動JupyterLab



JupyterLab 工作環境

DevCloud系統架構

How it Works



DevCloud 可支援硬體

CPU	家族	記憶體	GPU	加速器	佇列標籤	節點(Group ID)	
Processor	Processor Family	RAM	GPU	Inference Accelerator	Queue Labels	Node (Group ID)	
Intel® Xeon® D Processor	Intel Core i7-12700TE Processor	12th generation Intel Core i7	16 GB	Intel® UHD Graphics 770 (Integrated)	None	CPU: i7-12700TE idc072	
Intel Xeon D Processor	Intel Core i5-12500TE Processor	Intel Core i5-7500 Processor	Intel Core i7-1065G7 Processor	10th generation Intel Core i7 processor (formerly code named Ice Lake)	Intel® Iris® Plus Graphics G7 (Integrated)	None CPU: i7-1065G7 idc030	
Intel Xeon D Processor	Intel® Core™ i5-6442EQ Processor	Intel Core i5-7500T Processor	Intel Core i7-10700T Processor	Intel® Xeon® E-2286M Processor	Intel Xeon E processor (formerly code named Coffee Lake)	32 GB Intel HD Graphics 630 (Integrated) None CPU: e-2286m idc033	
Intel Xeon D Processor	Intel Core i5 6500TE Processor	Intel Core i5-8365UE Processor	Intel Core i7-10710U Processor	Intel Xeon Gold 6314U Processor	3rd generation Intel Xeon Scalable processor (formerly code named Ice Lake)	128 GB None None CPU: intel-xeon 6314u idc051	
Intel® Core™ i7-11700b Processor	Intel Core i5 6500TE Processor	Intel Core i5-8365UE Processor	Intel Core i9 10900T Processor	Intel Xeon Gold 6338N Processor	3rd generation Intel Xeon Scalable processor (formerly code named Ice Lake)	128 GB None None CPU: intel-xeon 6338n idc052	
Intel Core i9-11900kb Processor	Intel Core i5 6500TE Processor	Intel Core i5-8365UE Processor	Intel Core i9 10900T Processor	Intel® Xeon® Silver 4214R Processor	11th generation Intel Core i7 processor (formerly code named Tiger Lake)	16 GB Intel® Iris® X Graphics (Integrated) None CPU: intel-core i7-1185g7e GPU: iris xe graphics idc045	
			Intel Core i9 10900T Processor	Intel Xeon Gold 5120 Processor	11th generation Intel Core i5 processor (formerly code named Tiger Lake)	16 GB Intel Iris X Graphics (Integrated) None CPU: intel-core i5-1145g7e GPU: iris xe graphics idc045	
			Intel Atom® x5-E3940 Processor	Intel Xeon Gold 5220R Processor	Intel Pentium® J6426 Processor	Intel Pentium processor (formerly code named Elkhart Lake)	4 GB Intel HD Graphics 530 (Integrated) None CPU: j6426 GPU: intel-hd-530 idc070
			Intel Atom® x7-E3950 Processor	Intel Xeon Gold 6258R Processor	Intel Atom® x6425RE Processor	Intel Atom X processor family (formerly code named Elkhart Lake)	16 GB Intel HD Graphics 530 (Integrated) None CPU: x6425re GPU: intel-hd-530 idc071
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			Intel Atom® x7-E3950 Processor	Intel Xeon Gold 6258R Processor	Intel Atom® x6425RE Processor	Intel Atom X processor family	

43種硬體排列組合

CPU, iGPU, GPU, VPU, FPGA

Group ID

資料來源：<https://www.intel.com/content/www/us/en/developer/tools/devcloud/edge/hardware-workloads.html>

JupyterLab工作環境

剩餘工作時間
(預設10小時)

檔案瀏覽器

運行狀態

內容表

快速程式碼

插件管理

雲儲存連接器

The screenshot displays the JupyterLab Launcher interface. On the left is a sidebar with icons for file browser, running status, content table, code editor, plugin management, and cloud storage connectors. The main area shows a 'Most Used' section with cards for 'Accelerated Object Detection', 'Benchmark App Tutorial', 'Intruder Detection Object Detection', and 'DL Workbench AI Tools'. At the top right, a 'Time left: 8:06:40' indicator is highlighted. A 'Terminal' button is also visible.

Quick Launcher Time left: 8:06:40 Back to Intel.com Log Out

Search...

Most Used 最近使用過案例區

Accelerated Object Detection
Object Detection

Accelerate object detection by using asynchronous inferencing and distributing workloads to multiple types of processing units.

Benchmark App
Tutorial

Learn how to use the Intel® DevCloud benchmarking tool to evaluate the performance of your model's synchronous and asynchronous inference.

Intruder Detection
Object Detection

Perform object detection on an input video feed for an application that gives an alert when someone enters a restricted area.

DL Workbench
AI Tools

DLworkbench simplifies using the Intel Distribution of OpenVINO toolkit to tune, visualize, and compare the performance of deep learning models on Intel architecture.

Simple 0 2

Launcher

終端機
操作模式

程式碼編輯環境

The screenshot displays the Intel DevCloud OpenVINO IDE interface. On the left is the **檔案瀏覽區** (File Browser) showing a list of files including 'Untitled.ipynb'. The main area is the **程式碼編輯區** (Code Editor) for 'Untitled.ipynb', which contains a series of code cells with shell commands for system information. A context menu is open over the code editor, with 'Markdown' selected, and a red arrow points to it with the label **文字類型** (Text Type). On the right, a 'Select Kernel' dialog is open, showing 'Python 3 (OpenVINO 2021.4.2)' as the selected kernel, with a red arrow pointing to it and the label **核心運行環境** (Core Runtime Environment).

檔案瀏覽區

程式碼編輯區

文字類型

核心運行環境

DevCloud 執行環境及預安裝項目

➤ CPU

- Intel(R) Xeon(R) Gold 6138 CPU @ 2.00GHz

➤ OS

- Ubuntu 18.04.6 LTS

➤ OpenVINO

- 2022.1 (+ pytorch/TF1.5/TF2.4)
- 2022.2 (TF1.5/TF2.4)
- 2022.3
- 2021.4.2
- 2020.3.2 LTS
- Xpython

➤ Python

- 可用 `print(sys.version)`查詢版本
- 可用 `pip list`查詢所有安裝套件
- 這裡列出幾項常用
 - numpy
 - opencv-python
 - pip
 - scikit-learn
 - tensorflow
 - torch
 - torchvision

相關預安裝的套件數量、版本會隨選用Python + OpenVINO版本而有所不同。

DevCloud 應用範例

Featured Applications



Tiny YOLO* V3 Object Detection

Convert a pretrained Tiny YOLO* V3 model on Darknet to TensorFlow*. Then run accelerated inference for object detection.



Performance Comparison

Create a smart-video IoT solution for object detection using Intel® hardware and software. Explore the impact of data type on model performance.



Safety Gear Detection

Detect people and their safety gear from video input that uses an optimized, pretrained MobileNet* single-shot detector (SSD) neural network.

23個案例

Filter by

Industry

CLEAR

Retail (5)

Government (3)

Health and Life Sciences (3)

Manufacturing (2)

Transportation, Travel and Warehousing (2)

There may be additional results restricted from public access, sign in or register to ensure you are seeing all content available to you.

<p>Featured</p> <p>Performance Comparison</p> <p>ID: 678761 Date: 09/30/21</p> <p>Create a smart-video IoT solution for object detection using Intel® hardware and software. Explore the impact of data type on model performance.</p>	<p>Featured</p> <p>Safety Gear Detection</p> <p>ID: 678605 Date: 09/30/21</p> <p>Detect people and their safety gear from video input that uses an optimized, pretrained MobileNet* single-shot detector (SSD) neural network.</p>	<p>Neural Network Compression Framework</p> <p>ID: 727588 Date: 04/01/22</p> <p>Apply advanced algorithms for neural networks inference optimization with minimal accuracy drop using this framework.</p>	<p>Noise Suppression</p> <p>ID: 727584 Date: 04/01/22</p> <p>Use a pretrained deep-learning model (noise-suppression-pocnetlike-0001) that inputs a noise-induced audio file, and then generates a noise-suppressed audio file.</p>
<p>Time Series Forecasting</p> <p>ID: 727579 Date: 04/01/22</p> <p>Use a pretrained deep-learning model (time-series-forecasting-electricity-0001) to forecast the time series data from an open-sourced dataset: Electricity.</p>	<p>Tiny YOLO* V4 Object Detection</p> <p>ID: 727492 Date: 03/31/22</p> <p>Perform object detection using this pretrained deep-learning model. It inputs a video file and generates an output video that predicts objects and draws a bounding box around them.</p>	<p>Store Traffic Monitor</p> <p>ID: 678979 Date: 10/02/21</p> <p>Detect and infer objects with input feeds. Monitor customers and track inventory with a pretrained neural network.</p>	<p>Store Aisle Monitor</p> <p>ID: 678926 Date: 10/02/21</p> <p>To detect people in a retail setting, run inference on a pretrained model from the Intel® Distribution of OpenVINO™ toolkit.</p>
<p>Tiny YOLO* V3 Object Detection</p> <p>ID: 678623 Date: 10/02/21</p> <p>Convert a pretrained Tiny YOLO* V3 model on Darknet to TensorFlow*. Then run accelerated inference for object detection.</p>	<p>Accelerated Object Detection</p> <p>ID: 678626 Date: 10/01/21</p> <p>Accelerate object detection by using asynchronous inferencing and distributing workloads to multiple types of processing units.</p>	<p>OpenVINO™ Integration with TensorFlow* Classification</p> <p>ID: 678902 Date: 10/01/21</p> <p>Learn how to use the native TensorFlow* models with the OpenVINO™ toolkit using a classification sample application.</p>	<p>Intruder Detection</p> <p>ID: 678771 Date: 10/01/21</p> <p>Perform object detection on an input video feed for an application that gives an alert when someone enters a restricted area.</p>
<p>Machine Translation</p> <p>ID: 678966 Date: 10/01/21</p> <p>Translate text from English to German and Russian using nonautoregressive transformer models.</p>	<p>Frictionless Retail</p> <p>ID: 678998 Date: 10/01/21</p> <p>Evaluate a typical video analytics pipeline to identify customers as they shop for groceries and automatically bill them.</p>	<p>Restricted Zone Notifier</p> <p>ID: 679031 Date: 06/30/21</p> <p>Create a smart video solution to detect people within a video frame and determine whether they have entered a restricted zone.</p>	<p>Pneumonia Detection</p> <p>ID: 678632 Date: 09/30/21</p> <p>Classify the probability of pneumonia in X-Ray images using a pretrained neural network and the Intel® Distribution of OpenVINO™ toolkit.</p>
<p>Weld Porosity</p> <p>ID: 678762 Date: 09/30/21</p> <p>Detect arc-welding porosity defects in real time with an end-to-end solution that integrates hardware and software.</p>	<p>Brain Tumor Segmentation</p> <p>ID: 678996 Date: 09/29/21</p> <p>Convert and optimize a model based on U-Net for brain tumor segmentation to maximize inference performance on Intel® architecture.</p>	<p>People Counter System</p> <p>ID: 679033 Date: 09/29/21</p> <p>Deploy an IoT solution using a model from the Intel® Distribution of OpenVINO™ toolkit to detect and count people in each frame of a video feed.</p>	<p>Biomedical Text Mining</p> <p>ID: 678765 Date: 09/29/21</p> <p>Perform biomedical question answering using a pretrained BioBERT model and the BioASQ dataset for high-performance inferencing on Intel® hardware.</p>

資料來源：<https://www.intel.com/content/www/us/en/developer/tools/devcloud/edge/build/sample-apps.html>

物件偵測範例



Intruder Detection

Object Detection

Perform object detection on an input video feed for an application that gives an alert when someone enters a restricted area.



➤ Intruder-detector-jupyter.ipynb

➤ 闖入者偵測，主要包括人、車、腳踏車

➤ 主要依下列步驟執行

1. 使用Model Downloader下載模型
2. 建立多個工作並分派到指定硬體進行推論
3. 監看所有分派的工作直到全部完成
4. 檢視執行結果比較各硬體效能表現

工作排程指令

➤ 常用指令

➤ 多工批次

- nodes=x:ppn=y (x, y為節點及節點運算單元數量)

➤ 工作派送

- qsub

- 成功回傳ID

➤ 查看狀態 / 取消作業

- qstat / qdel

➤ 檢查所有支援硬體資訊及數量

- !pbsnodes | grep compnode | awk '{print \$3}' | sort | uniq -c

61種硬體排列組合

```
!pbsnodes | grep compnode | awk '{print $3}' | sort | uniq -c
```

```
6 idc001skl,compnode,openvino-latest,intel-core,i5-6500te,intel-hd-530,ram8gb
7 idc002mx8,compnode,openvino-latest,intel-core,i5-6500te,intel-hd-530,ram8gb,myriadx-8-vpu
5 idc004nc2,compnode,openvino-latest,intel-core,i5-6500te,intel-hd-530,ram8gb,myriadx-1-vpu
1 idc006kbl,compnode,openvino-latest,intel-core,i5-7500t,intel-hd-630,ram8gb
2 idc007xv5,compnode,openvino-latest,intel-xeon,e3-1268l-v5,intel-hd-p530,ram32gb
2 idc008u2g,compnode,openvino-latest,intel-atom,e3950,intel-hd-505,ram4gb,myriadx-1-vpu
1 idc009jkl,compnode,openvino-latest,intel-core,i5-7500,intel-hd-630,ram8gb
1 idc010jal,compnode,openvino-latest,intel-celeron,j3355,intel-hd-500,ram4gb
1 idc011ark2250s,compnode,openvino-latest,intel-core,i5-6442eq,intel-hd-530,ram8gb,myriadx-3-vpu
1 idc012ark1220l,compnode,openvino-latest,intel-atom,e3940,intel-hd-500,ram8gb,myriadx-2-vpu
```

工作分派及排程佇列

```
#Submit job to the queue
job_id_core = !qsub intruder_detector.sh -l nodes=1:1dc001sk1 -F "results/core/ CPU FP32 " -N intrud_core -v VENV_PATH,OPENVINO_RUNTIME
print(job_id_core[0])
#Progress indicators
if job_id_core:
    progressIndicator('results/core', f'i_progress_{job_id_core[0]}.txt', "Inference", 0, 100)
```

707174.v-qsvr-1.devcloud-edge

Inference

Total Estimated: 46.0 seconds

Remaining: 0 seconds

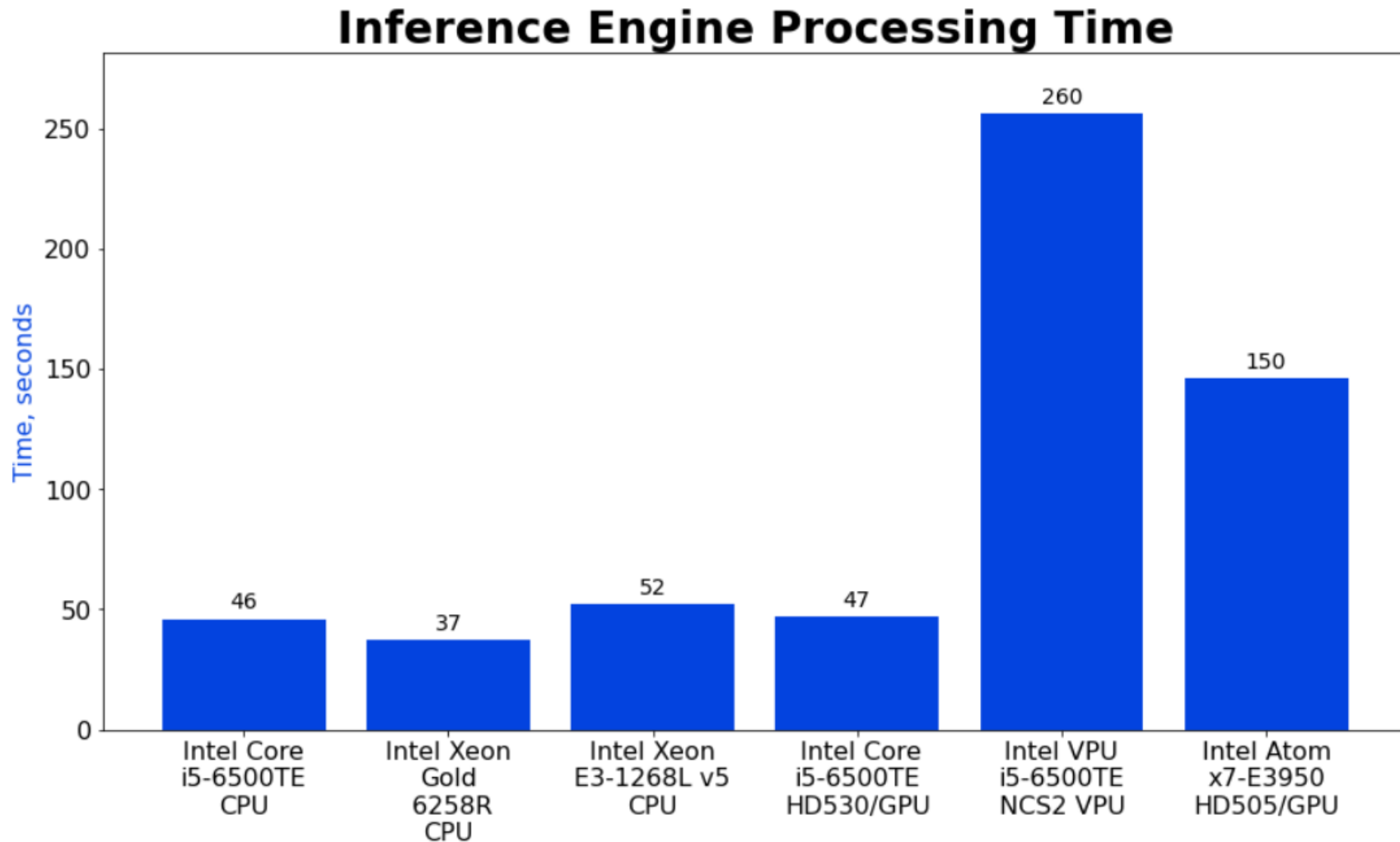
liveQstat()

2022-12-14 15:07:55

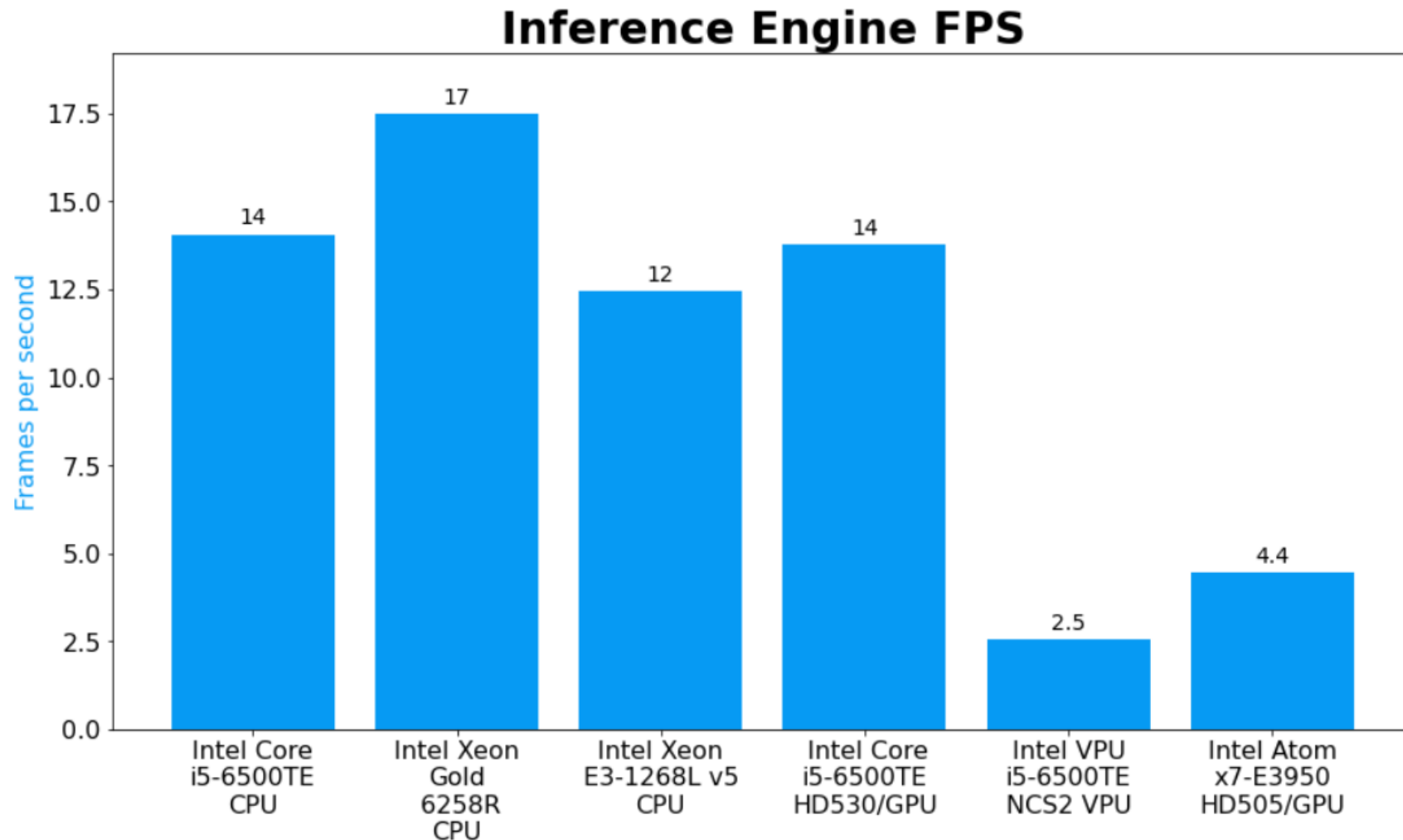
Job ID	Name	User	Time Use	S	Queue
707194.v-qsvr-1	intrud_core	u79934	00:00:00	R	academia
707195.v-qsvr-1	..._cascade_lake	u79934	00:00:20	R	academia
707196.v-qsvr-1	..._xeon_skylake	u79934	00:00:00	R	academia
707197.v-qsvr-1	intrud_gpu	u79934	00:00:00	R	academia
707198.v-qsvr-1	intrud_ncs2	u79934	00:00:00	R	academia
707199.v-qsvr-1	intrud_atom	u79934	00:00:00	Q	academia

Stop

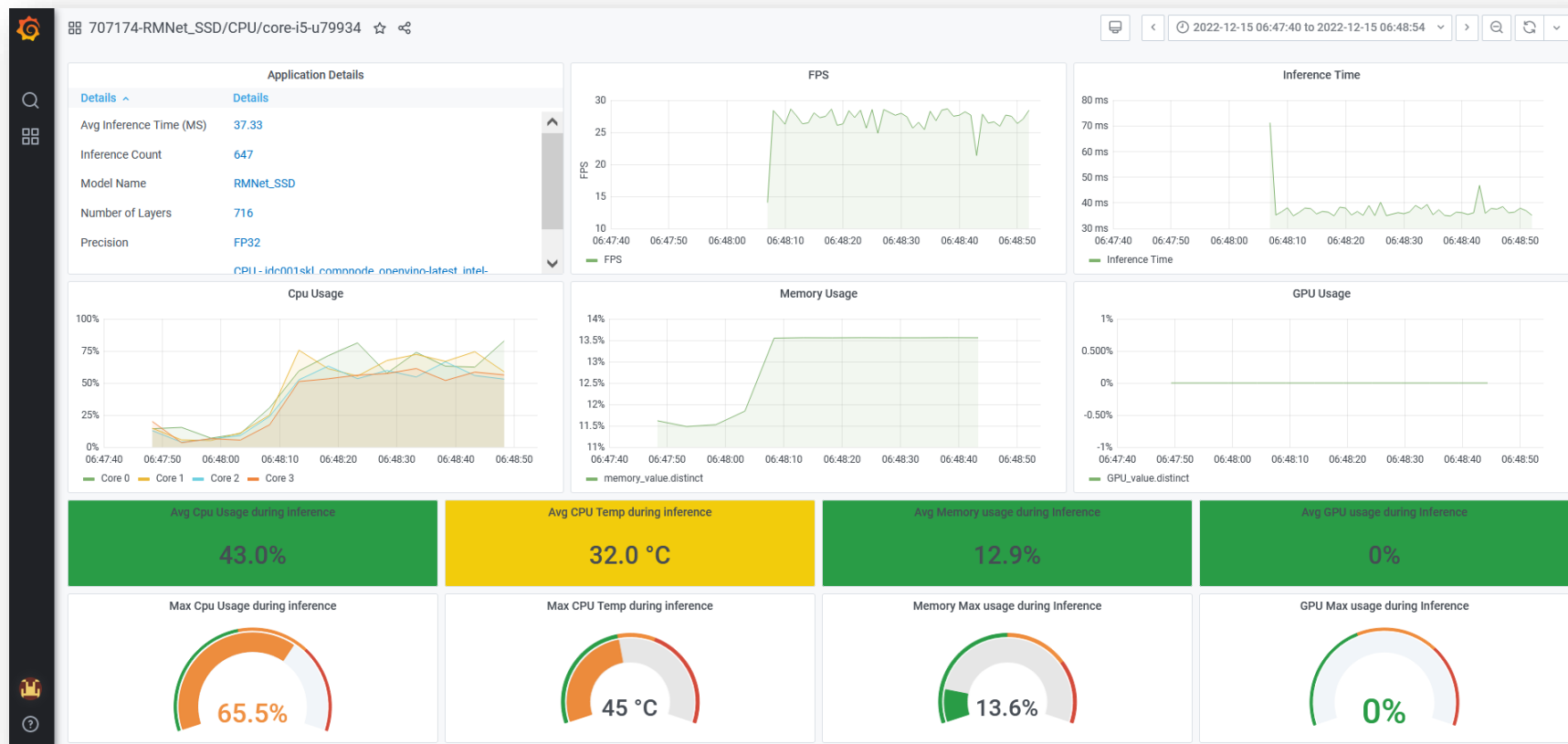
多硬體比較報表—推論時間(ms)



多硬體比較報表—推論速度(FPS)



儀表板展示



運行Tutorials (Notebooks)

1. 進入DevCloud Jupyter開發環境

2. 進入終端機環境

3. 下載Notebooks範例指令

4. 完成下載後會產生新路徑

5. 選擇範例路徑

6. 雙擊載入範例

7. 執行範例

下載完就可關閉

```
git clone --depth=1 https://github.com/openvinotoolkit/openvino_notebooks.git
```

Python3.8 (OpenVINO 2022.3.0)

```
[3]: # The MobileNet model expects images in RGB format.
image = cv2.cvtColor(cv2.imread(filename="../../data/image/coco.jpg"), code=cv2.COLOR_BGR2RGB)

# Resize to MobileNet image shape.
input_image = cv2.resize(src=image, dsize=(224, 224))

# Reshape to model input shape.
input_image = np.expand_dims(input_image, 0)
plt.imshow(image);
```

Intel DevCloud 下載及執行
OpenVINO Notebooks範例流程

OmniXRI整理製作, 2023/03/28

參考資料：<https://omnixri.blogspot.com/2023/03/intel-devcloudopenvino-notebooks.html>

參考文獻

- Intel DevCloud

<https://devcloud.intel.com/edge/>

- Intel OpenVINO

<https://docs.openvino toolkit.org/latest/index.html>

- Intel® DevCloud for Edge | OpenVINO™ toolkit | Ep. 58

<https://youtu.be/OgNnBnzlsZs>

- 許哲豪，如何在Intel DevCloud中執行OpenVINO Notebooks範例

<https://omnixri.blogspot.com/2023/03/intel-devcloudopenvino-notebooks.html>