

日常生活中的 機器學習與 AI 應用

楊証琨、游為翔

中央研究院資訊科學研究所

2017.10.28 中央研究院 Open House 活動



Data
Insights
Research
Lab 資料洞察實驗室



講者



- 台大土木所畢
- 中研院資訊所研究助理
- 研究專長
 - 社群媒體資料處理分析
 - 製造工業影像資料分析

- 台大心理所畢
- 中研院資訊所研究助理
- 研究專長
 - 消費及使用者行為分析
 - 深度學習於影像辨識研究

*What's
~~Data Science?~~*

Artificial Intelligence?





Data Scientist: *The Sexiest Job of the 21st Century*

**Meet the people who
can coax treasure out of
messy, unstructured data.**

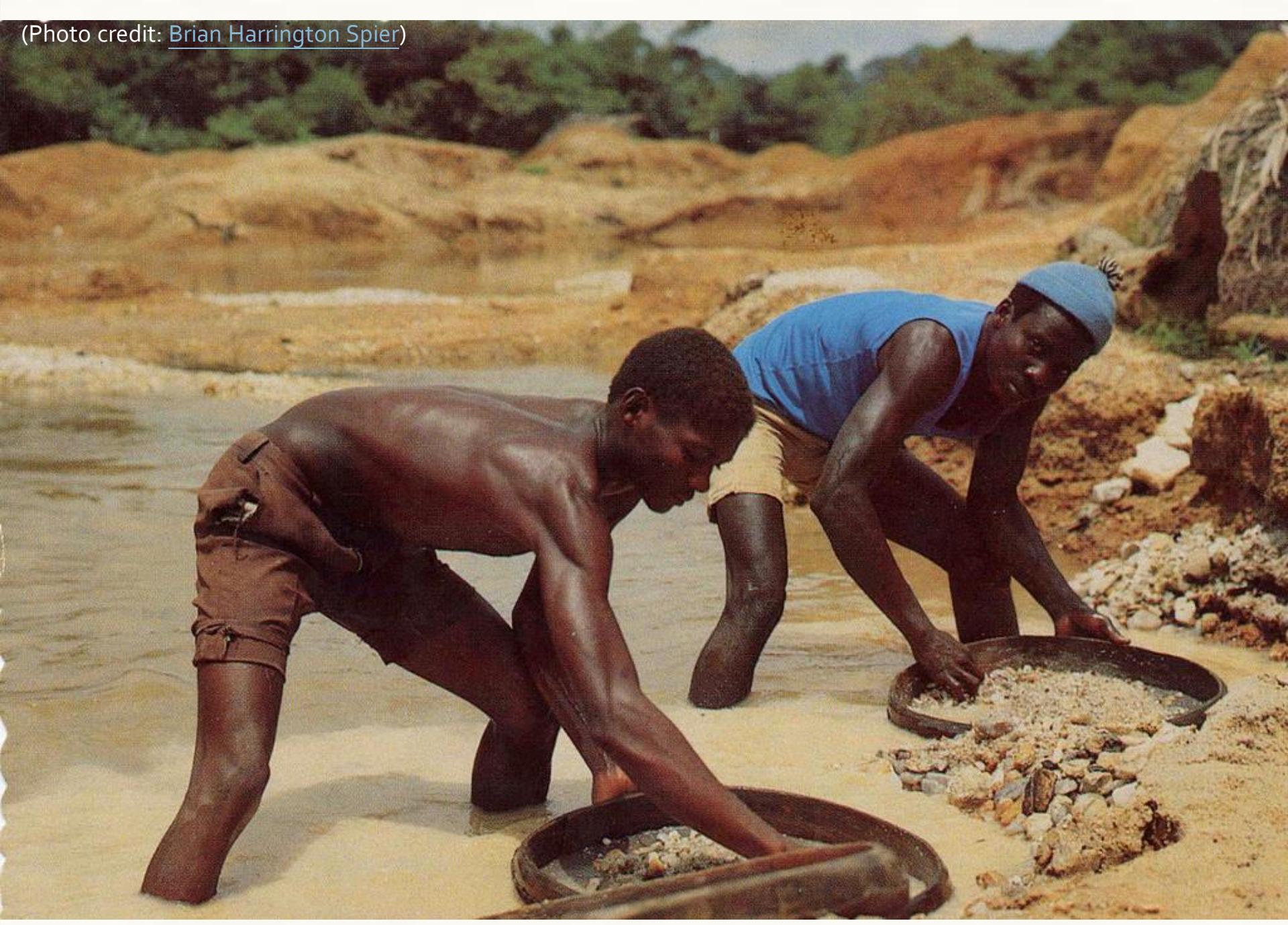
by Thomas H. Davenport
and D.J. Patil

W

hen Jonathan Goldman arrived for work in June 2006 at LinkedIn, the business networking site, the place still felt like a start-up. The company had just under 8 million accounts, and the number was growing quickly as existing members invited their friends and colleagues to join. But users weren't seeking out connections with the people who were already on the site at the rate executives had expected. Something was apparently missing in the social experience. As one LinkedIn manager put it, "It was like arriving at a conference reception and realizing you don't know anyone. So you just stand in the corner sipping your drink—and you probably leave early."

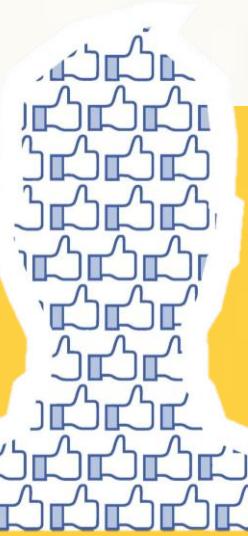


(Photo credit: Brian Harrington Spier)



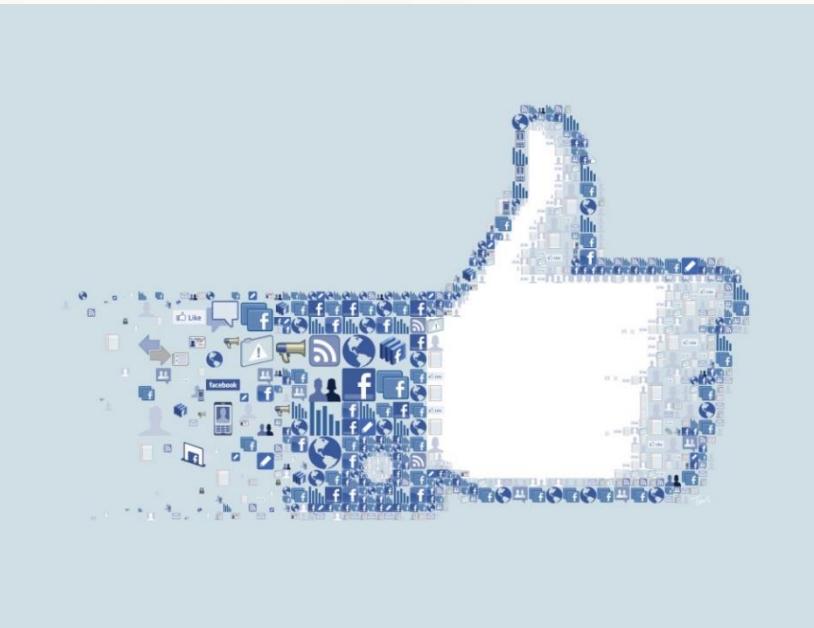


Real Example in 資料洞察實驗室



 Like

You are what you like!



誰按的粉絲團？

??

小茉莉-陳瑀希

Garena 《英雄聯盟 LOL》

波多野結衣Hatano Yui

解婕翎

豆花妹 蔡黃汝

Nono_辜莞允

張景嵐

FHM Taiwan 男人幫國際中文版

潮物blog - 街頭潮流男著

張小筑 Ya Chu

??

Catworld小舖

EYESCREAM Inc.

LOVFEEL

OB嚴選

grace gift

BEVY C.

Joyceshopstyle

QUEEN FASHION SHOP

SweeSa水莎

Lulus



性別

男

[小茉莉-陳瑀希](#)

[Garena 《英雄聯盟 LOL》](#)

[波多野結衣Hatano Yui](#)

[解婕翎](#)

[豆花妹 蔡黃汝](#)

[Nono_辜莞允](#)

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[FHM Taiwan 男人幫國際中文版](#)

[潮物blog - 街頭潮流男著](#)

[張小筑 Ya Chu](#)

女

[Catworld小舖](#)

[EYESCREAM Inc.](#)

[LOVFEEL](#)

[OB嚴選](#)

[grace gift](#)

[BEVY C.](#)

[Joyceshopstyle](#)

[QUEEN FASHION SHOP](#)

[SweeSa水莎](#)

[Lulus](#)



體型

??

??

一休陪你一起愛瘦身

《HITO 本舖》

iFit 愛瘦身

潮物部落格

小甜甜 張可昀

PAZZO

FB減肥達人 輕鬆教你瘦

Image

美樂蒂 Melody

《OneBoy》

BEMAX

UNO STORE

Woma

RockSteady

OB嚴選

SweeSa水莎

鍾欣凌

高高-流行服飾Store

杜詩梅 Tu Shih Mei

Maxy

體型

胖

一休陪你一起愛瘦身

iFit 愛瘦身

小甜甜 張可昀

FB減肥達人 輕鬆教你瘦

美樂蒂 Melody

BEMAX

Woma

OB嚴選

鍾欣凌

杜詩梅 Tu Shih Mei

瘦

《HITO 本舖》

潮物部落格

PAZZO

Image

《OneBoy》

UNO STORE

RockSteady

SweeSa水莎

高高-流行服飾Store

Maxy



學歷

高

TED

Technews 科技新報

批踢踢實業坊 (Ptt.cc)

PanSci 科學新聞網

商業周刊 (商周.com)

TEDxTaipei

The News Lens 關鍵評論網

背包客棧

VoiceTube 看影片學英語

Cheers : 快樂工作人

低

在不瘋狂就等死

羅志祥 SHOW

Mimi Dancing Club

小A辣

小三魔法棒 (小三美日)

真愛談戀愛 × 真愛橋

宛宛兒

連靜雯joanne lien

BY2

爆笑禁區





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讚

追蹤

分享

...

來去逛逛

Institute of Information Science, Academia Sinica



收入

高

商業周刊

BMW Taiwan總代理 汎德

Citiesocial

Mobileo1

Technews 科技新報

背包客棧

天下雜誌

財報狗

經理人月刊MANAGERtoday

遠見雜誌

低

學生愛打工

Tetris Battle

Garena<英雄聯盟LOL>

神魔之塔 Tower of Saviors

遊戲大亂鬥

終極一班2

ENL 簡單新生活

R-chord

AES黃鴻升

You Are the Apple of My Eye



收入 ($25 < \text{age} < 40$)

高

[citiesocial](#)

[商業周刊](#)

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[Technews 科技新報](#)

[台灣廉價航空福利社](#)

[Inside 硬塞的網路趨勢觀察](#)

[經理人月刊MANAGERtoday](#)

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低

[唯舞獨尊\(臉書版\)_首款社群平台音樂遊戲](#)

[Android 免費遊戲區](#)

[ENL 簡單新生活](#)

[Tetris Battle](#)

[學生愛打工](#)

[RC語音](#)

[終極一班2](#)

[終極x宿舍](#)

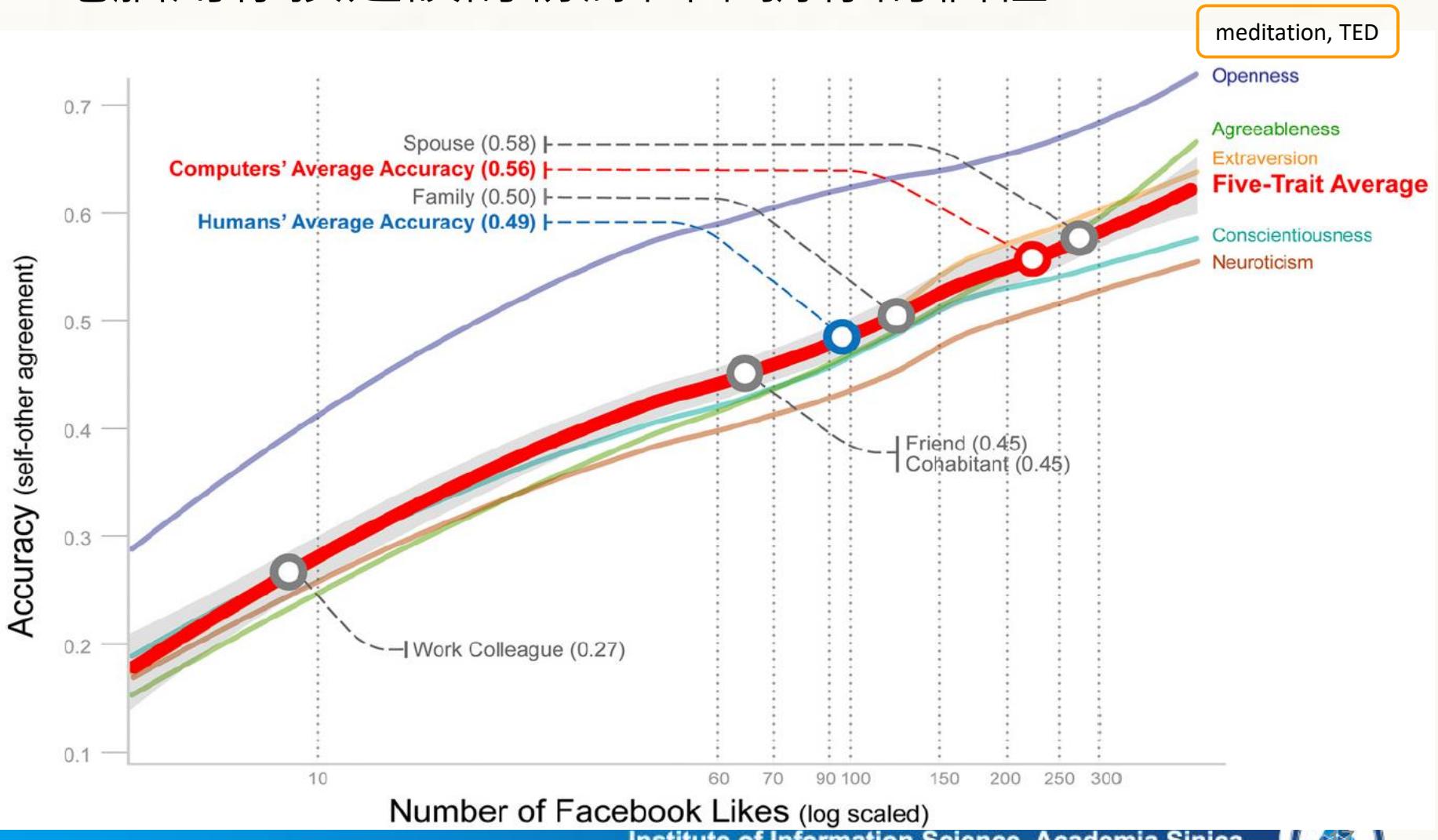
[遊戲大亂鬥](#)

[蔡芷紜](#)



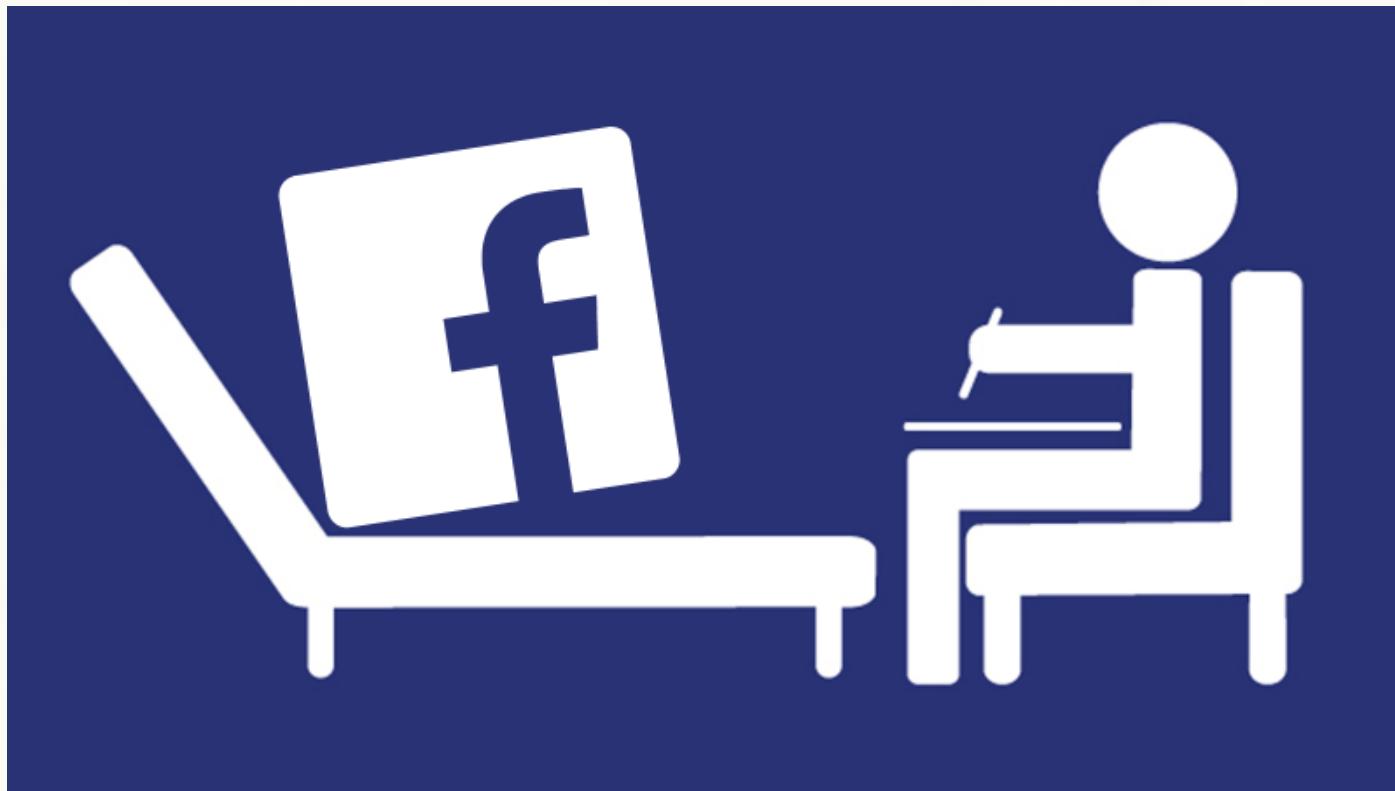
Computer vs. Humans

- 電腦用你按過讚的粉絲團來猜你的個性



Facebook 的強大

- 一名心理諮詢師與其病人的故事

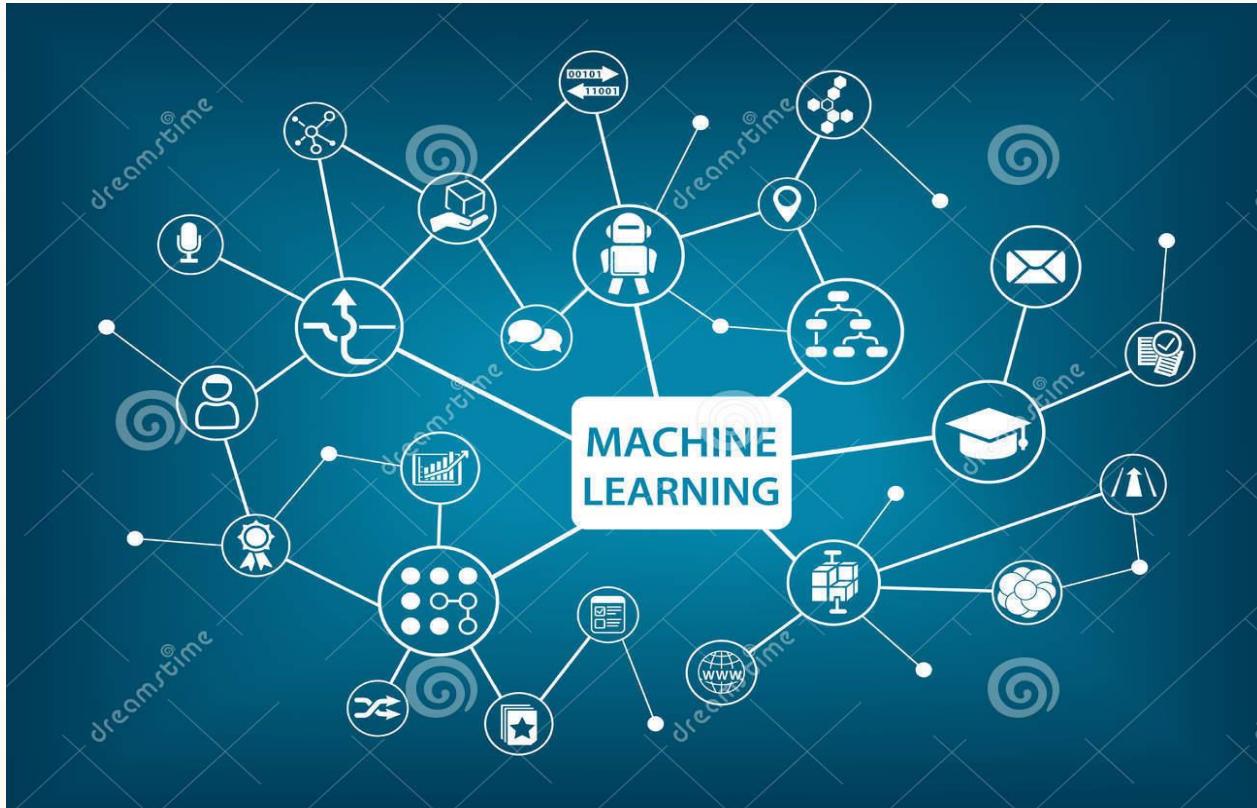


Facebook 的強大

- 這位資深心理諮詢師，其病人的年紀多在 50~60 歲上下，某天一位 20 出頭的滑板少年來找他看診
- 看診結束過後沒幾天，該名滑板少年發現自己的“你可能認識的好友”清單裡面出現很多完全不認識的老人
- 好奇之下拿給心理諮詢師看，才發現那些推薦名單大都是他的病人
- 診間沒有 WiFi，醫師也不會加病人好友，且心理諮詢非常注重個人隱私

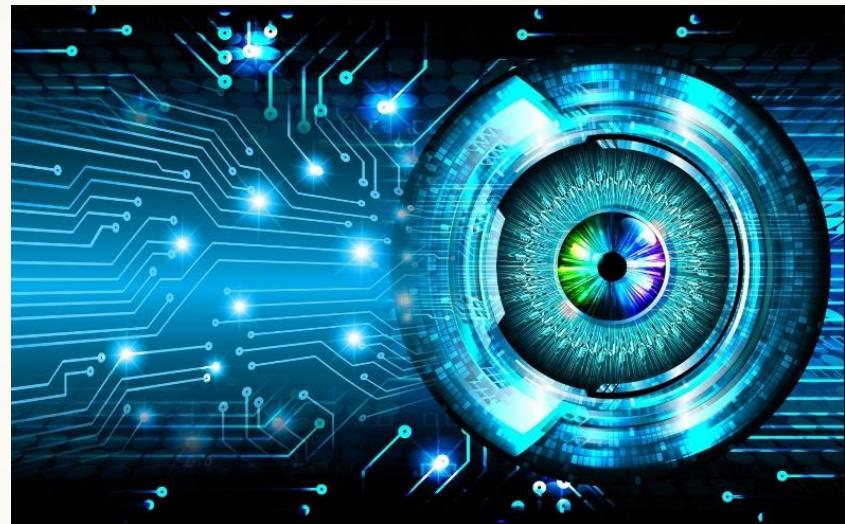


Facebook 怎麼做到的?



- 如果你是注重隱私的人，要非常注意你在網路上的活動

How Data AI
change our lives?



卷積神經網路
Convolutional Neural Network (CNN)

What's this?



```
decode_predictions(preds, top=3)
```

```
[[(n02111889, 'Samoyed', 0.8701604),  
(n02120079, 'Arctic_fox', 0.12416725),  
(n02114548, 'white_wolf', 0.0036498504)]]
```

What's this?



```
decode_predictions(preds, top=3)
```

```
[[(n01531178, 'goldfinch', 0.99720144),  
(n01537544, 'indigo_bunting', 0.0014747247),  
(n01530575, 'brambling', 0.00056995713)]]
```

What's this?



```
decode_predictions(preds, top=3)
```

```
[[('n02787622', 'banjo', 0.99902868),  
 ('n02676566', 'acoustic_guitar', 0.000544385),  
 ('n03272010', 'electric_guitar', 0.0001290191)]]
```



都是哈士奇嗎？



阿拉斯加雪橇犬



西伯利亞雪橇犬

Intro to IMAGENET

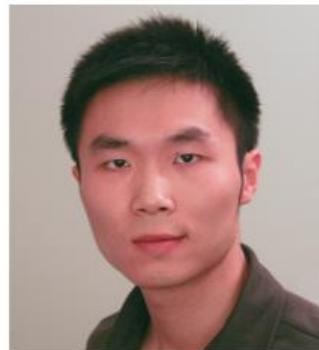
- Large Scale Visual Recognition Challenge (ILSVRC)
- image classification
 - **1000 object classes**
 - **1,431,167 images**



Olga Russakovsky
(Stanford U.)



Sean Ma
(Stanford U.)



Jia Deng
(U. of Michigan)



Jonathan Krause
(Stanford U.)



Alexander Berg
(UNC Chapel Hill)



Fei-Fei Li
(Stanford U.)

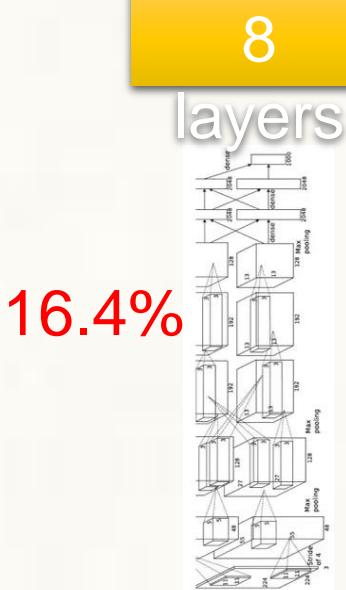
Variety of object classes in ILSVRC

	DET	CLS-LOC				
birds						
bottles						
cars						

Deep Neural Networks

Human yields **5.1 % error!!**

http://cs231n.stanford.edu/slides/winter1516_lecture8.pdf



16.4%

AlexNet (2012)

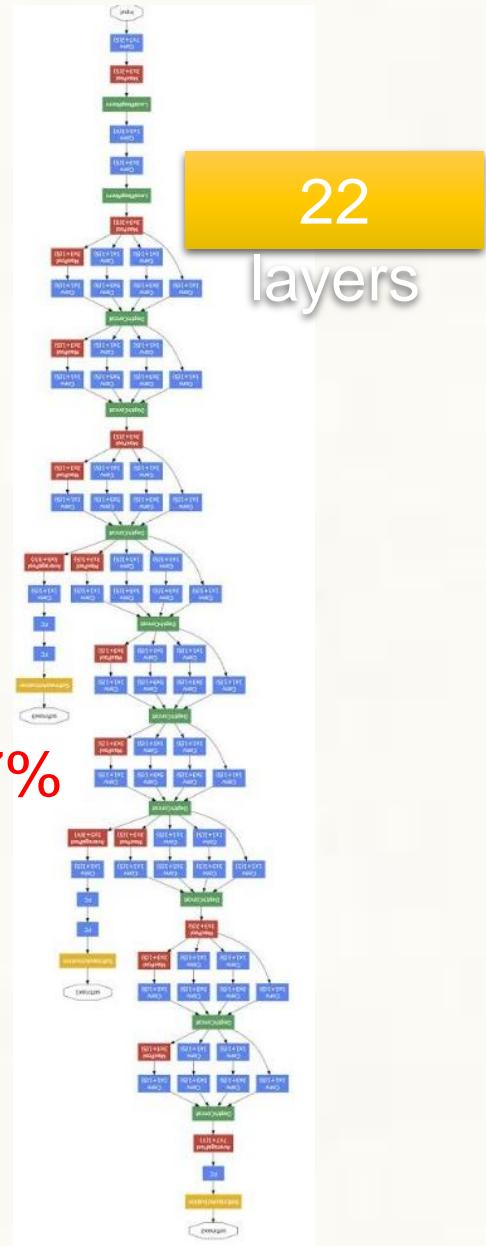
7.3%



VGG (2014)

6.7%

GoogleNet (2014)



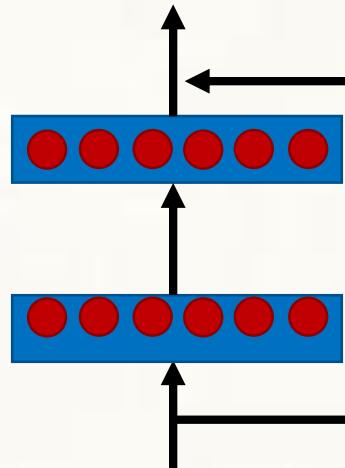
Deep Neural Networks

Human yields **5.1 % error!!**

152 layers

101 layers

Special
structure



3.57%

Ref:

<https://www.youtube.com/watch?v=dxB6299gpvl>

16.4%

AlexNet
(2012)

7.3%

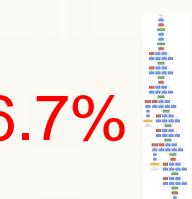
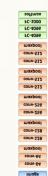
VGG
(2014)

6.7%

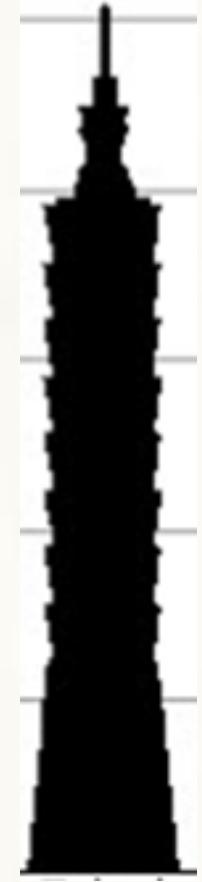
GoogleNet
(2014)

Residual Net
(2015)

Taipei
101

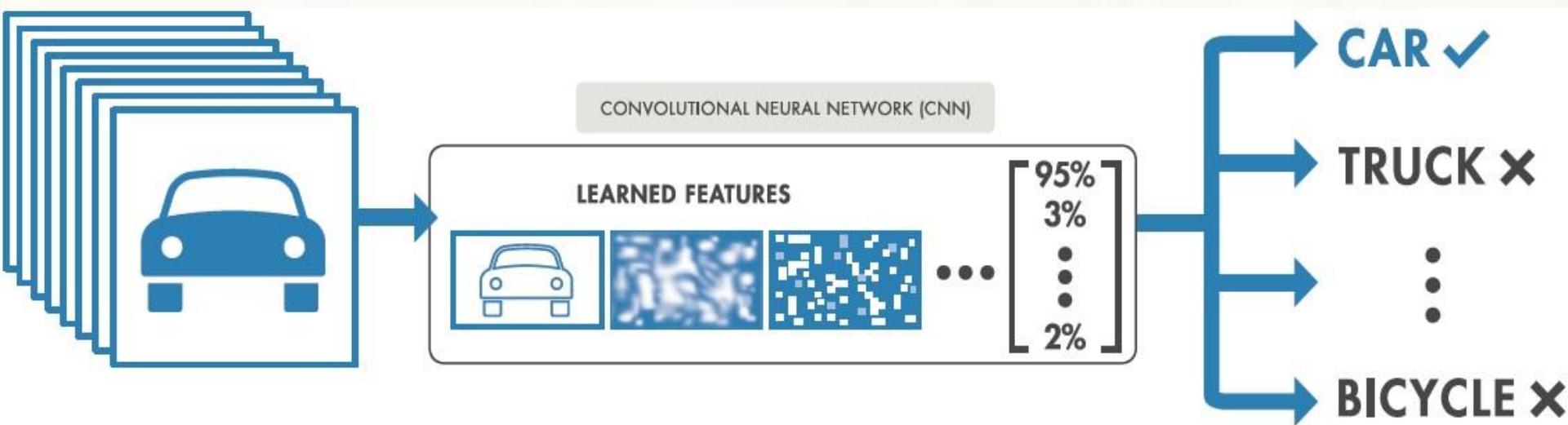


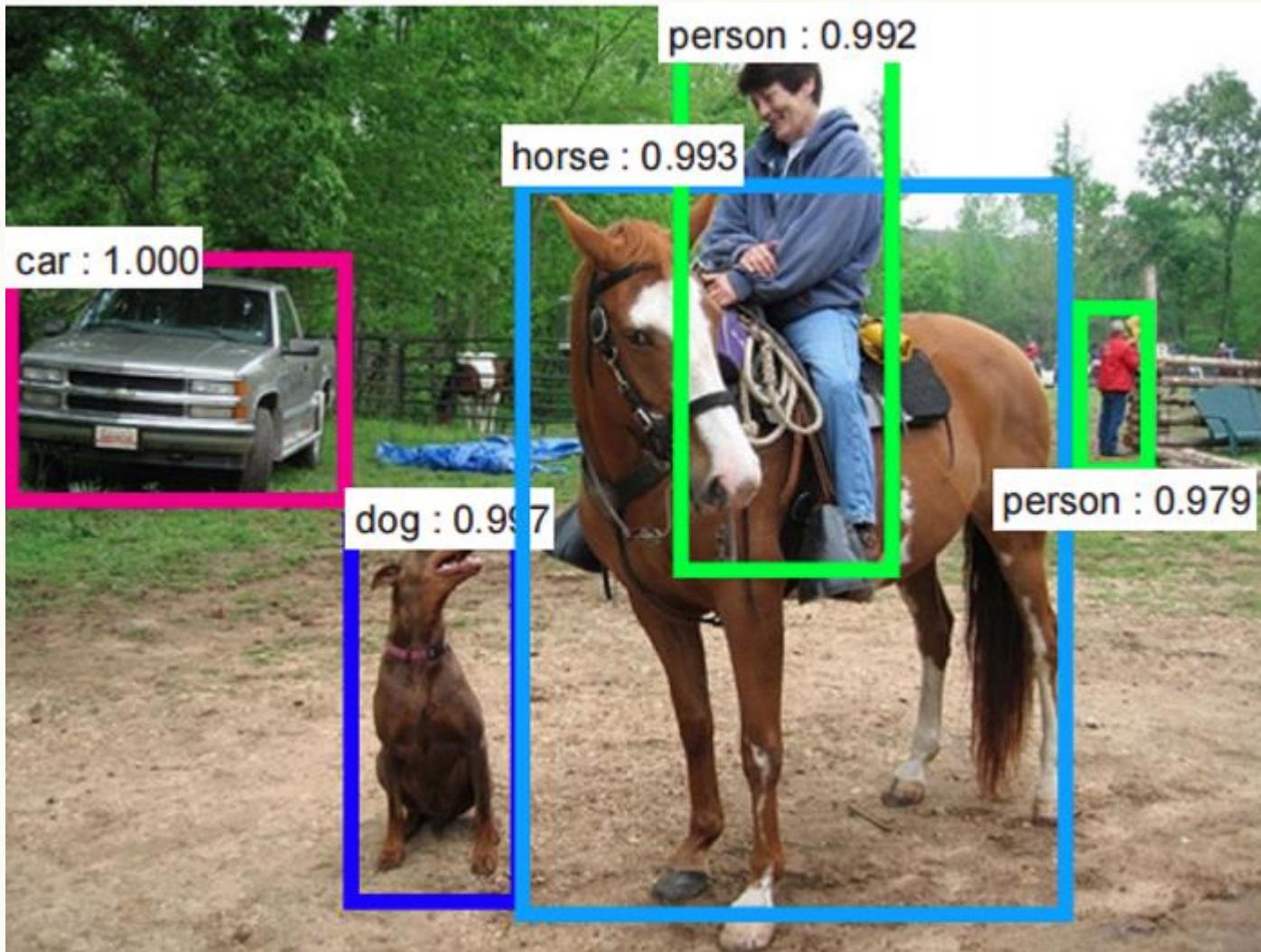
Residual Net
(2015)



CNN 好棒棒!

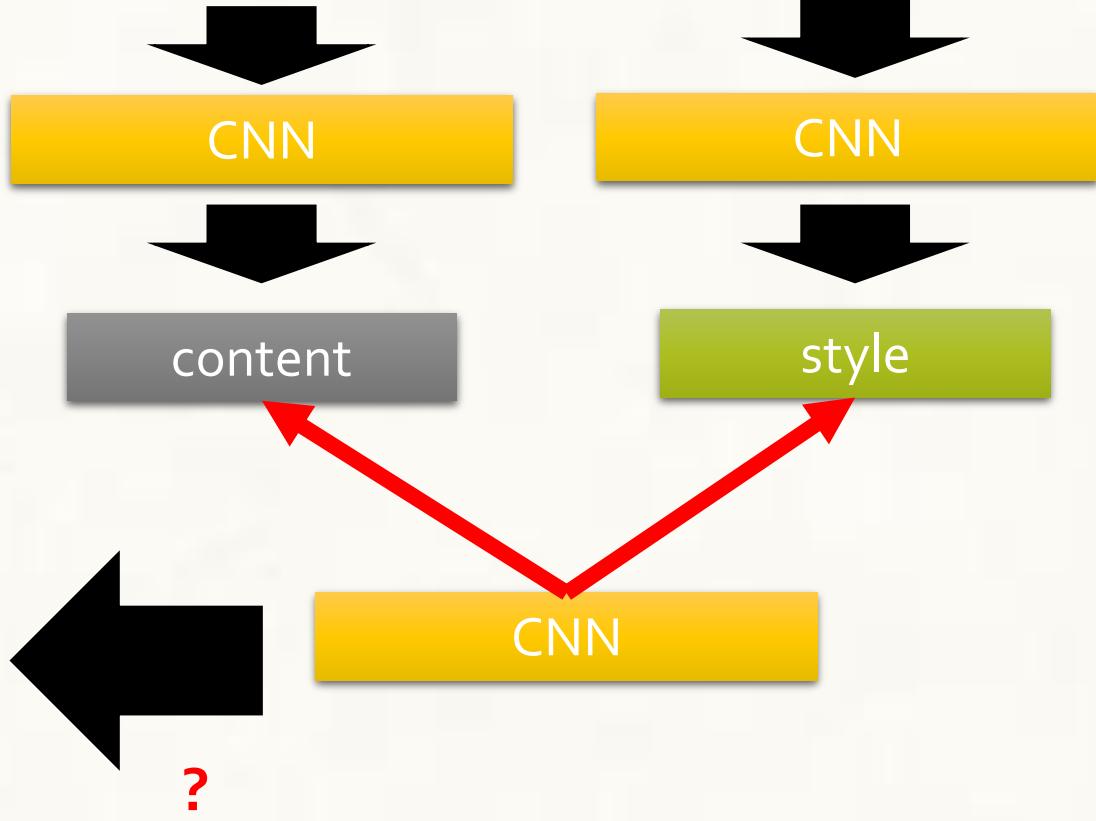
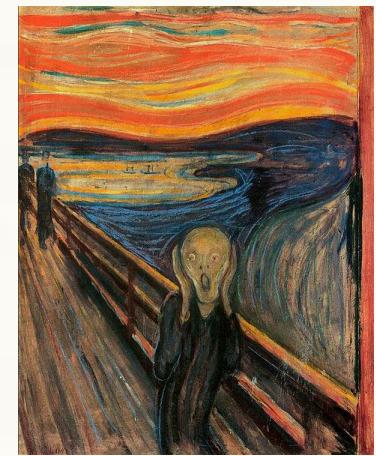
- 透過卷積 (Convolution) 的方式提取特徵
- 完全自動，只需要給 CNN 圖片資料與標籤



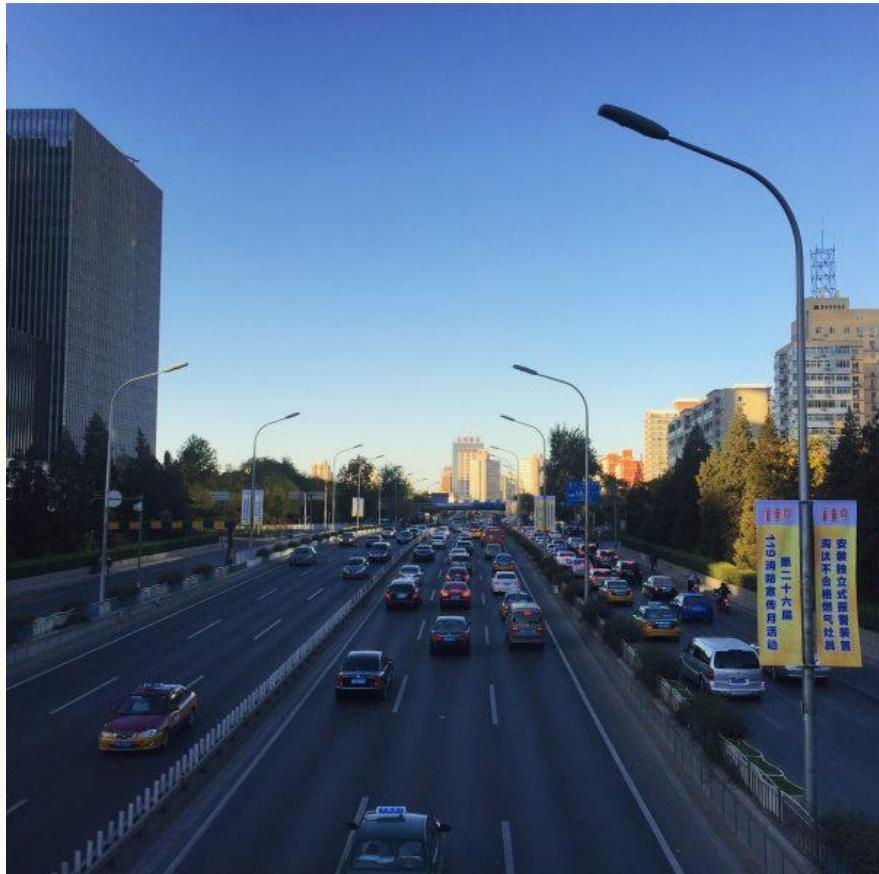


Machine learning in image processing

The Deep Style



(Slide Credit: [Hung-Yi Lee](#))



你的名字 style



source

<https://ccc.technews.tw/2016/11/23/your-name-photo-filter/>

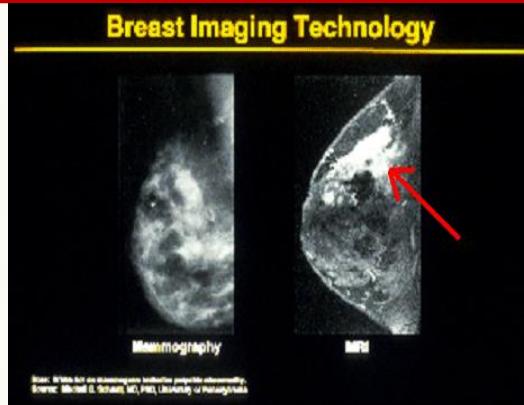
Institute of Information Science, Academia Sinica



AI 已無所不在



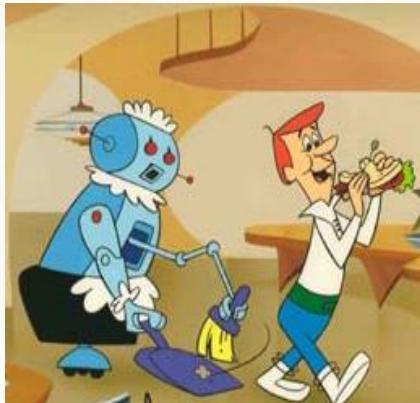
Safety



Health



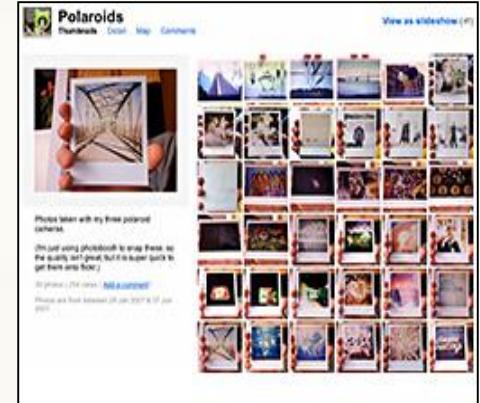
Security



Comfort



Fun



Access

唯一不變的就是‘改變’





"Generative Adversarial Networks is the **most interesting idea in the last ten years** in machine learning."

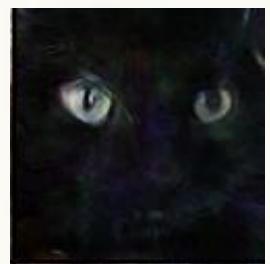
Yann LeCun, Director, Facebook AI

Next!

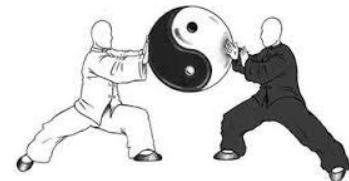
生成式對抗網路 (Generative Adversarial Network)

對抗式生成網路 Generative Adversarial Network (GAN)

哪隻貓是假的



對抗式生成網路 (GAN) 是什麼?



- 2014 年由 Google Inc. 的 Ian Goodfellow 提出
- 兩個相互競爭的神經網路
 - 一個扮演匪徒：無中生有 (印假鈔)
 - 一個扮演檢察官：明辨是非 (驗鈔票)

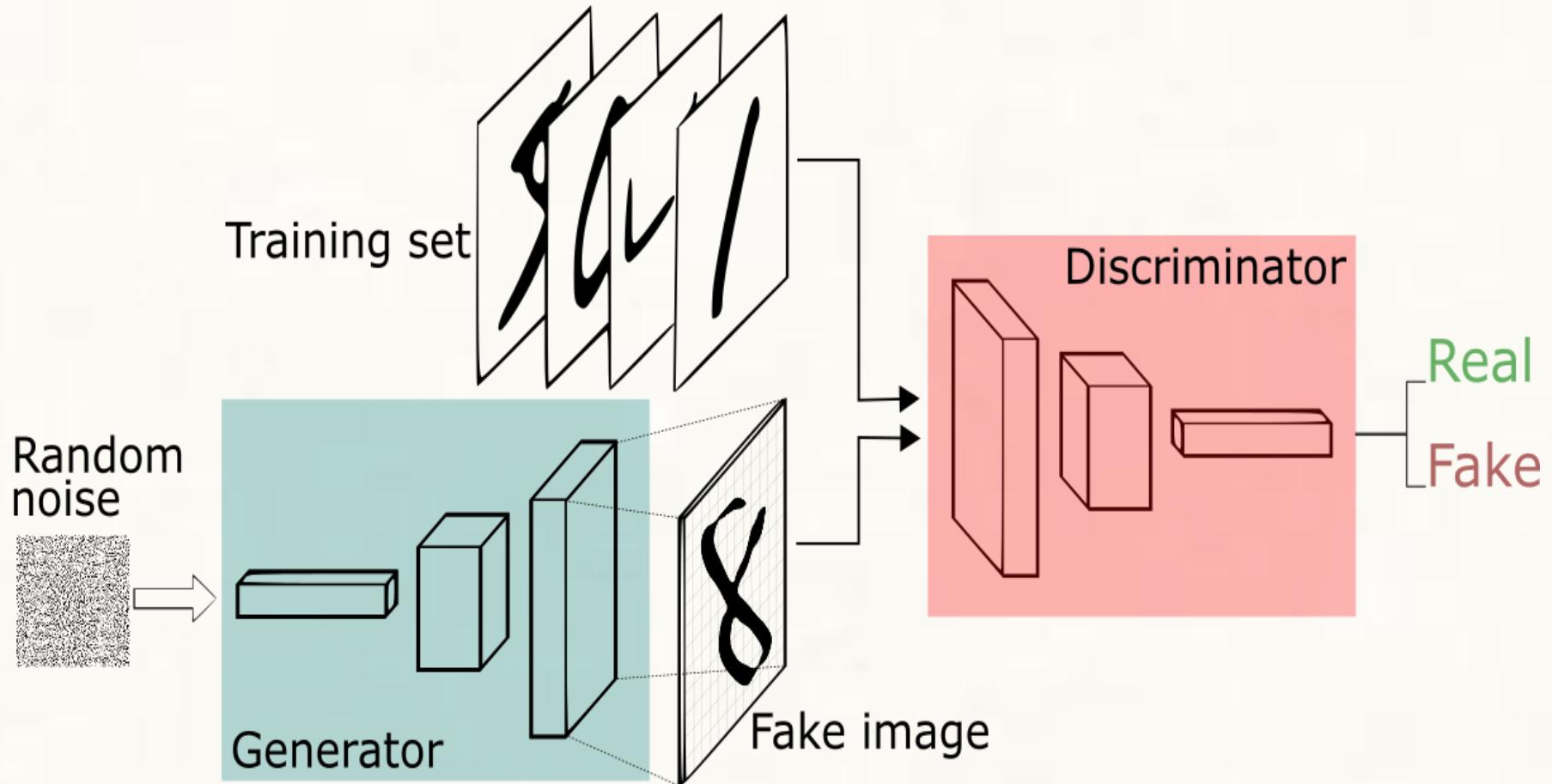


Generator



Discriminator

一個實際的例子



GAN 的應用

圖片生成

Super resolution

風格轉換

影像生成



GAN 的應用

圖片生成

Super resolution

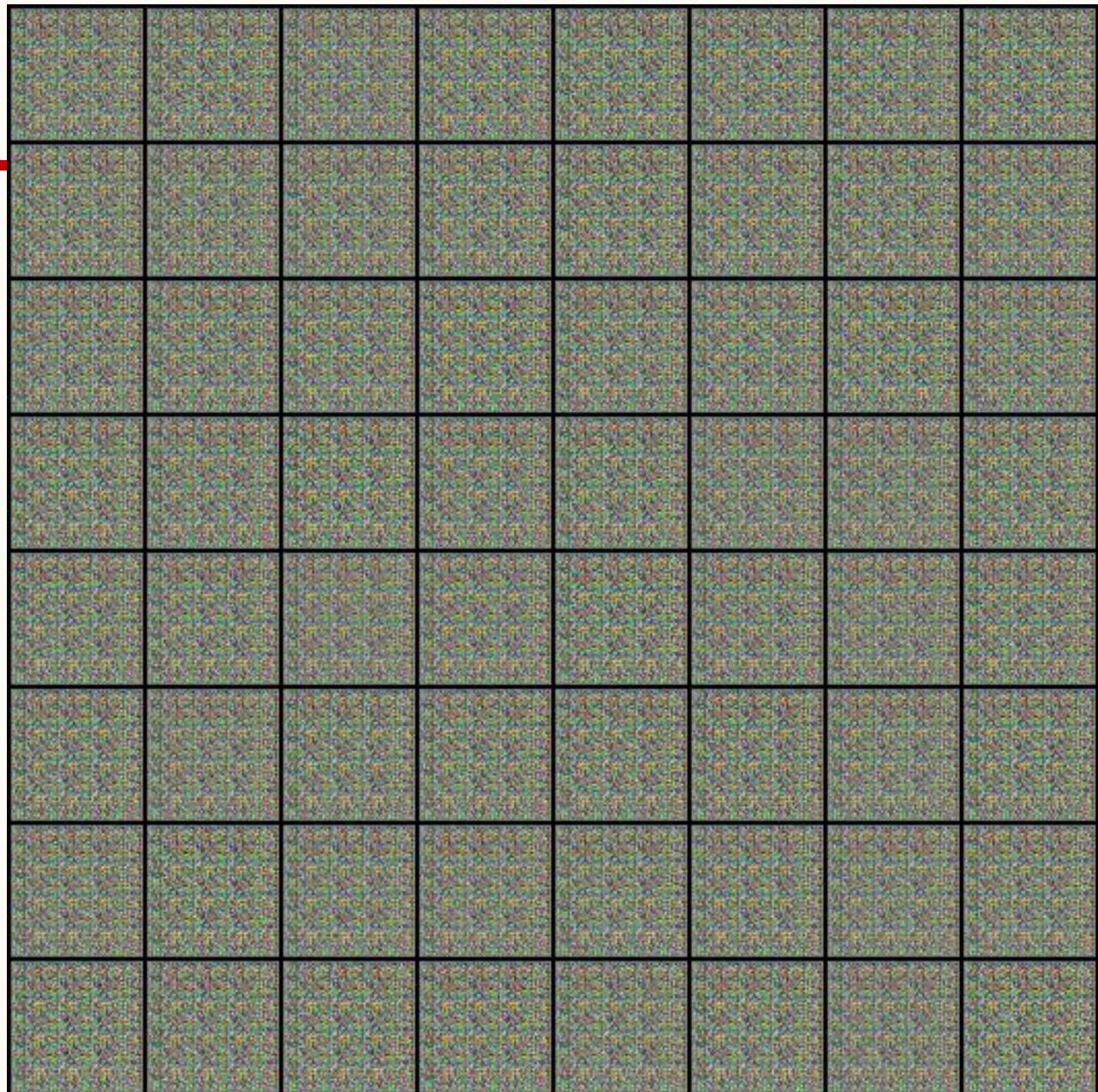
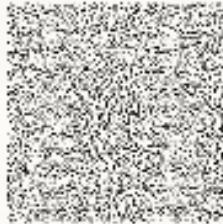
風格轉換

影像生成



圖片生成

Random
noise



圖片生成: 望文生圖

Text description	This bird is red and brown in color, with a stubby beak	The bird is short and stubby with yellow on its body	A bird with a medium orange bill white body gray wings and webbed feet	This small black bird has a short, slightly curved bill and long legs	A small bird with varying shades of brown with white under the eyes	A small yellow bird with a black crown and a short black pointed beak	This small bird has a white breast, light grey head, and black wings and tail
------------------	---------------------------------------------------------	------------------------------------------------------	------------------------------------------------------------------------	-----------------------------------------------------------------------	---------------------------------------------------------------------	-----------------------------------------------------------------------	-------------------------------------------------------------------------------

紅褐色
短硬的喙

白深灰翅
橘喙

黑冠黃身
短黑喙

白身灰冠
黑翅黑尾



圖片生成: 望文生圖

Text
description

This bird is red and brown in color, with a stubby beak



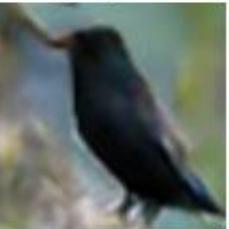
The bird is short and stubby with yellow on its body



A bird with a medium orange bill white body gray wings and webbed feet



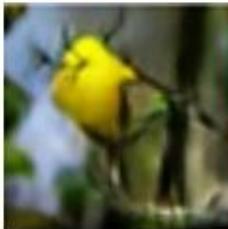
This small black bird has a short, slightly curved bill and long legs



A small bird with varying shades of brown with white under the eyes



A small yellow bird with a black crown and a short black pointed beak



This small bird has a white breast, light grey head, and black wings and tail



64x64
GAN-INT-CLS
[22]

紅褐色
短硬的喙

白深灰翅
橘喙

黑冠黃身
短黑喙

白身灰冠
黑翅黑尾

圖片生成: 望文生圖

Text
description

This bird is red and brown in color, with a stubby beak



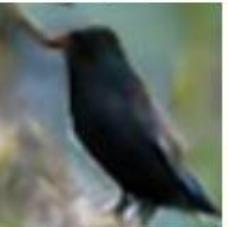
The bird is short and stubby with yellow on its body



A bird with a medium orange bill white body gray wings and webbed feet



This small black bird has a short, slightly curved bill and long legs



A small bird with varying shades of brown with white under the eyes



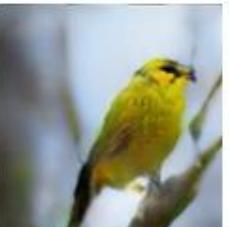
A small yellow bird with a black crown and a short black pointed beak



This small bird has a white breast, light grey head, and black wings and tail



64x64
GAN-INT-CLS
[22]



128x128
GAWWN
[20]

紅褐色
短硬的喙

白深灰翅
橘喙

黑冠黃身
短黑喙

白身灰冠
黑翅黑尾

圖片生成: 望文生圖

Text
description

This bird is red and brown in color, with a stubby beak

The bird is short and stubby with yellow on its body

A bird with a medium orange bill white body gray wings and webbed feet

This small black bird has a short, slightly curved bill and long legs

A small bird with varying shades of brown with white under the eyes

A small yellow bird with a black crown and a short black pointed beak

This small bird has a white breast, light grey head, and black wings and tail

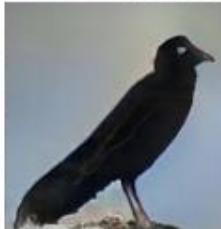
64x64
GAN-INT-CLS
[22]



128x128
GAWWN
[20]



256x256
StackGAN



紅褐色
短硬的喙

白深灰翅
橘喙

黑冠黃身
短黑喙

白身灰冠
黑翅黑尾

圖片生成: 望文生圖

The petals of the flower are purple with a yellow center and have thin filaments coming from the petals.

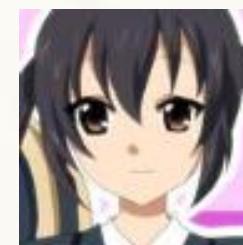
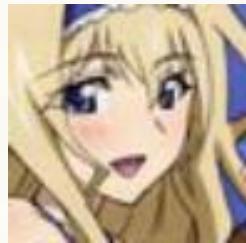
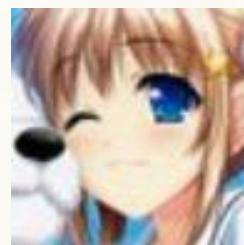


This flower is white and yellow in color, with petals that are oval shaped



圖片生成: 日本人的最愛

二次元妹子生成器

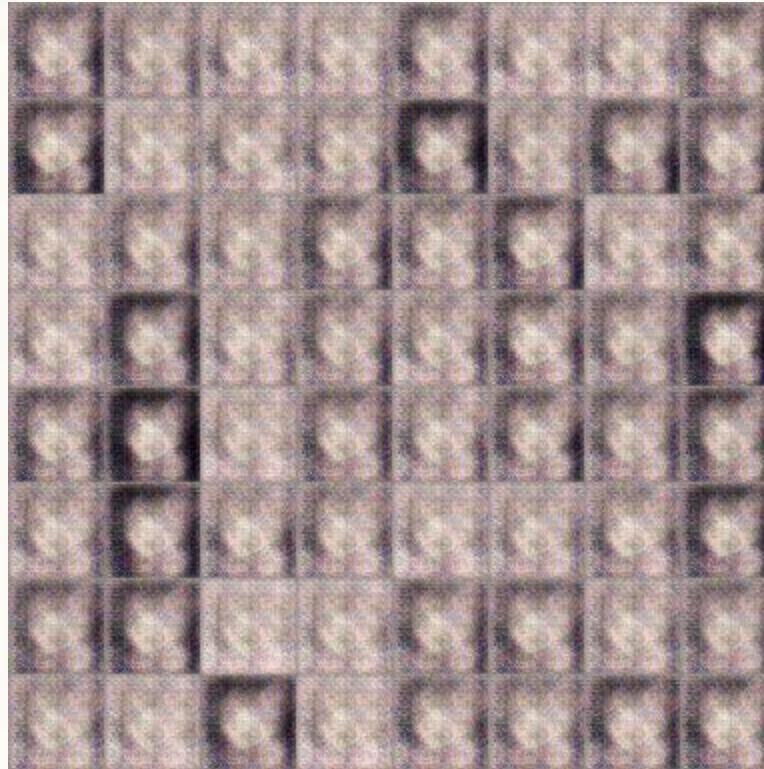


Source of images: <https://zhuanlan.zhihu.com/p/24767059>

DCGAN: <https://github.com/carpedm20/DCGAN-tensorflow>



Anime Girl Face Generation



100 rounds



Anime Girl Face Generation



1000 rounds



Anime Girl Face Generation



2000 rounds



Anime Girl Face Generation



50,000 rounds



我們也來生成一個吧！

- <http://make.girls.moe/#/>



GAN 的應用

圖片生成

Super resolution

風格轉換

影像生成



從模糊照片還原高清照片 (Super resolution)



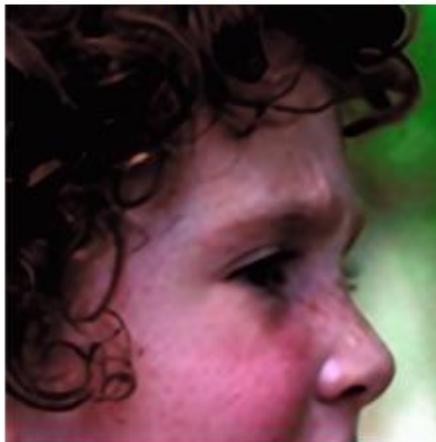
Figure 2: From left to right: bicubic interpolation, deep residual network optimized for MSE, deep residual generative adversarial network optimized for a loss more sensitive to human perception, original HR image. Corresponding PSNR and SSIM are shown in brackets. [4× upscaling]

從模糊照片還原高清照片 (Super resolution)

bicubic



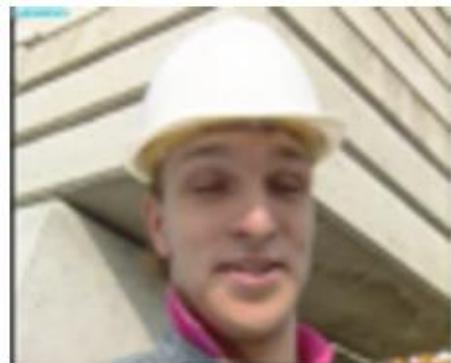
SRResNet



SRGAN



original



GAN 的應用

圖片生成

Super resolution

風格轉換

影像生成



Image to Image Translation: 藝術風格轉換

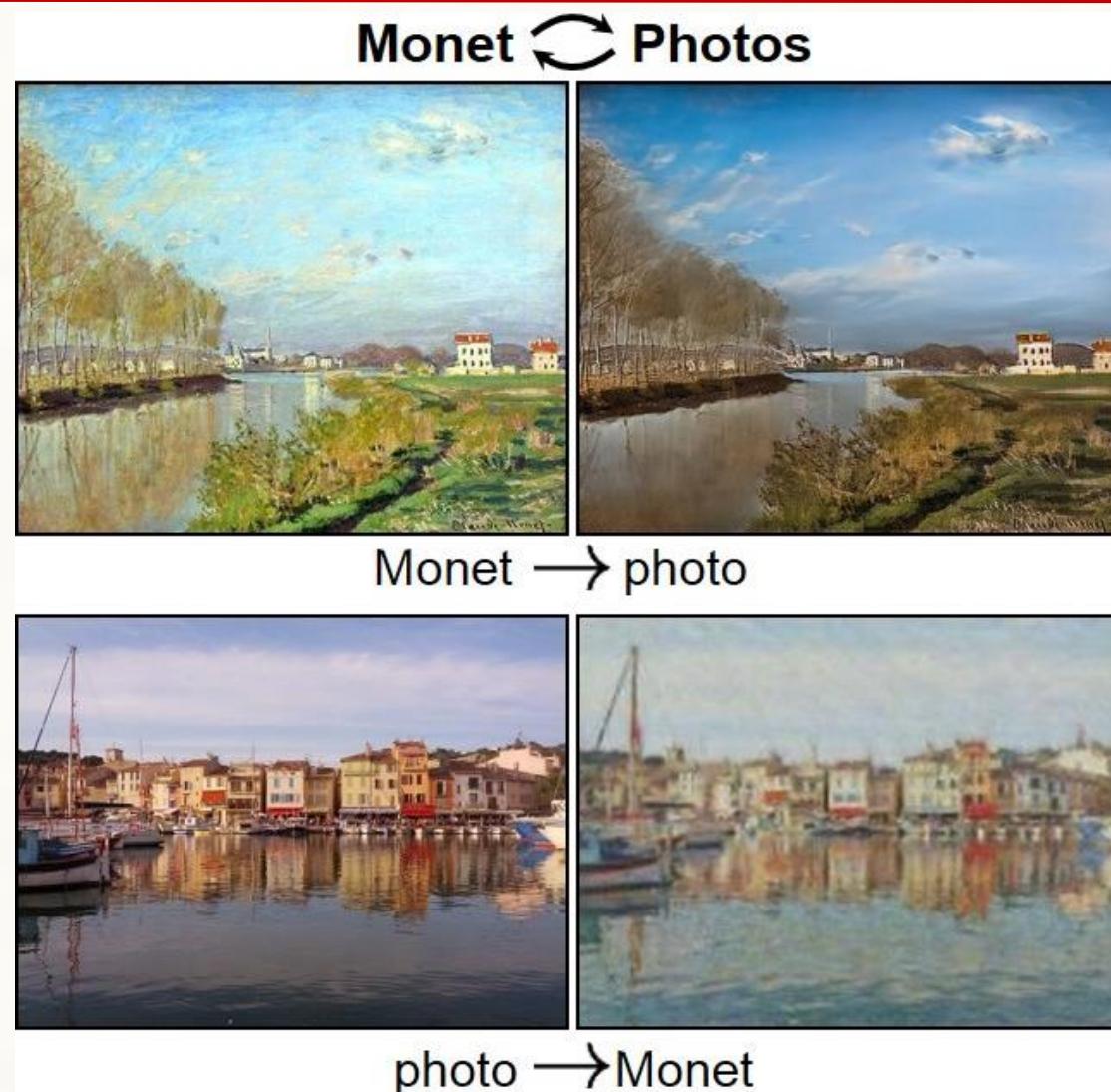


Image to Image Translation: 更多風格轉換

Input



Monet



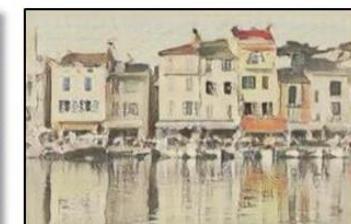
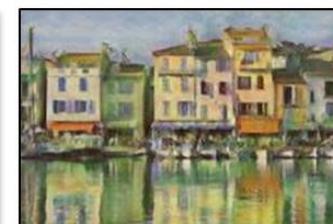
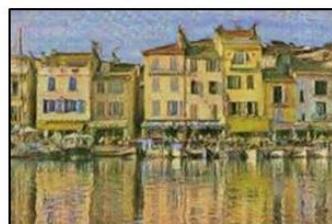
Van Gogh



Cezanne



Ukiyo-e



想知道某個景點變成冬天會怎樣？

Summer ↘ Winter

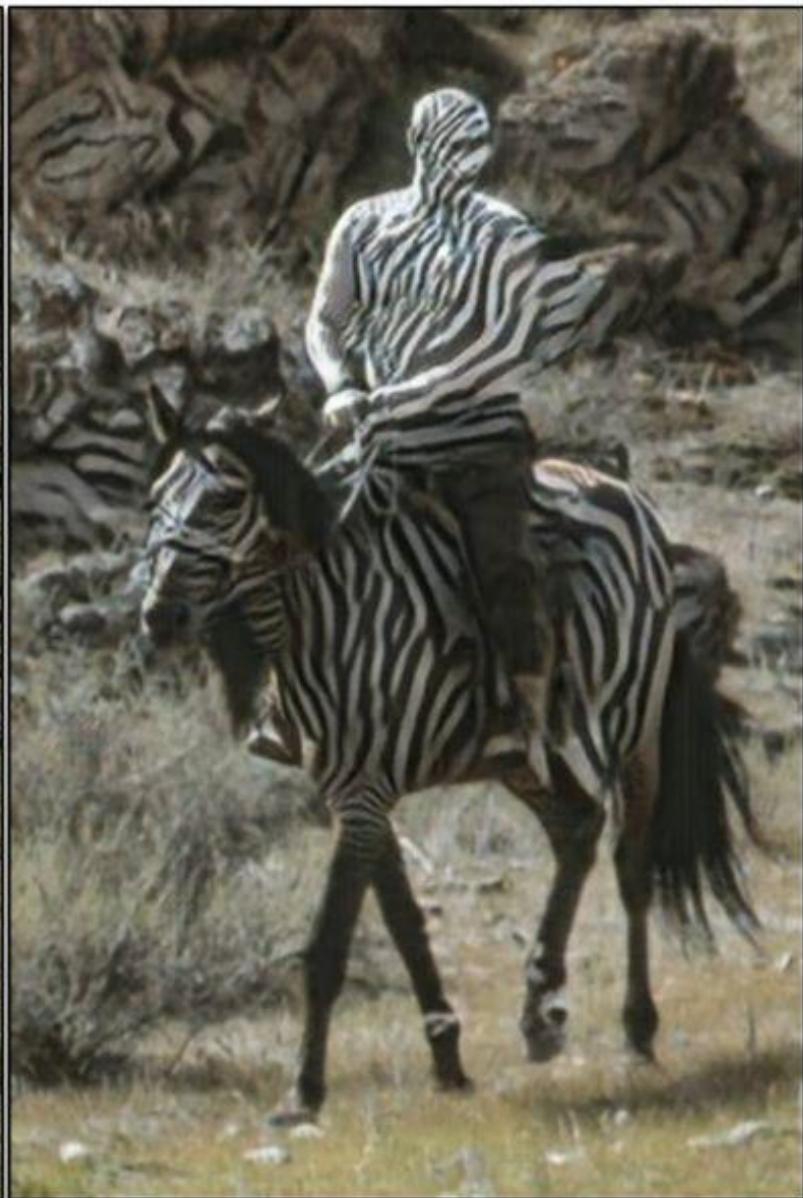
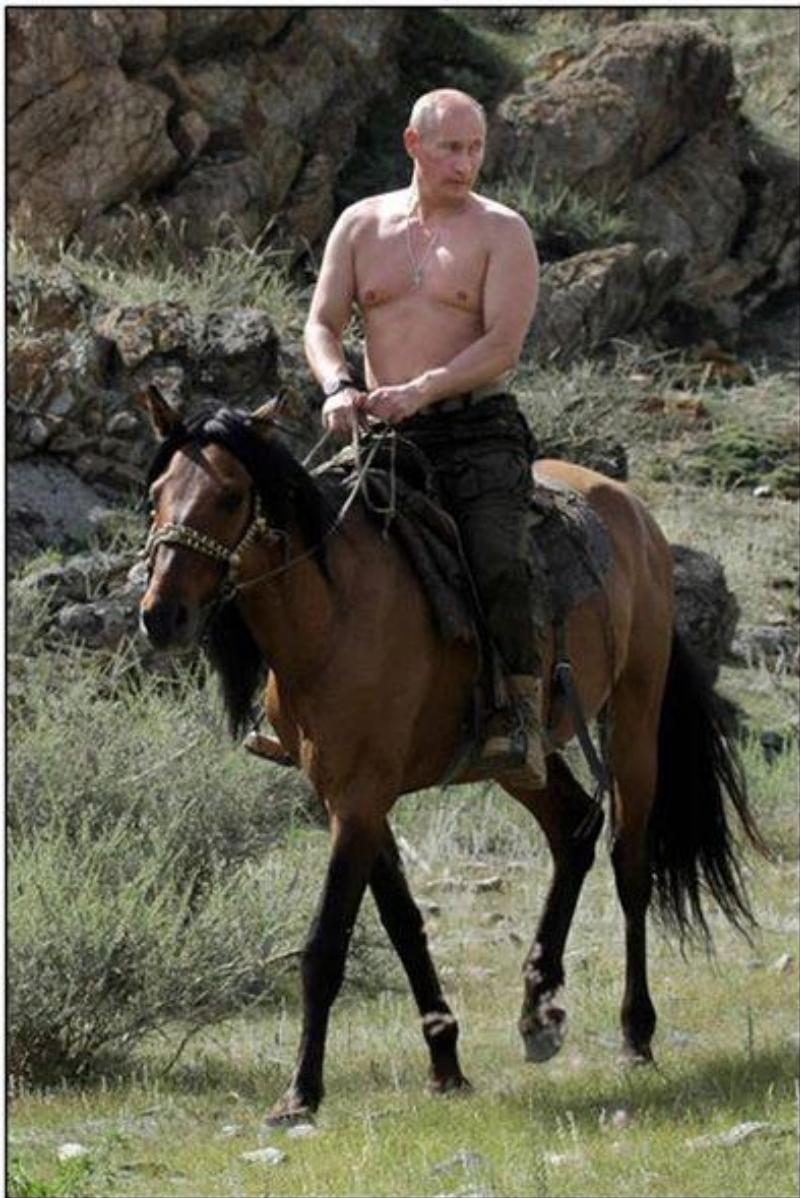


summer → winter

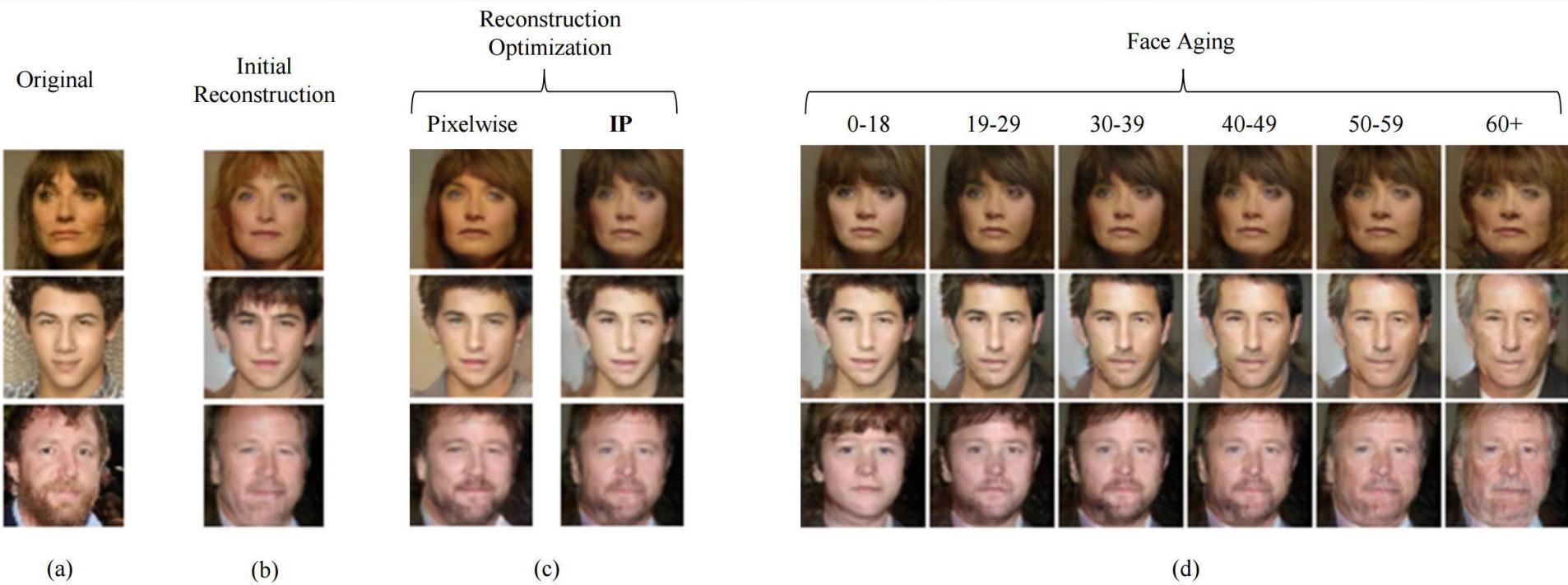


winter → summer

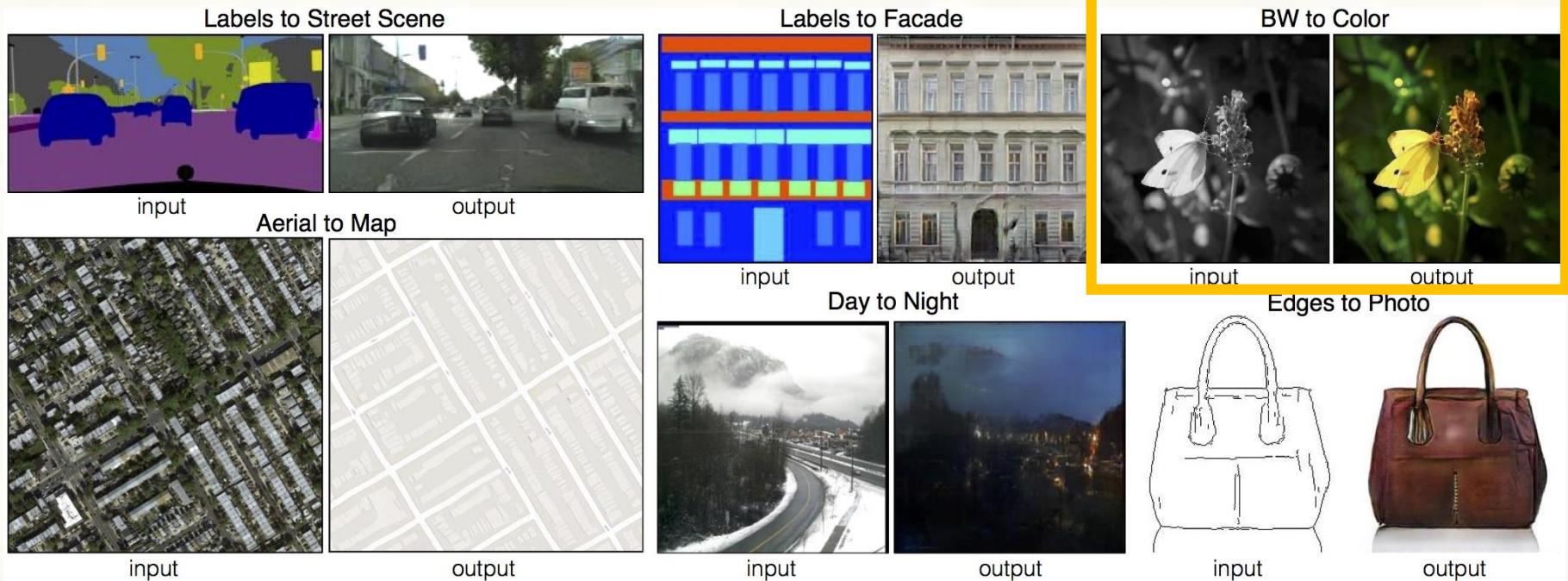
馬 -> 斑馬?



想知道未來變老後的樣子？



圖片互相轉換的更多應用



Phillip Isola, Jun-Yan Zhu, Tinghui Zhou, Alexei A. Efros, “Image-to-Image Translation with Conditional Adversarial Networks”, arXiv preprint, 2016



自動上色

泛黃的黑白照片想要找回青春的色彩？



<http://demos.algorithmia.com/colorize-photos/>

Zhang, Isola, Efros.
Colorful Image Colorization.
In ECCV, 2016

自動上色: Let's do it!

泛黃的黑白照片想要找回青春的色彩?



自動上色: Let's do it!

泛黃的黑白照片想要找回青春的色彩?



原圖



黑白化

GAN 的應用

圖片生成

Super resolution

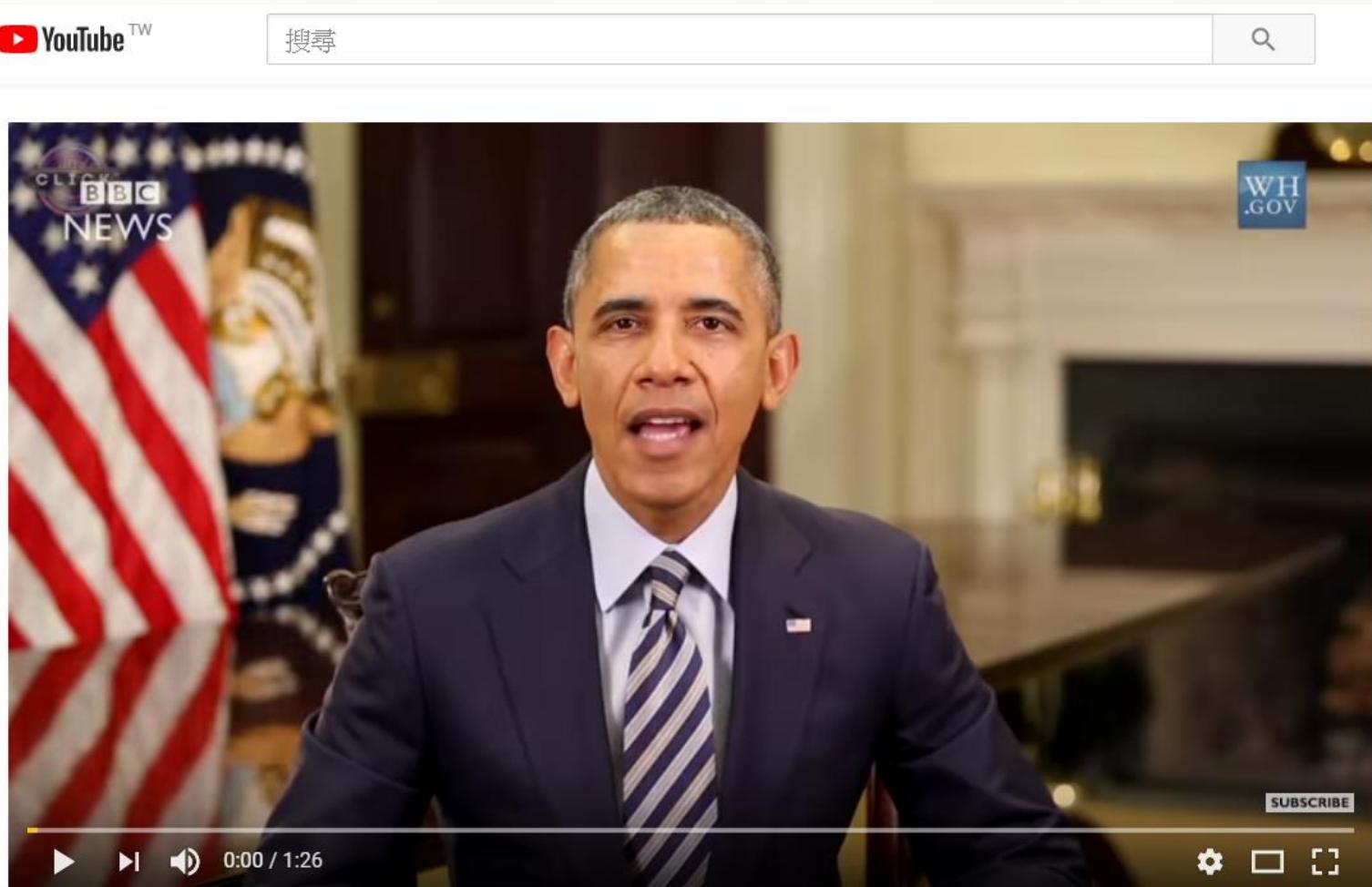
風格轉換

影像生成

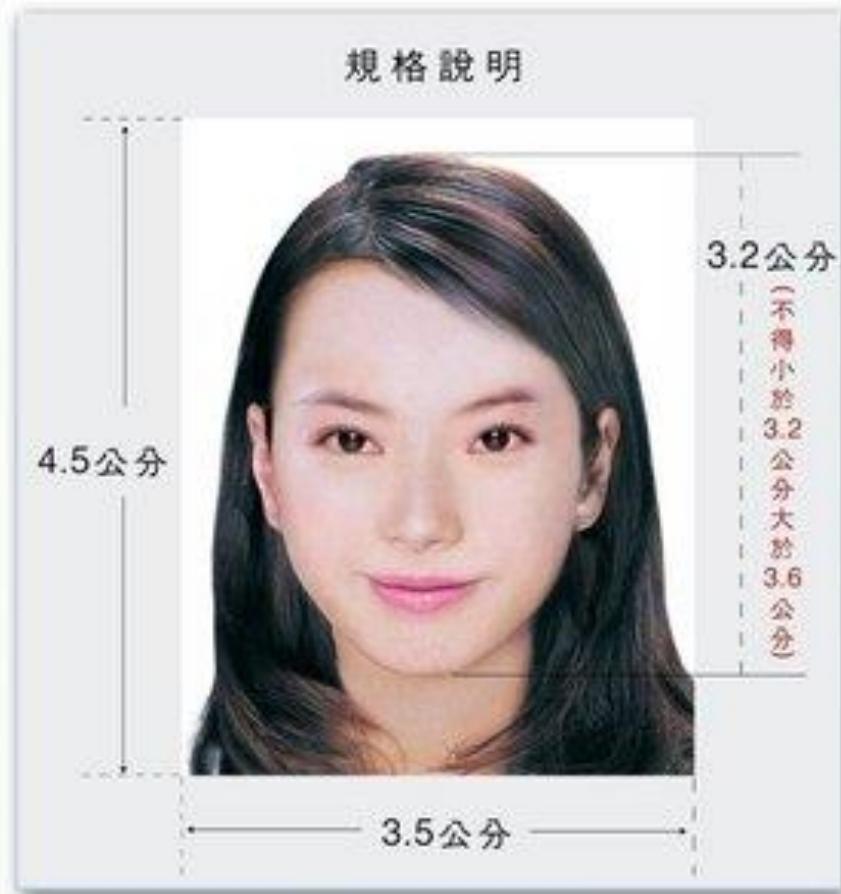


影像生成

- <https://www.youtube.com/watch?v=AmUC4m6w1wo>

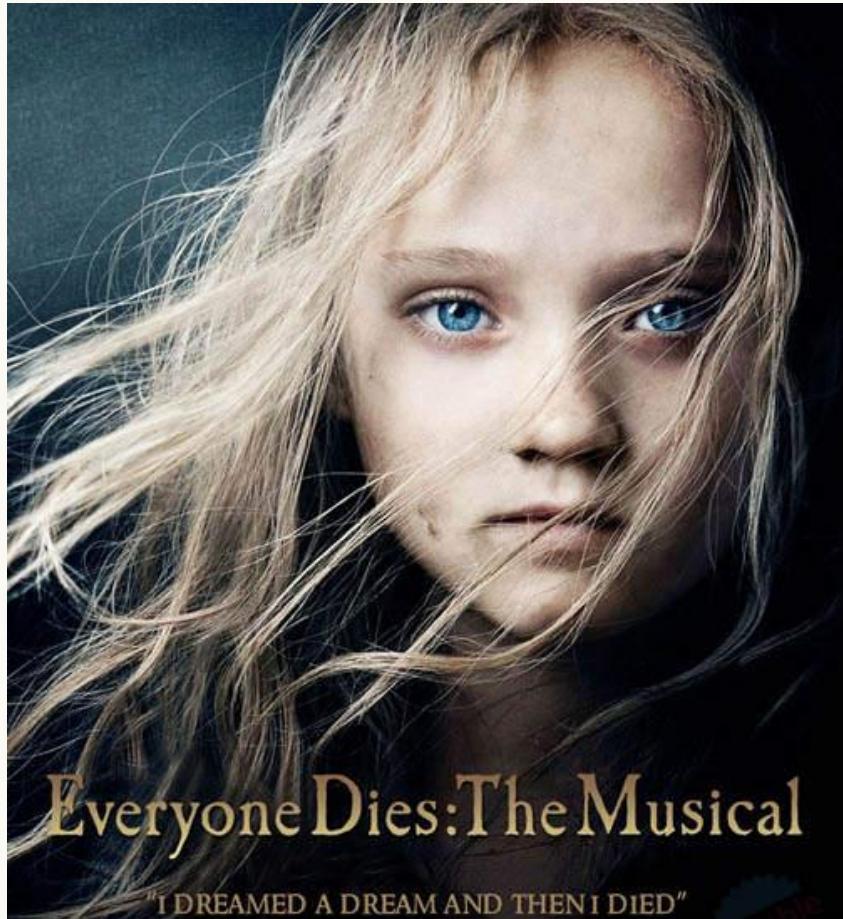


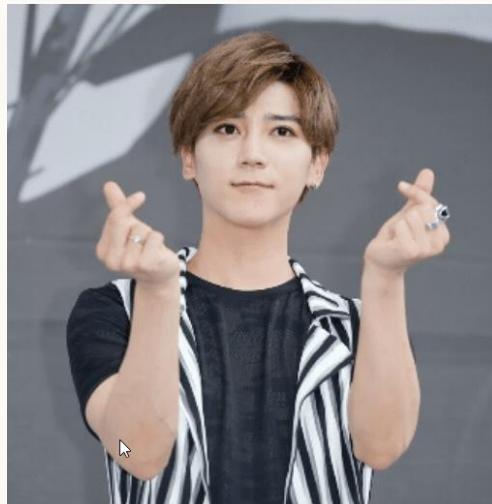
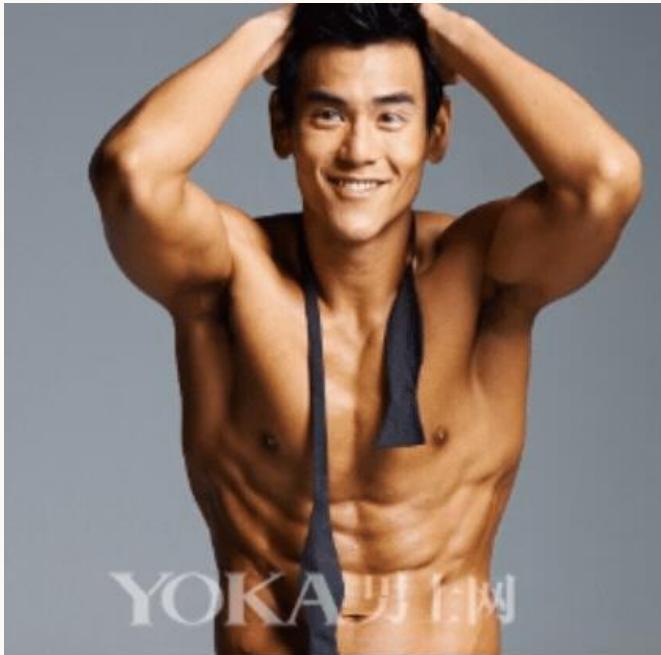
影像生成



<https://sites.skoltech.ru/compvision/projects/deepwarp/>

影像生成





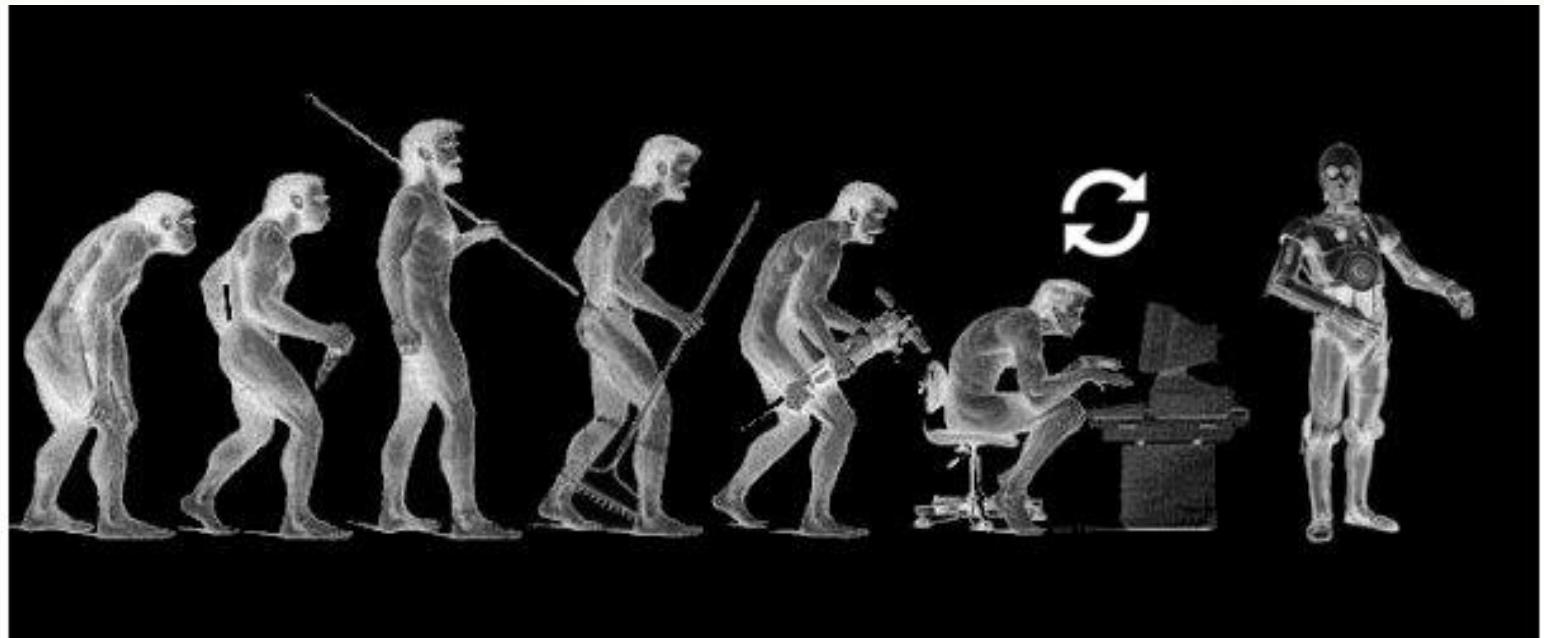


Image credit. Jackson

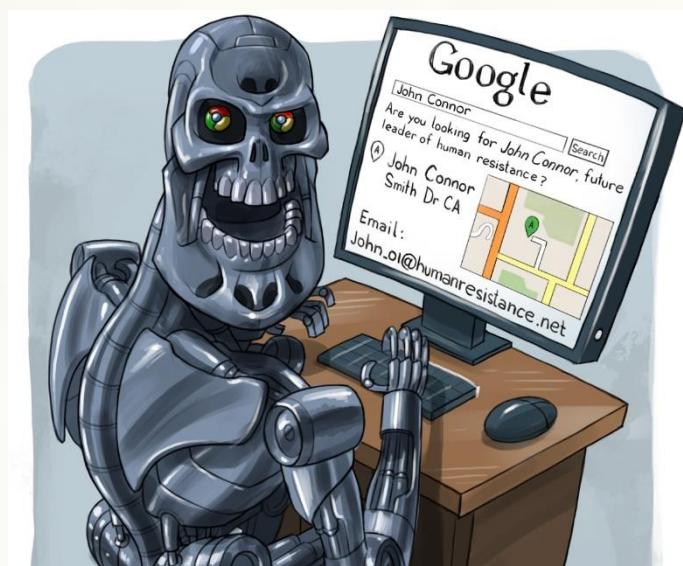
總結 我們想像中的未來社會

未來社會 - 人機協力與更方便的生活



- Wake up, daddy's home.
- Welcome home, sir.

壞事會發生嗎？



人類會被人工智慧取代嗎？

Creativity!



Thank You!