



# Build Intelligent Apps with AI

**AI应用开发 -  
使用Azure认知服务  
自訂视觉服务**

July 2020  
Microsoft Reactor | Ryan Chung

```
led by player to
    .load_image("kg.png")
(self):
    alize Dog object and create Text o
g, self).__init__(image = Dog.image
x = games.mouse.x
bottom = games.screen.height
re = games.Text(value = 0, size = 24,
    top = 5, right = game
reen.add(self.score)
    a = games.Text(value = 0, size = 24,
    top = 5, left = game
reen.add(self.bird)
```



# Ryan Chung

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# Reactor



[developer.microsoft.com/reactor/](https://developer.microsoft.com/reactor/)  
@MSFTReactor on Twitter

# AI On-line Workshop agenda 人工智能应用在线研讨会议程

14:30	Welcome 开场
14:35	Custom Vision Service – Image Recognition 图片分类项目建立
15:10	Custom Vision Service – Object Detection 对象侦测项目建立
15:35	5 minutes Lab Break 中场休息 / 实作练习
15:40	Web Application Integration 网站整合实作
15:55	Q&A 问答时间
16:00	Event end 活动结束

# AI普及化 – 运用微软Azure认知服务



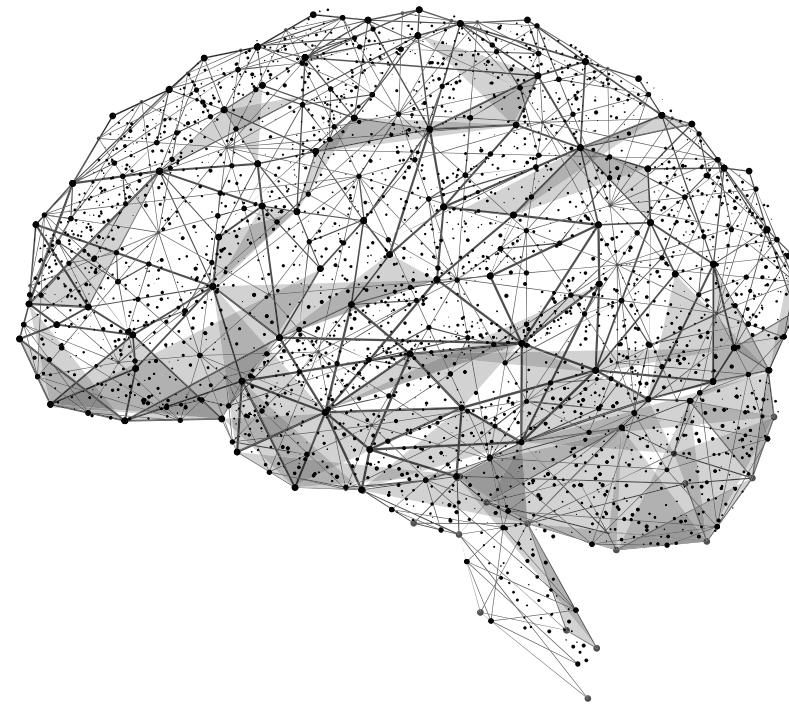
Lance Olson  
Director of Program Management,  
Applied AI

>>认知服务使开发人员能够

无需成为数据科学家即可充分利用AI。

# 让人工智能助您一臂之力!

- 广泛的各产业应用案例
- Azure认知服务协助您节省人力、金钱、时间成本
- 将您原本的应用程序加值成为智能化应用程序



# 资料与隐私议题

- 数据像是人工智能发展时的汽油，**越多、品质越好**的汽油，人工智能跑得就越快越远(**更好的预测**)
- 有些人工智能的服务会**自动储存资料**
- 时时谨记在心，数据的储存是否有**合乎法规**



# Custom Vision Service 自訂视觉服务



Cognitive Services

Custom Vision

Visual Intelligence Made Easy

Easily customize your own state-of-the-art computer vision models that fit perfectly with your unique use case. Just bring a few examples of labeled images and let Custom Vision do the hard work.

[SIGN IN](#)

<https://www.customvision.ai/>

# 需要使用 Azure 帐号登入

- 申请免费 Azure 账号

<https://aka.ms/Azurefreechina>

The screenshot shows the Microsoft Azure homepage with a dark theme. At the top, there's a navigation bar with links for Overview, Solutions, Products, Documentation, Pricing, Training, Markets, Partners, Support, Blogs, and More. On the right side of the top bar are links for Contact Salesperson, Search, My Account, Portal, and Log In. A green button labeled "Free Account" is visible on the far right. Below the navigation bar, a blue banner features a link to COVID-19 resources. The main content area has a dark background with white text. On the left, there's a large heading "原因所在。有目的地发明。" (The reason is there. Invent with purpose.) and a subtext about using over 100 services to create solutions. A green button at the bottom left says "开始使用" (Get Started). On the right, there's a diagram illustrating Azure Edge Zone architecture, showing three zones: "Azure Edge Zone", "Azure Edge Zone with carrier", and "Azure Private Edge Zone", each represented by a 3D model of a city or network components. Below the diagram, a text box announces the launch of Azure Edge Zone with 5G support.

Microsoft Azure

联系销售人员 搜索 我的帐户 门户 登录

概述 解决方案 产品 文档 定价 培训 市场 合作伙伴 支持 博客 更多

免费帐户 >

了解 Microsoft 如何应对 COVID-19 疫情，并获取有帮助的资源 >

原因所在。有目的地发明。

利用超过 100 项服务，使用你选择的框架，创建、部署和管理云端、本地和边缘应用程

免费开始使用 >

Azure Edge Zone with carrier

Azure Edge Zone

Azure Private Edge Zone

宣布推出 Azure Edge Zone：通过 Edge Zone 和 5G 提供超低延迟的体验 >

# Azure for Student

The screenshot shows the Microsoft Azure for Students landing page. At the top left is the Microsoft Azure logo. Below it is a navigation bar with links: 概述 (Overview), 解决方案 (Solutions), 产品 (Products), 文档 (Documentation), 定价 (Pricing), 培训 (Training), 市场 (Market), 合作伙伴 (Partners), 支持 (Support), 博客 (Blog), and 更多 (More). The main headline is "开始使用面向学生的 Azure 创造未来!" (Start using Azure for students to create the future!). Below it is a sub-headline: "创建面向学生的 Azure 免费帐户时获得 \$100 额度" (Get a \$100 credit when creating a free Azure account for students). A large green button with white text says "立即激活 >". At the bottom, there is a link: "阅读常见问题解答了解是否符合资格 >".

<https://azure.microsoft.com/zh-cn/free/students/>

# New Project 建立新的项目

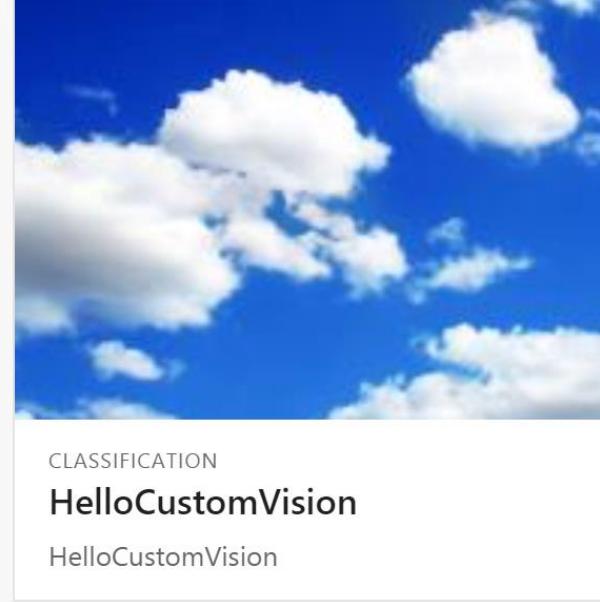
Custom Vision

## Projects

Project Name:  Project Type:  Resource:



**NEW PROJECT**



CLASSIFICATION  
**HelloCustomVision**  
HelloCustomVision

# Create new project 建立新的项目

Create new project

X

Name\*

Sky or not

Description

Enter project description

Resource

create new

HelloCustomVision [S0]

[Manage Resource Permissions](#)

Project Types ⓘ

- Classification
- Object Detection

Classification Types ⓘ

- Multilabel (Multiple tags per image)
- Multiclass (Single tag per image)

专案名称

专案描述

资源群组(会跟你登入的Azure账号有关)

专案类型

图片分类 或 对象侦测

分类类型

一张图片可以有多个标签 或  
一张图片只会有一个标签

# Create new project 建立新的项目

Domains:

General

Food

Landmarks

Retail

General (compact)

Food (compact)

Landmarks (compact)

Retail (compact)

领域英文	领域中文	备注
General	一般	无特定领域或目前尚未得知
Food	食物	餐厅菜色、单一水果照片等
Landmarks	景观	自然或人造景观，有一些人站在前面也可辨识
Retail	零售	商品特写如服饰、手表等
Compact	精简版	适合将模型导出至行动装置等

Pick the domain closest to your scenario. Compact domains are lightweight models  
that can be exported to iOS/Android and other platforms. [Learn More](#)

Cancel

Create project

# Add images 加入图片

- 同时设定Tag 标签
- 官方建议每个标签最好有30张以上的图片

Image upload X

Add Tags Uploading Summary



5 images will be added...

Add some tags to this batch of images...

My Tags

Sky

Upload 5 files

图片的差异性越大越好

不同的照相机角度

不同的光线

不同的背景

不同的视觉风格

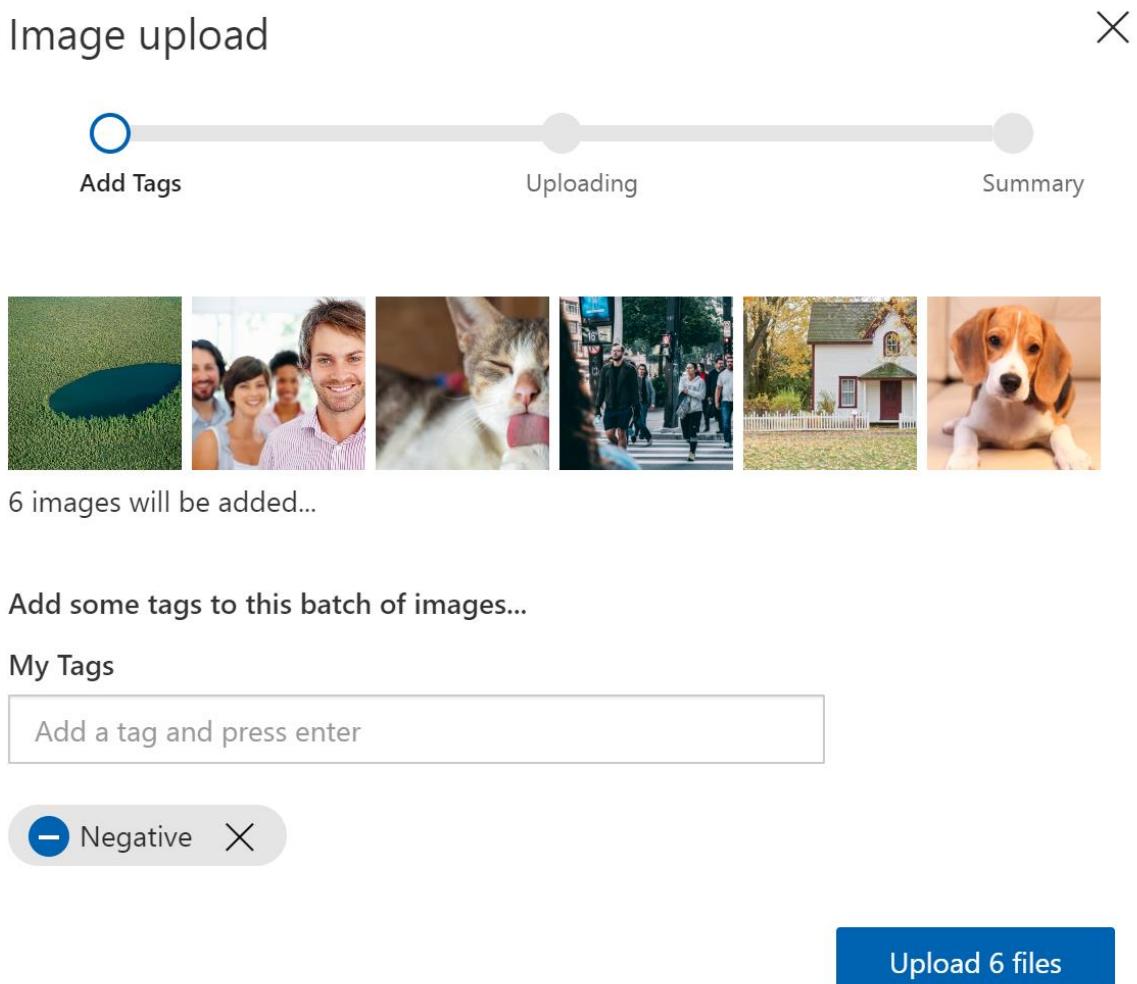
单一主题/多重主题

图片大小 (训练图片需小于6MB、  
预测图片需小于4MB)  
(短边像素至少256以上)

图片格式 (支援JPG/PNG/BMP/GIF)

# Add images 加入图片

- 不是天空的图片设定为Negative



# 训练资料

- 多元化

## The Right Data

I want to train a model to detect shoes



# 训练资料

- 越真实越好，实验室的资料有时太干净反而脱离现实
- 多样且平均分散，避免数据仅来自部分类别，造成偏差
  - 各种可能的情境
  - 真实世界的影像(不是在摄影棚/录音室/实验室里拍摄的)
  - 有背景噪音的声音资料
  - 各种风格的手写字
  - 不同种类的资要，但尽可能搜集数量均衡一些
  - 确认标注的正确性

# Train -> Quick Training 开始训练

Sky or not

Training Images    Performance    Predictions

Train

Quick Test

Filter

Add images    Delete    Tag images    Select all

Iteration

Workspace

Tags

Tagged    Untagged

Showing:

- Negative    Sky

Search For Tags:

Negative 5    Sky 5

Choose Training Type

Training Types ⓘ

Quick Training

Advanced Training

Train

# Performance 效能评测

Precision ⓘ



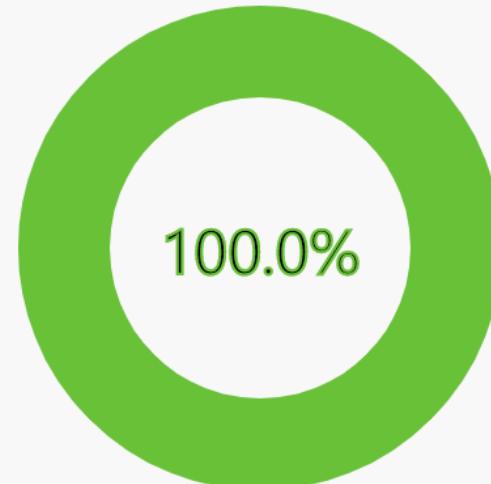
Precision  
模型的精确度

Recall ⓘ



Recall  
真实状况的吻合程度

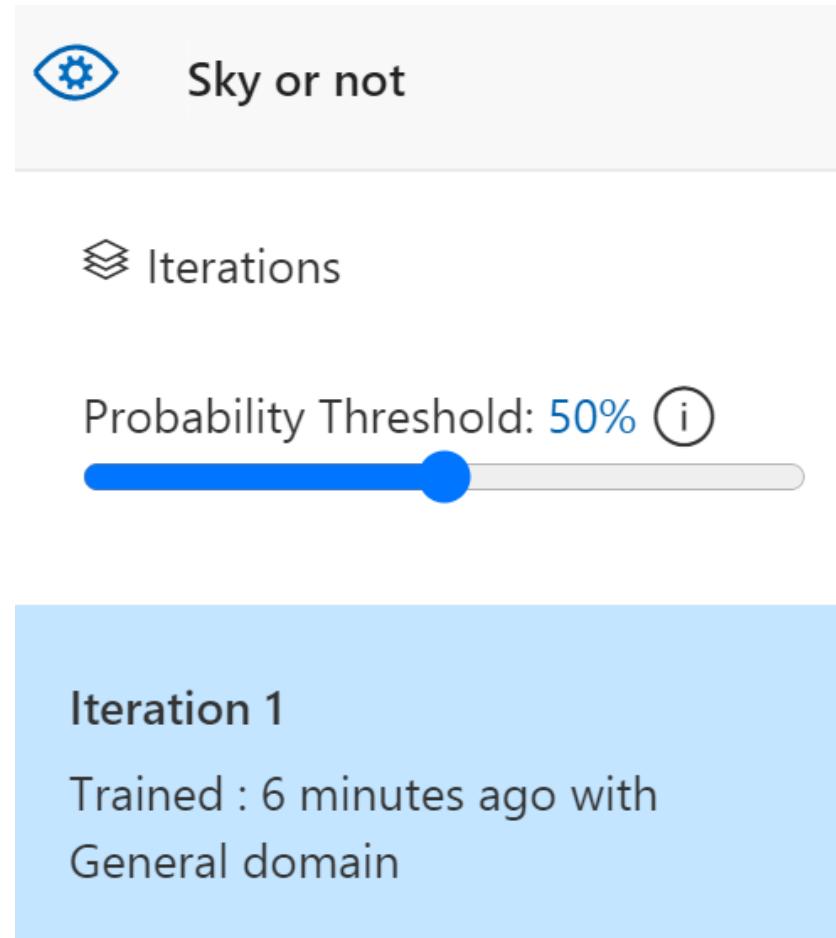
AP ⓘ



AP  
系统综合评比信息

# Probability Threshold

- Threshold越高，Precision越高，但Recall可能下降
- Threshold越低，Recall可能较高，但误报比例也增加



# Quick Test 测试

- 可输入图片网址或直接上传图片进行测试

Sky or not

Training Images Performance Predictions Train Quick Test

Iterations Publish Prediction URL Delete Export

Image URL

Enter Image URL →

or

Browse local files

File formats accepted: jpg, png, bmp  
File size should not exceed: 4mb

Using model trained in

Iteration

Iteration 1

Tag	Probability
Sky	100%
Negative	0%

# 实验方向

- 资料量悬殊 (Unbalanced Data)
  - 如果天空的照片跟不是天空的照片比例差异高，会有什么影响?
- 标记错误 (Dirty Data)
  - 如果把一些不是天空的照片标示为天空，也把一些是天空的照片标示为不是天空，会有什么影响?

# 常见评量方式

- Precision
- Recall
- F1 Score
- Accuracy

# 常见评量方式

$n = 100$	预测为No		预测为Yes	
实际上 是 No	TN	35	FP	15 (Type I Error)
实际上 是 Yes	FN	5 (Type II Error)	TP	45

**Precision 准确率** =  $\frac{\text{模型预测为Yes且实际上为Yes}}{\text{模型预测为Yes的个数}}$

**Recall 召回率** =  $\frac{\text{实际上为Yes而模型也预测为Yes}}{\text{实际上为Yes的所有个数}}$

**F1 Score** =  $2 * \frac{Precision * Recall}{Precision + Recall}$

**Accuracy 精准率** =  $\frac{\text{模型预测为Yes且实际上为Yes} + \text{模型预测为No且实际上为No}}{\text{所有预测的个数}}$

# 使用时间

- 机率为Yes或No比例相当时，大多数可用Accuracy
  - 因为当Yes或No明显比例偏高时，就全部猜那一边Accuracy会大幅提升
- 怕Type I Error的，要用Precision
  - Type I Error 就是预测为Yes但实际为No
  - 例如门禁系统把陌生人当成自家人
- 怕Type II Error的，要用Recall
  - Type II Error 就是预测为No但实际为Yes
  - 例如广告投放判断不是潜在客户但结果却是潜在客户
- F1 Score 可以避免Precision & Recall的极端误差

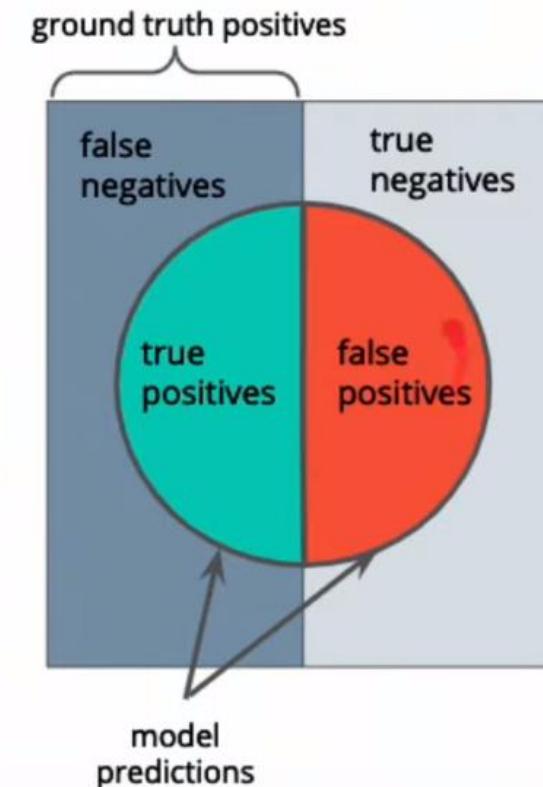
# Precision & Recall

- Precision – 准确率(你的模型判断是对的中，有多少真的是对的)
- Recall – 召回率(真的是对的的项目中，你的模型找到几个)
- 准确率是从模型的角度出发、召回率是用真实的状况来看

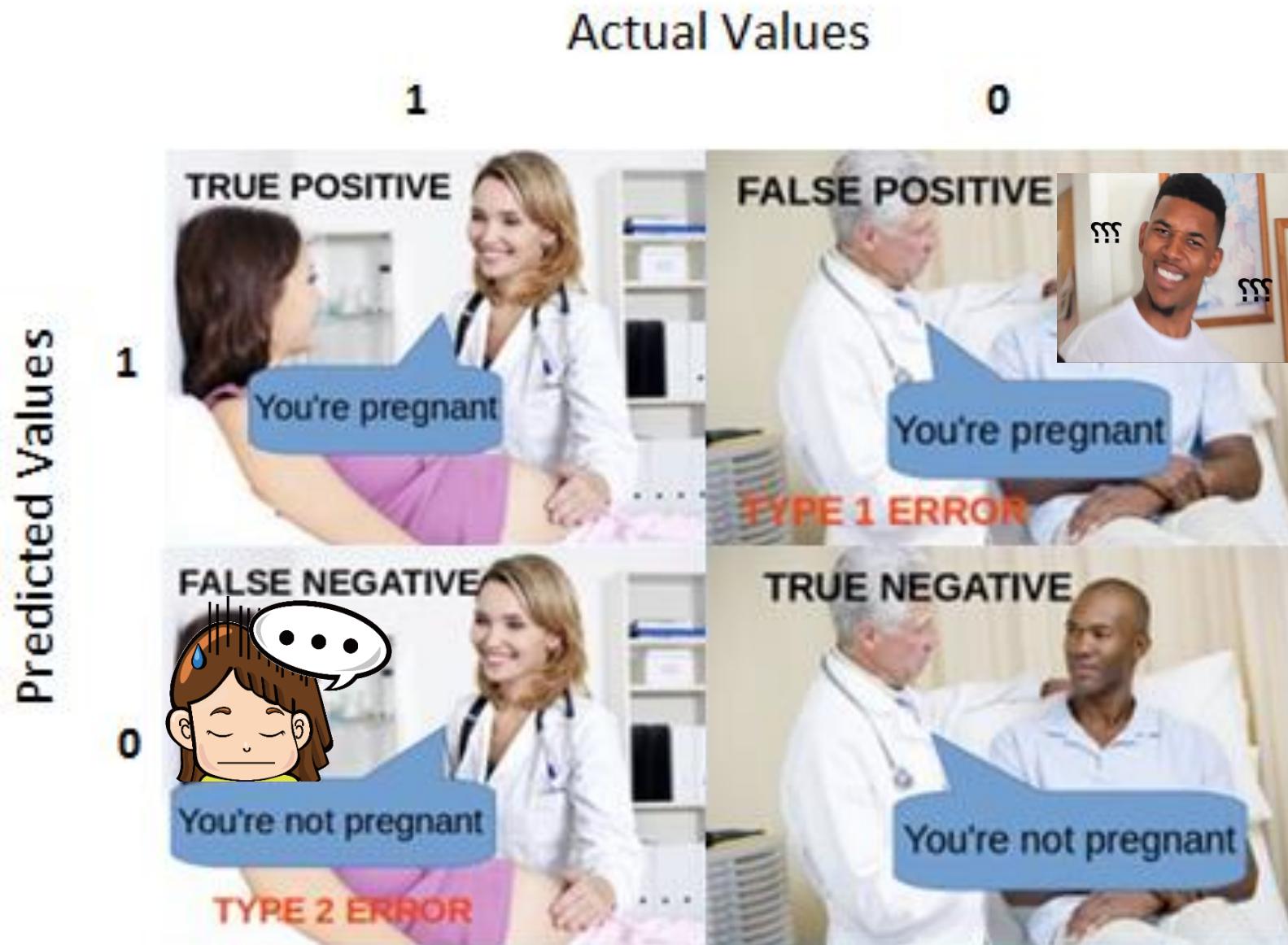
How do we test?

$$\text{Precision} = \frac{\text{true positives}}{\text{model predictions}} = \frac{\text{true positives}}{\text{true positives} + \text{false positives}} = \frac{\text{true positives}}{\text{model predictions}}$$

$$\text{Recall} = \frac{\text{true positives}}{\text{ground truth positives}} = \frac{\text{true positives}}{\text{true positives} + \text{false negatives}} = \frac{\text{true positives}}{\text{model predictions}}$$



# Pregnant or not



# Recall & Precision练习

模型預測結果



Cat



Dog



Cat

Precision 准确率 =  $\frac{\text{模型预测为} Yes \text{且实际上为} Yes}{\text{模型预测为} Yes \text{的个数}}$

Precision for Cat = \_\_\_\_\_

Precision for Dog = \_\_\_\_\_

Precision for Mouse = \_\_\_\_\_

Precision for Whole Model =  $\frac{\text{每一种类别的精确率加总}}{\text{类别数}}$

= \_\_\_\_\_

# Recall & Precision练习

模型預測結果



Cat



Dog



Cat

Recall 召回率 =  $\frac{\text{實際上為Yes而模型也預測為Yes}}{\text{實際上為Yes的所有個數}}$

Recall for Cat = \_\_\_\_\_

Recall for Dog = \_\_\_\_\_

Recall for Mouse = \_\_\_\_\_

Recall for Whole Model =  $\frac{\text{每一種類別的召回率加總}}{\text{類別數}}$

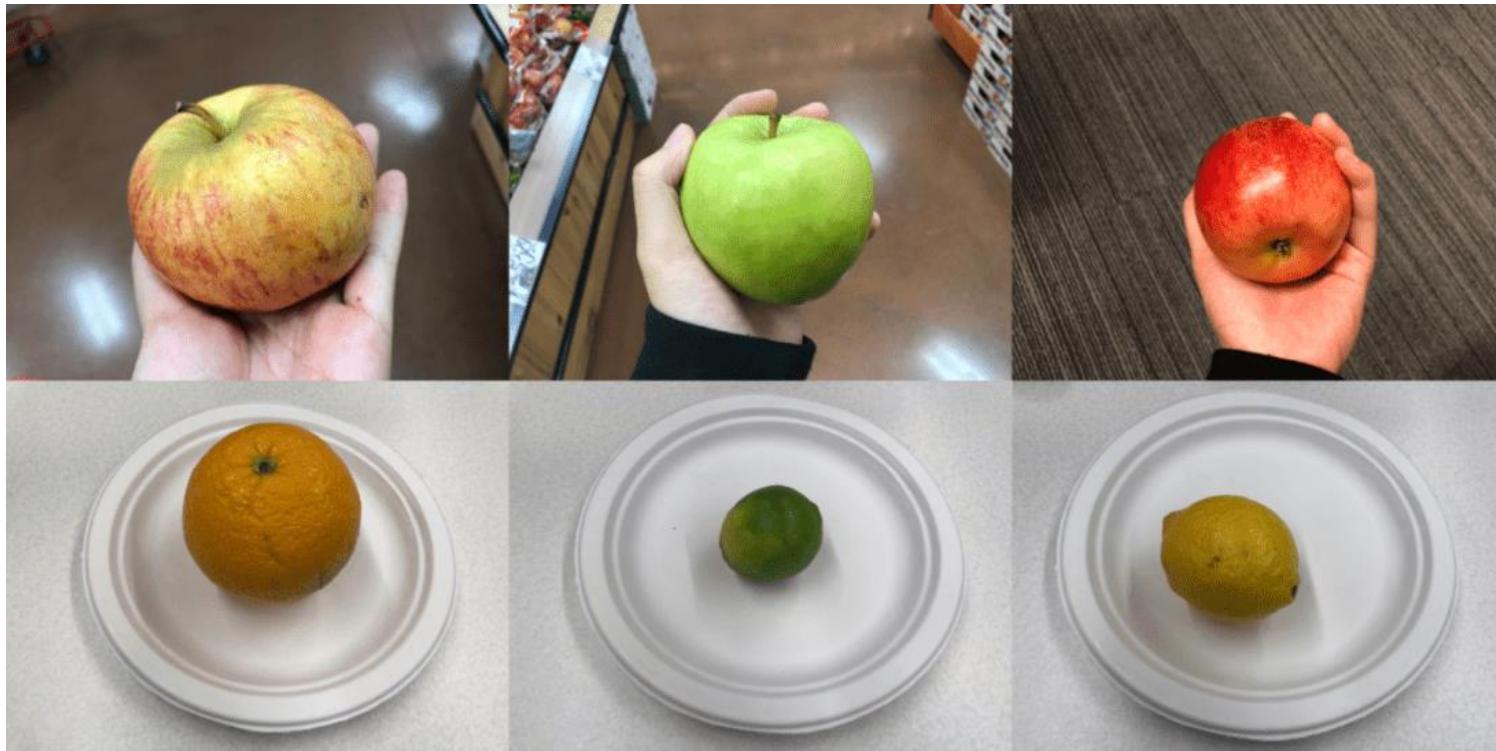
= \_\_\_\_\_

# 如何改善?

1. 先训练一次
2. 增加更多图片(每种分类平均数量)，再训练
3. 增加一些不同的照片(背景/光线/物件大小/拍摄角度/风格)，再训练
4. 换不同的照片来测试
5. 根据测试结果修正训练资料

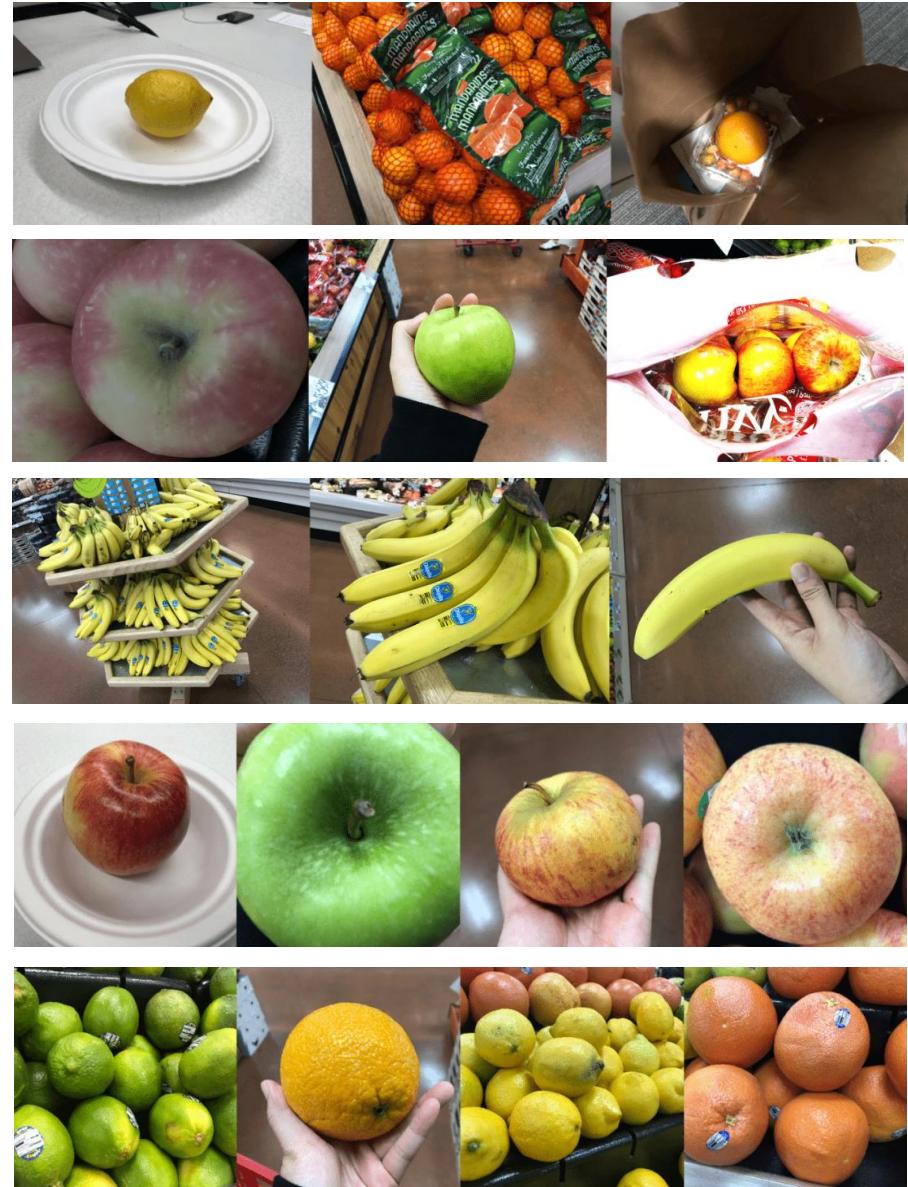
# 你的训练图片有可能误导了结果!

- 图片分类：苹果 VS. 橘子
- 可能误导的情况：
  - 如果苹果的照片都是拿在手上，而橘子的照片都是放在盘子里
  - 那么训练出来的模型会变成是区分拿在手上的还是放在盘子里的



# 训练注意事项

- 数据量
  - 建议每个标签至少50张图片
- 数据平衡
  - 可以一样多最好
  - 至少维持最多跟最少的比例是2:1  
(例如最多照片的标签有100张，则最少照片的标签至少有50张)
- 数据多样性
  - 避免误导模型，学习错了方向
  - 给予相同的标签，有以下的变异性
    - 背景、光线、物件大小、拍摄角度、风格
- 反例
  - 差异极高的对象，系统会自动辨识为反例(分数低)
  - 如果反例与目标对象有一些共通性，则建议建立成另一个标签  
(例如在分辨橘子跟葡萄时，不要把柠檬列成反例)



# Object Detection 对象侦测

Create new project X

Name\*  
Find elephant

Description  
Enter project description

Resource create new  
HelloCustomVision [S0] ▼

Manage Resource Permissions

Project Types (i)  
 Classification  
 Object Detection

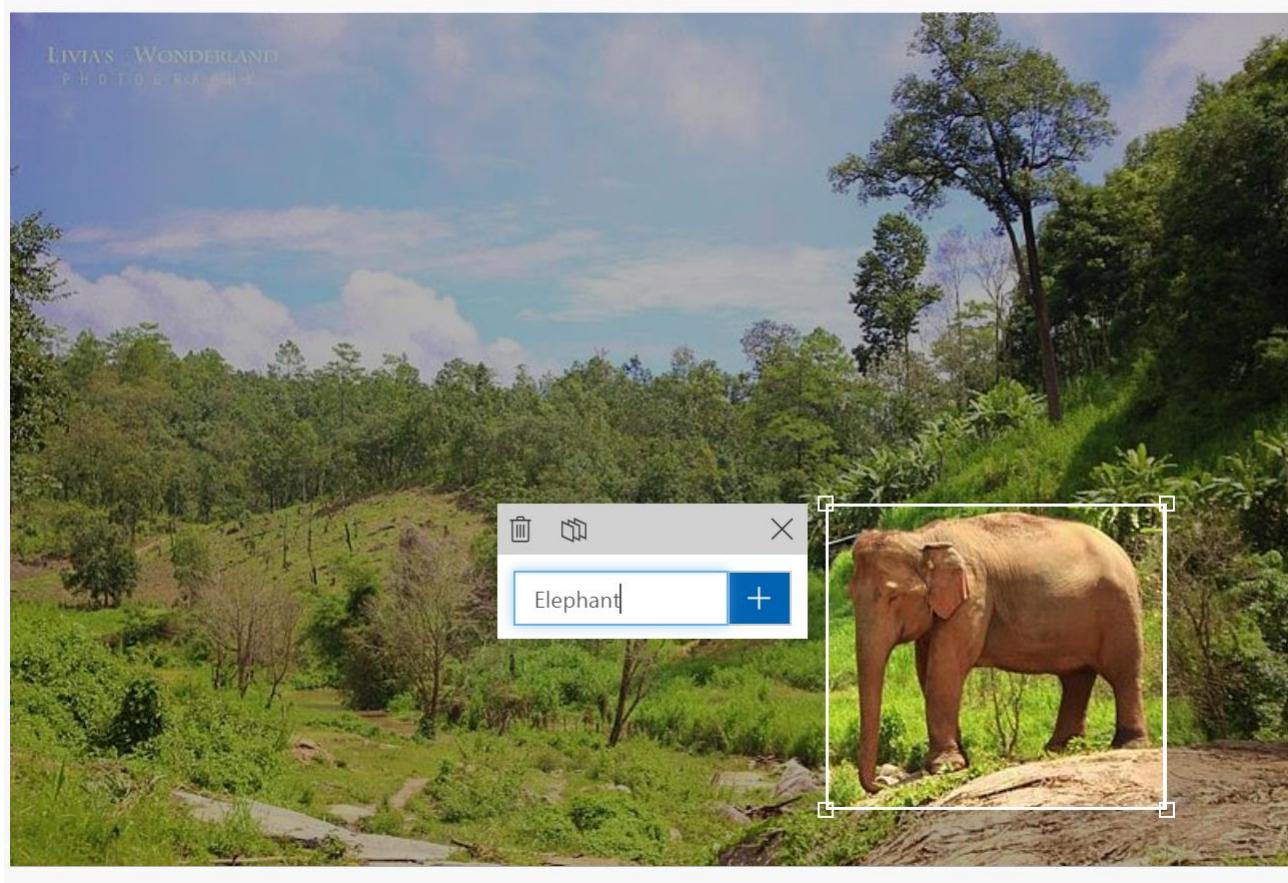
Domains:  
 General  
 Logo  
 Products on Shelves  
 General (compact)  
 General (compact) [S1]

Pick the domain closest to your scenario. Compact domains are lightweight models that can be exported to iOS/Android and other platforms. [Learn More](#)

Cancel Create project

# Add images

- 至少要15张图片



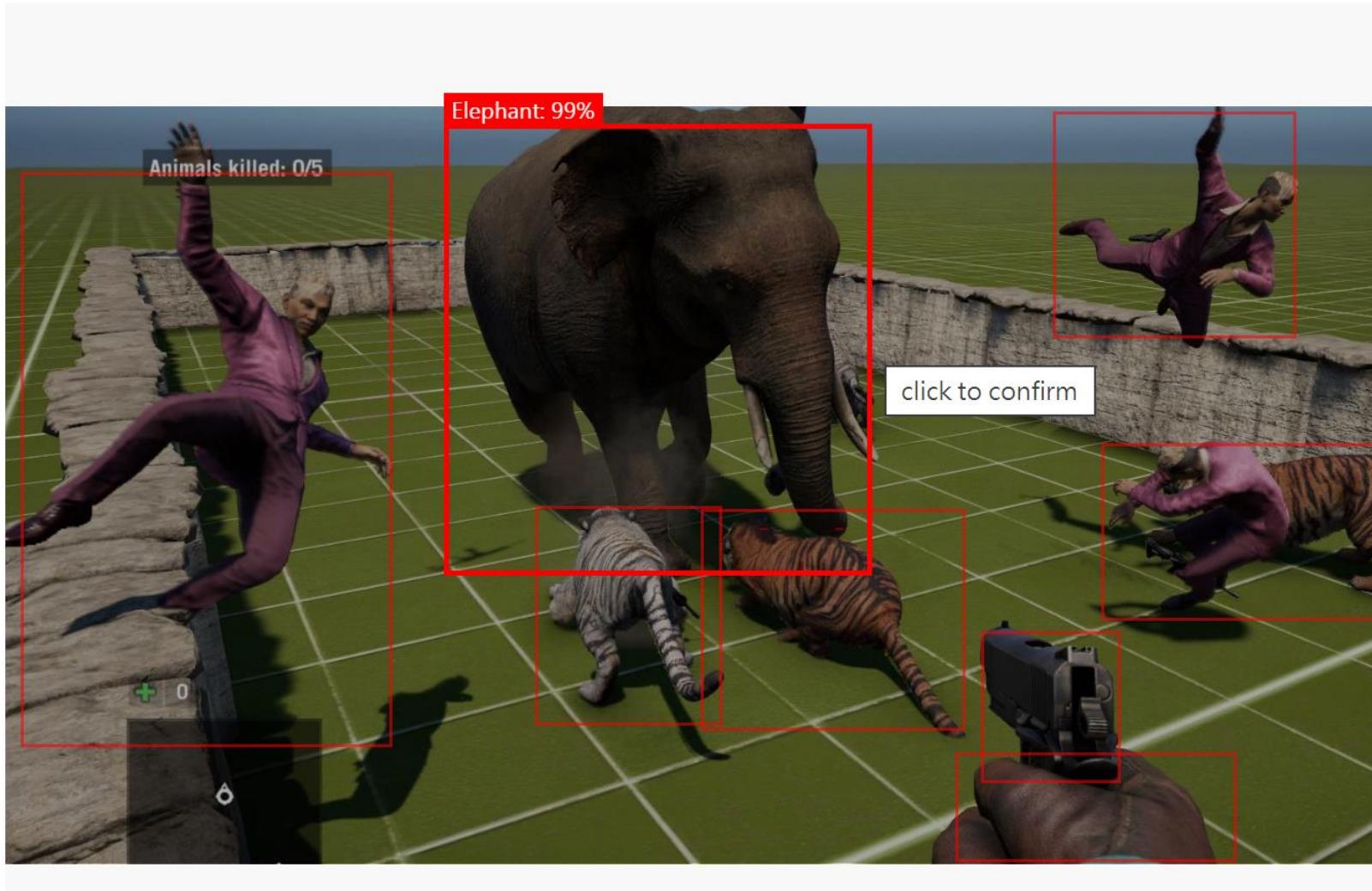
**Can't train just yet**

Your project can't be trained just yet. Make sure you have at least 15 images for every tag.



# 进行测试

- 侦测到很多对象，但大象的信心指数很高



# 网站整合

- 发布产生API : Performance -> Publish

The screenshot shows the 'Performance' tab of the Microsoft Custom Vision interface. At the top, there are four tabs: 'Training Images', 'Performance' (which is selected), and 'Predictions'. Below the tabs are four buttons: 'Publish' (with a checkmark icon), 'Prediction URL' (with a globe icon), 'Delete' (with a trash bin icon), and 'Export' (with a downward arrow icon). The main content area is titled 'Publish Model' and contains two paragraphs of text. The first paragraph states: 'We only support publishing to a prediction resource in the same region as the training resource the project resides in.' The second paragraph says: 'Please check if you have a prediction resource and if the prediction resource is in the same region as the training resource.' Below this text are two input fields: 'Model name' containing 'Iteration1' and 'Prediction resource' containing 'HelloCustomVision-Prediction'. At the bottom are two buttons: 'Publish' (blue) and 'Cancel'.

Training Images    **Performance**    Predictions

✓ Publish    Prediction URL    Delete    Export

Publish Model    X

We only support publishing to a prediction resource in the same region as the training resource the project resides in.

Please check if you have a prediction resource and if the prediction resource is in the same region as the training resource.

Model name  
Iteration1

Prediction resource  
HelloCustomVision-Prediction

Publish    Cancel

# 修改范例

- 填上Prediction API
- 填上Prediction-Key

## Analyze image:

輸入一個圖片網址，然後按下 分析圖片 按鈕.

Image to analyze:

Response:

```
{  
  "id": "",  
  "project": "",  
  "iteration": "",  
  "created": "",  
  "predictions": [  
    {  
      "probability": 1,  
      "tagId": "",  
      "tagName": "Sky"  
    },  
    {  
      "probability": 4.48418629e-11,  
      "tagId": "",  
      "tagName": "Negative"  
    }  
  ]  
}
```

Source image:



# 修改范例出現預測結果摘要

- Predictions Array
- probability > 0.8
- tagName == "Sky"



應該是天空! (信心:1)



不是天空吧

# 修改范例出現預測結果摘要

- Predictions Array
- probability > 0.8
- tagName == "Sky"

```
.done(function(data) {
    //顯示JSON內容
    $("#responseTextArea").val(JSON.stringify(data, null, 2));
    for(let x=0;x<data.predictions.length;x++){
        if(data.predictions[x].probability >= 0.8 && data.predictions[x].tagName == "Sky"){
            $("#picDescription").text("應該是天空! (信心:"+ data.predictions[x].probability +")");
            break;
        }else{
            $("#picDescription").text("不是天空吧");
        }
    }
})
```

# 延伸练习

- 修改成上传图片的版本
- 制作对象侦测的网页版本

# AI 实务情境与解决方案



# 质量检测，全自动辨识分类



品 質 檢 測

以電腦視覺取代人眼，高標準檢測永不疲勞

適用行業 製造業、農業、物流業、倉儲業、都市管理

解決方案 • 利用電腦視覺，結合攝影機，並運用認知服務，  
快速進行檢測

客戶需求 瑕疵品檢測、農產品外觀分級、辨識標籤錯  
貼或漏貼、垃圾分類

企業效益 • 誤判率低、速度快  
• 成本降低

現有挑戰 以人工進行品管、分類或貼標作業的檢測，  
錯誤率高，品管的效率低，花費高

使用的微軟服務及產品 Azure Custom Vision Service、Computer Vision API

# 物品检索，快速查询提供信息



物 品 檢 索

快速匹配，讓電腦幫您看出 A 或 B

適用行業 汽車、家電、各種物品保養維修業

客戶需求 確認維修品的型號，才能叫零件維修

現有挑戰 需翻閱手冊或檢視產品細節才能確知產品  
型號，相當耗費時間；有時非老經驗的師  
傅不可

解決方案

- 利用電腦視覺，快速透過攝影機，辦識產品型號
- 產品的原始資料，可從照片建立
- 透過語音與現場技師溝通，免除操作電腦的麻煩

企業效益

- 誤判率低、速度快
- 成本降低

使用的微軟服務及產品

Azure Custom Vision Service、Computer Vision API

# 延伸练习

- 在你既有的应用程序中加入
  - Computer Vision 计算机视觉
  - Text Translation 文字翻译
- 认知服务官网与范例
  - <https://azure.microsoft.com/services/cognitive-services/>
  - <https://how-old.net/>
  - <https://what-dog.net/>



- 其他范例
  - 图片分类  
<https://docs.microsoft.com/learn/patterns/classify-images-with-vision-services/>
  - 文字适当性分析  
<https://docs.microsoft.com/learn/patterns/evaluate-text-with-language-services/>
  - 语音识别与翻译  
<https://docs.microsoft.com/en-us/learn/patterns/translate-speech-with-speech-services/>

# AI 延伸学习资源

- 图片分类  
[docs.microsoft.com/learn/patterns/classify-images-with-vision-services/](https://docs.microsoft.com/learn/patterns/classify-images-with-vision-services/)
- 不当文字判断  
[docs.microsoft.com/learn/patterns/evaluate-text-with-language-services/](https://docs.microsoft.com/learn/patterns/evaluate-text-with-language-services/)
- 语音识别与翻译  
[docs.microsoft.com/en-us/learn/patterns/translate-speech-with-speech-services/](https://docs.microsoft.com/en-us/learn/patterns/translate-speech-with-speech-services/)
- Azure入门  
[docs.microsoft.com/learn/patterns/azure-fundamentals/](https://docs.microsoft.com/learn/patterns/azure-fundamentals/)
- 人工智能工程师系列  
[docs.microsoft.com/en-us/learn/browse/?roles=ai-engineer](https://docs.microsoft.com/en-us/learn/browse/?roles=ai-engineer)
- Python入门影片  
<https://www.youtube.com/playlist?list=PLIrxD0HtieHhS8VzuMCfQD4uJ9yne1mE6>

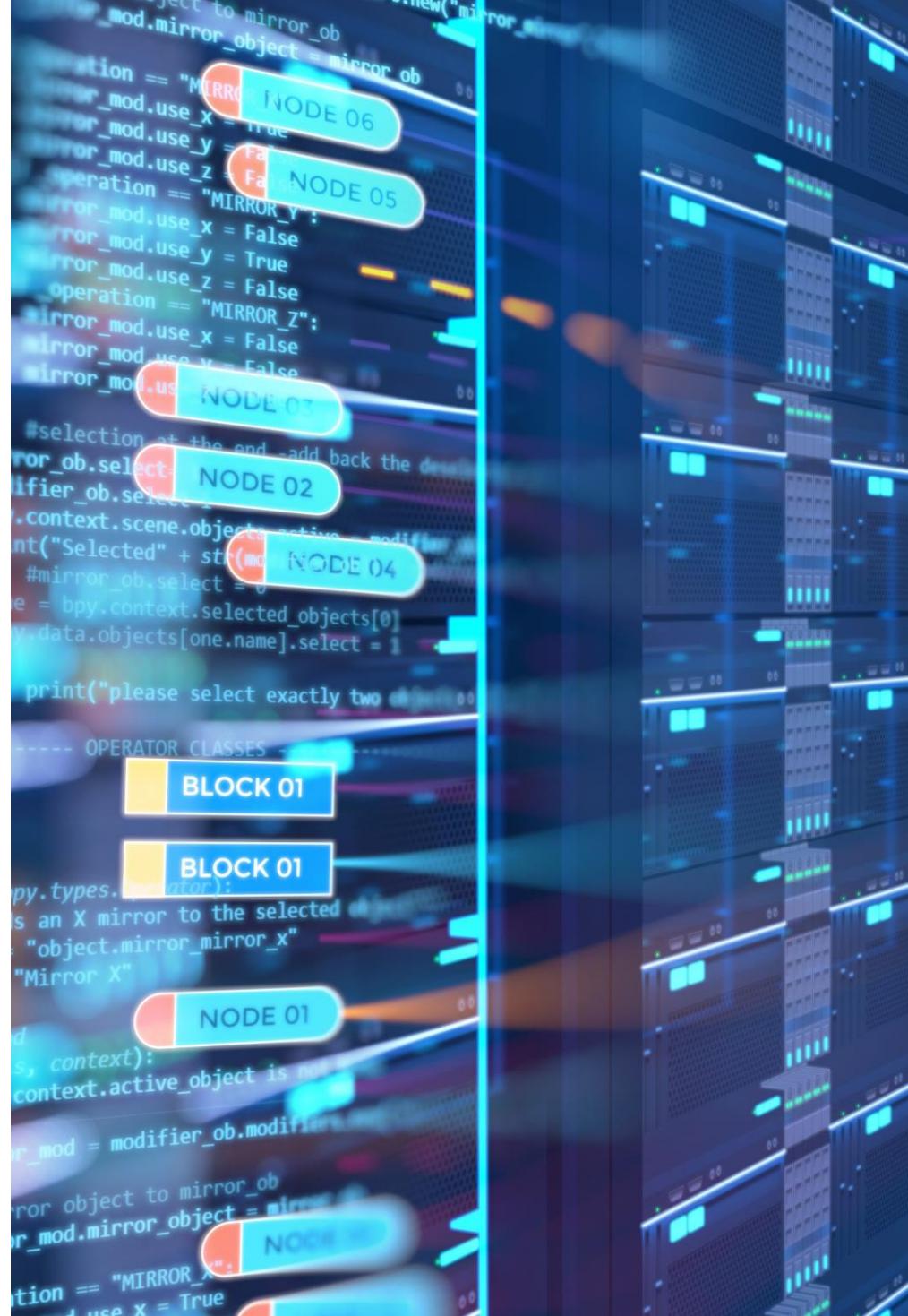
# 微软认证

人工智能系列：

- Azure AI Engineer Associate
- Azure Developer Associate
- Azure Fundamentals

还有：

- Azure Data Engineer Associate
- Azure Data Scientist Associate





# Reactor



[developer.microsoft.com/reactor/](https://developer.microsoft.com/reactor/)  
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