

# 居家照護之影像辨識應用

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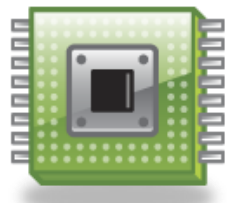
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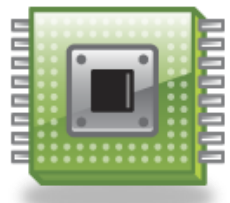




# Outline

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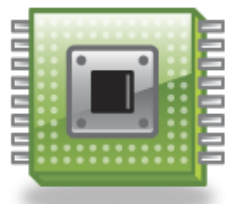
- **Introduction**
- **Home Care System architecture**
- **Scenario**
- **Technological components**
- **Benefits**
- **Challenges**
- **Case Study: Fall detection**



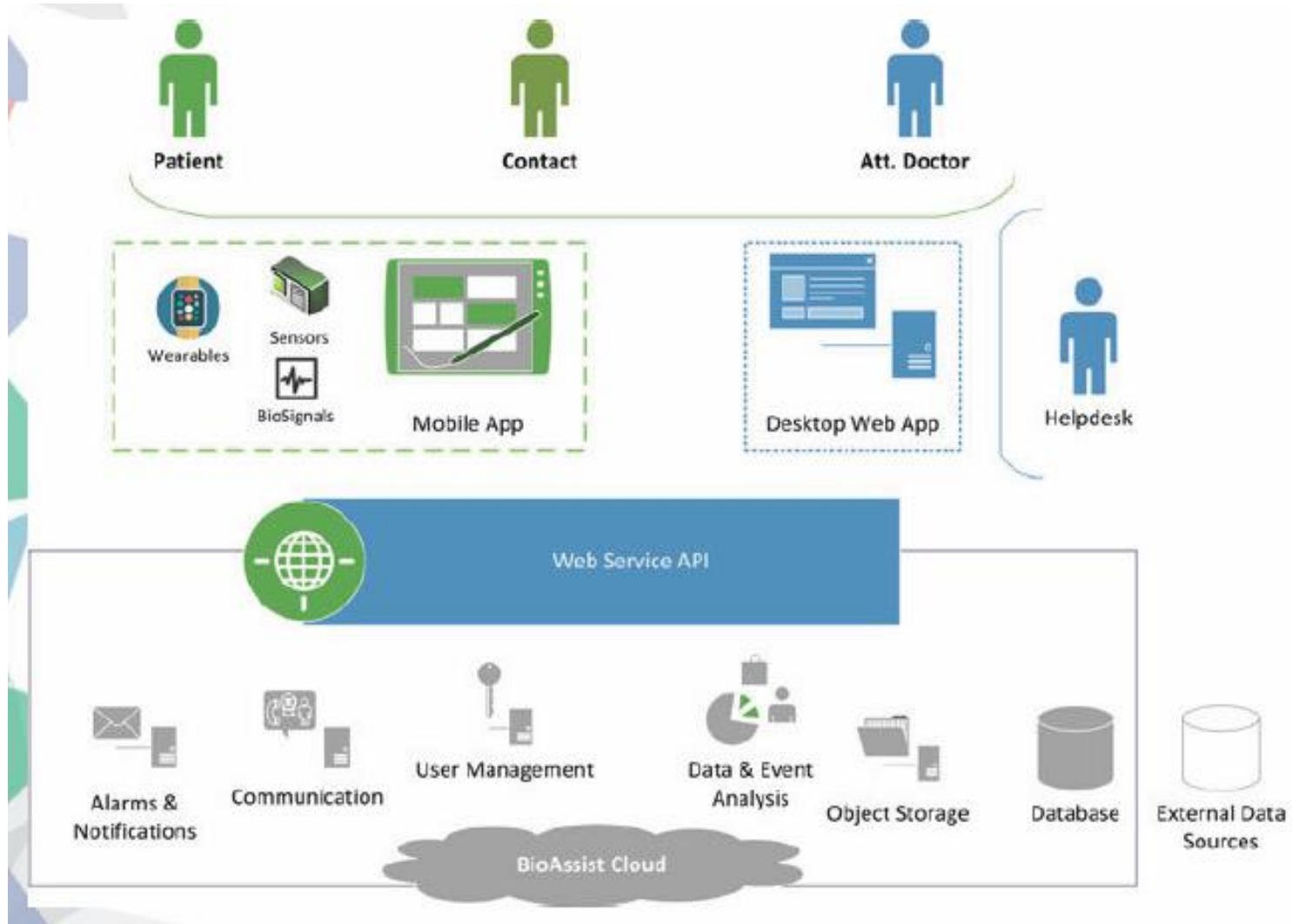
# Introduction

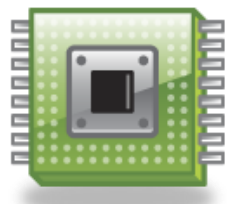
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- **IoT in Healthcare is a heterogeneous computing, wirelessly communicating system of apps and devices that connects patients and health providers to diagnose, monitor, track and store vital statistic and medical information.**

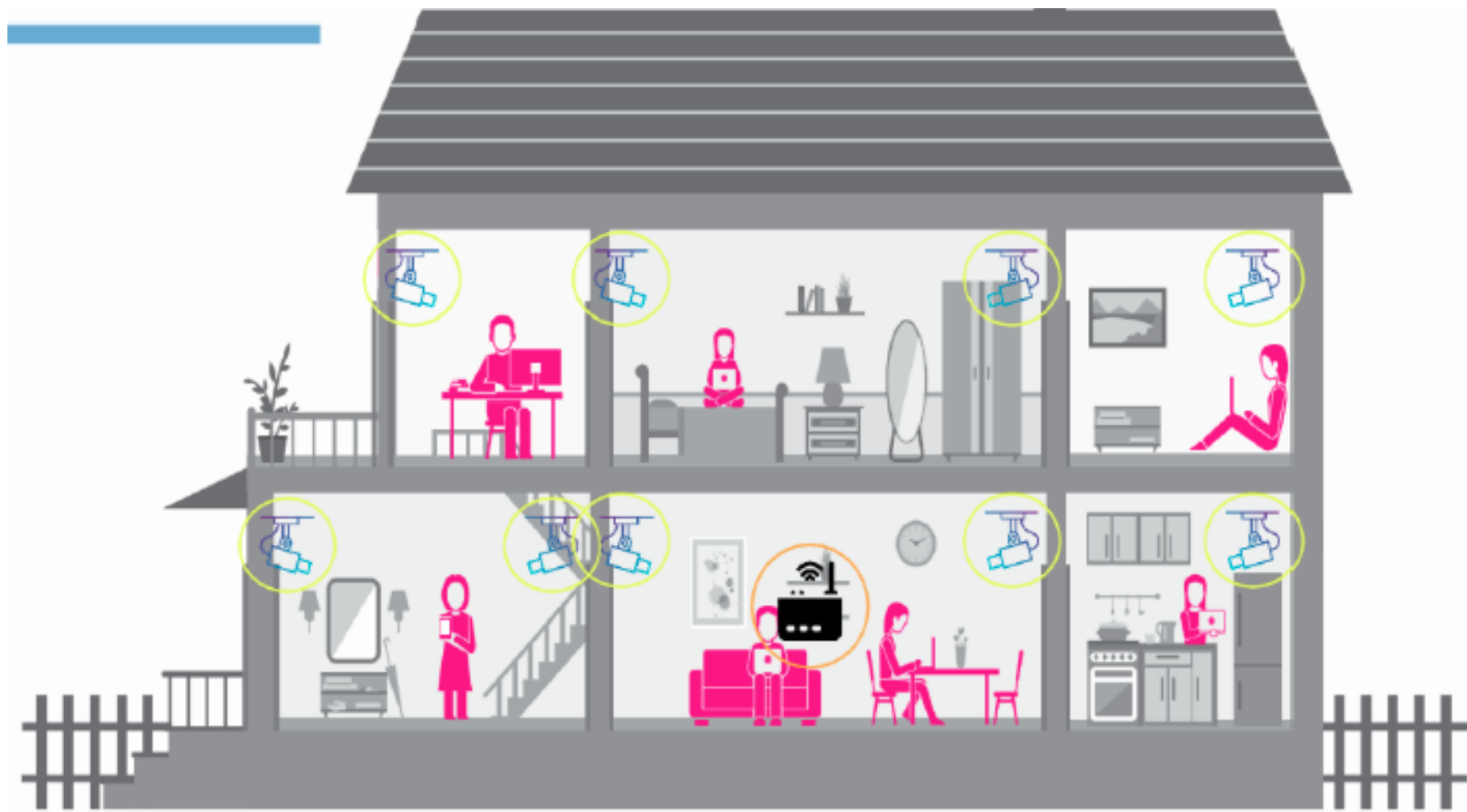


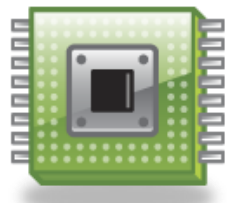
# Home Care System Architecture





# Home Care System Scenario



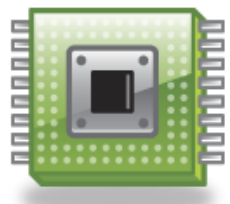


# The Technological Components

## ■ Sensors



- Sensors can be placed around as well as in **appliances** and on the **patient**. They alert caregivers if the senior **misses a meal, doesn't get out of bed, or falls.**

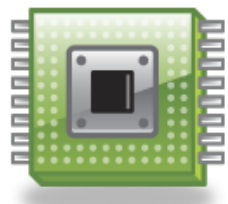


# The Technological Components

- **GPS**

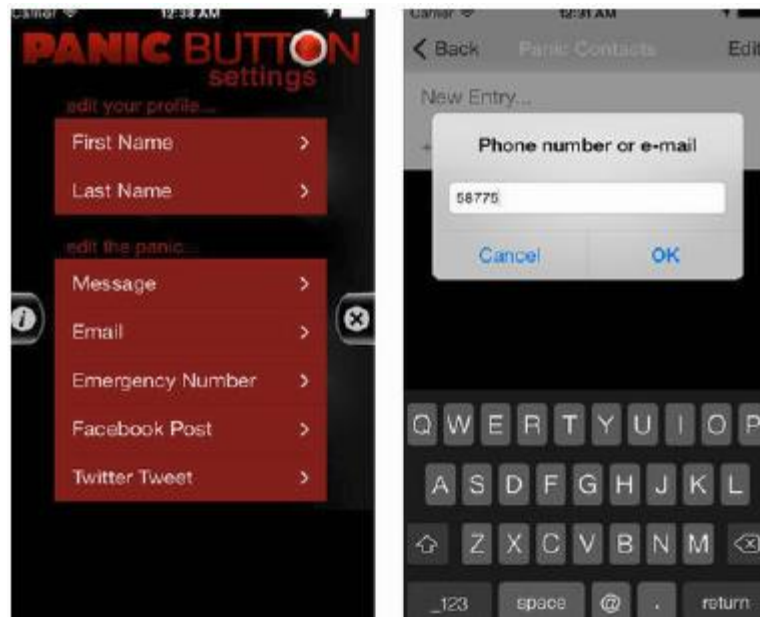


- When seniors are away from home, **GPS-tracking** technologies allow families, health workers, or law enforcement professionals to **locate** them in case of emergency



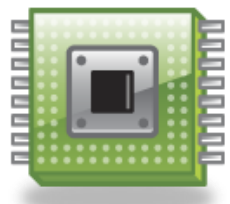
# The Technological Components

- **Mobile apps**



- From **monitoring** to **communication**, the reminder apps, which can **notify** seniors about medications or appointments, are a great tool for people of any age.



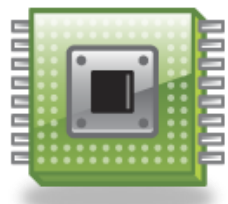


# The Technological Components

- Remote monitoring tools



- For elderly who need regular monitoring, devices that connect to their smartphones can **reduce expensive doctor visits**. In addition, many devices can **track sleep, diet, measure blood pressure, heart rate, and other vital measurements**.

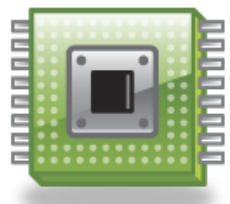


# The Technological Components

- **Big data**



- **Collecting** information from multiple sources and **analyzing** it for insights has become a vital part of healthcare. The data **appears in an online dashboard**, can reviews daily for any changes in clients' routines that might **suggest a medical concern**.

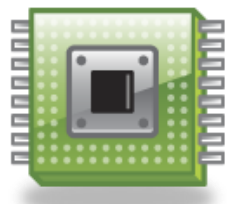


# The Technological Components

- Household stuff



- On the wearables front, expect to see smartwatches and other mobile devices gain tools that can **help seniors**.

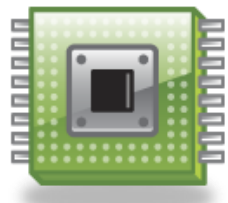


# The Technological Components

## ■ Telehealth (遠距醫療)



- Modern telehealth systems' ability to use **phones** and **standard video conferencing** systems to connect patients with doctors, could free disabled or ill seniors **from traveling to regular checkups.**

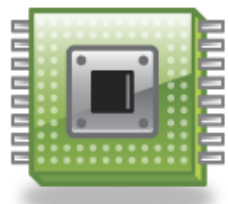


# Benefits

- Simultaneous reporting and monitoring



- With **real-time monitoring** of the condition in place by means of a smart medical device connected to a **smartphone app**, that can **collect** medical and other required health data and **transfer** collected information to a physician.

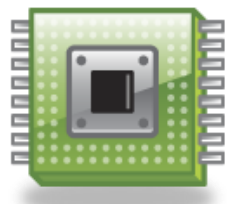


# Benefits

- End-to-end connectivity and affordability



- Connectivity protocols: Bluetooth, Wi-Fi, ZigBee, healthcare personnel can change the way they spot illness in patients and can also innovate revolutionary ways of treatment.



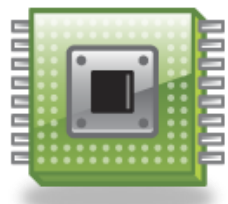
# Benefits

- Data assortment and analysis



- IoT devices can collect, report and analyses the data in real-time and cut the need to store the raw data which **speed up decision-making** and is **less prone to errors**.





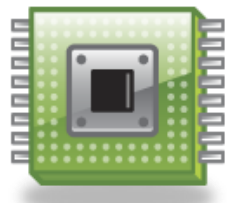
# Benefits

- **Tracking and alerts**



- **Medical IoT devices gather vital data and transfer that data to doctors for real-time tracking, while dropping notifications to people about critical parts via mobile apps and other linked devices.**



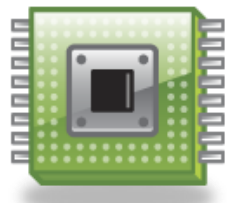


# Benefits

- Remote medical assistance



- In event of an emergency, patients can contact a doctor who is many kilometers away with a smart mobile apps. The medics can instantly check the patients and identify the ailments.

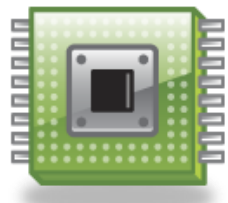


# Challenges

- **Data security & privacy**



- One of the most significant threats that IoT poses is of data security & privacy. IoT devices capture and transmit data in real-time. However, most of the IoT devices **lack data protocols and standards.**

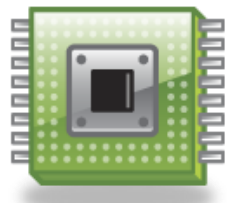


# Challenges

- **Integration: multiple devices & protocols**



- **Integration of multiple devices also causes hindrance in the implementation of IoT in the healthcare sector. This non-uniformity of the connected device's protocols slows down the whole process.**

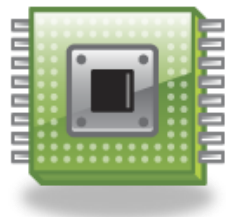


# Challenges

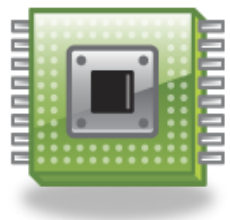
- **Data overload & accuracy**



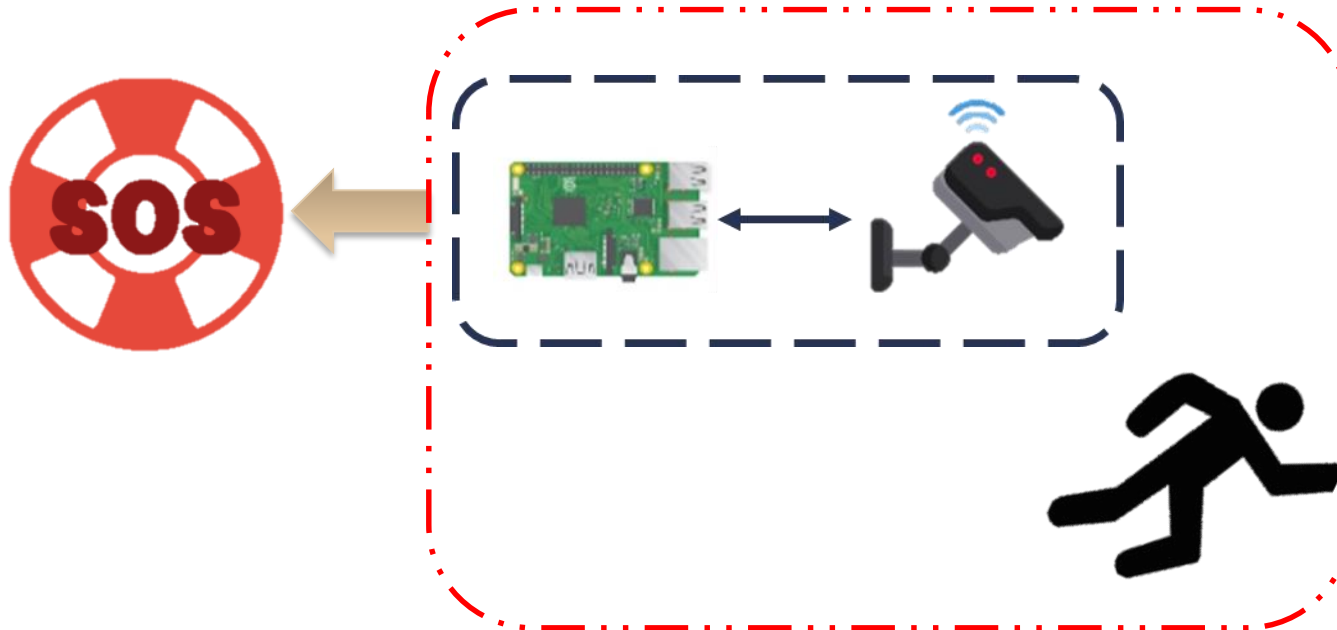
- **The amount of data is so tremendous that deriving insights from it are becoming extremely difficult for doctors which, ultimately affects the quality of decision-making.**

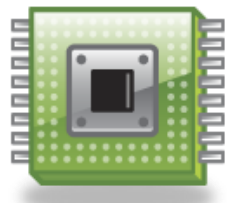


# CASE STUDY: 跌倒偵測

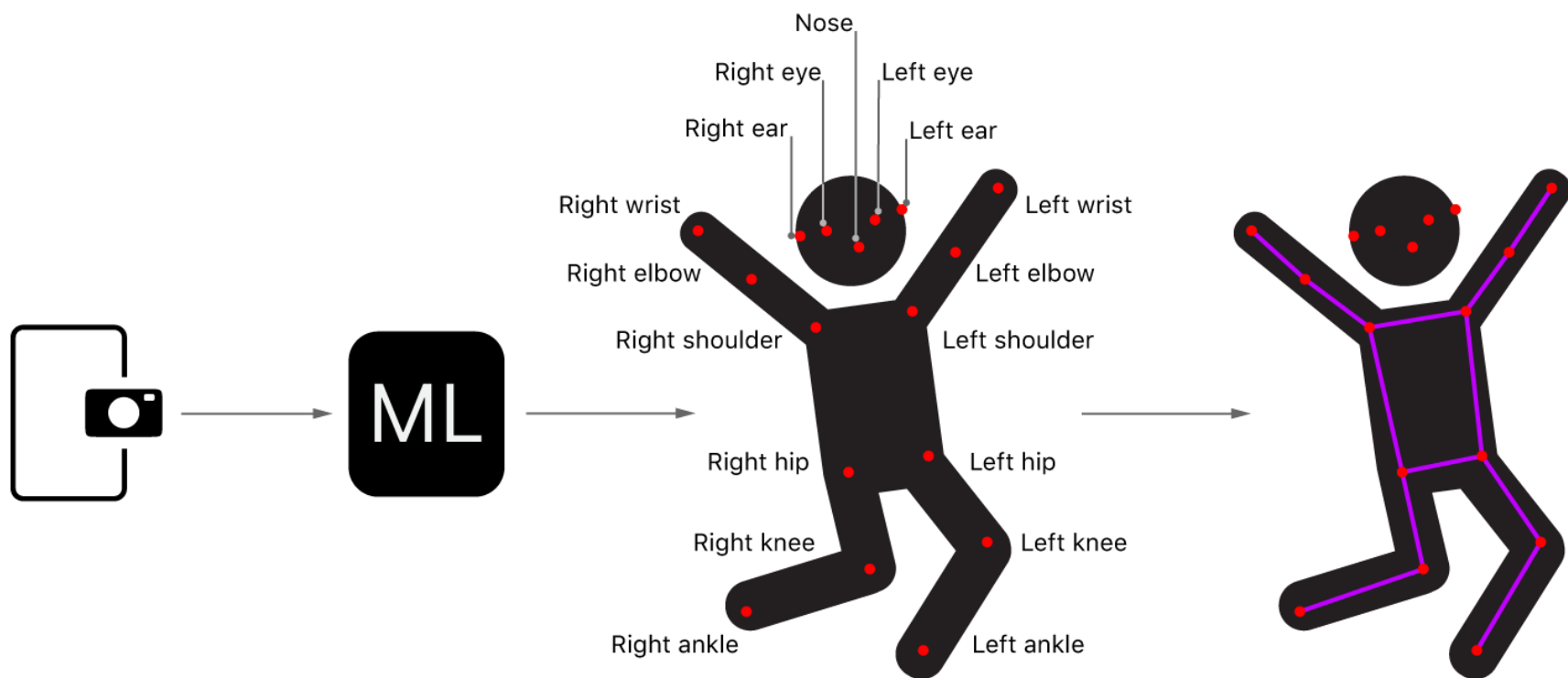


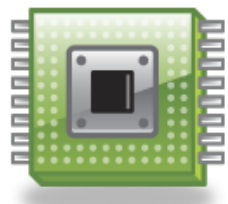
# Use Case





# Principle of PoseNet



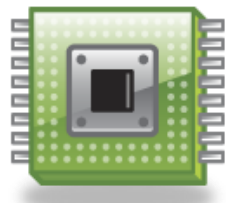


# One Application: Move Mirror

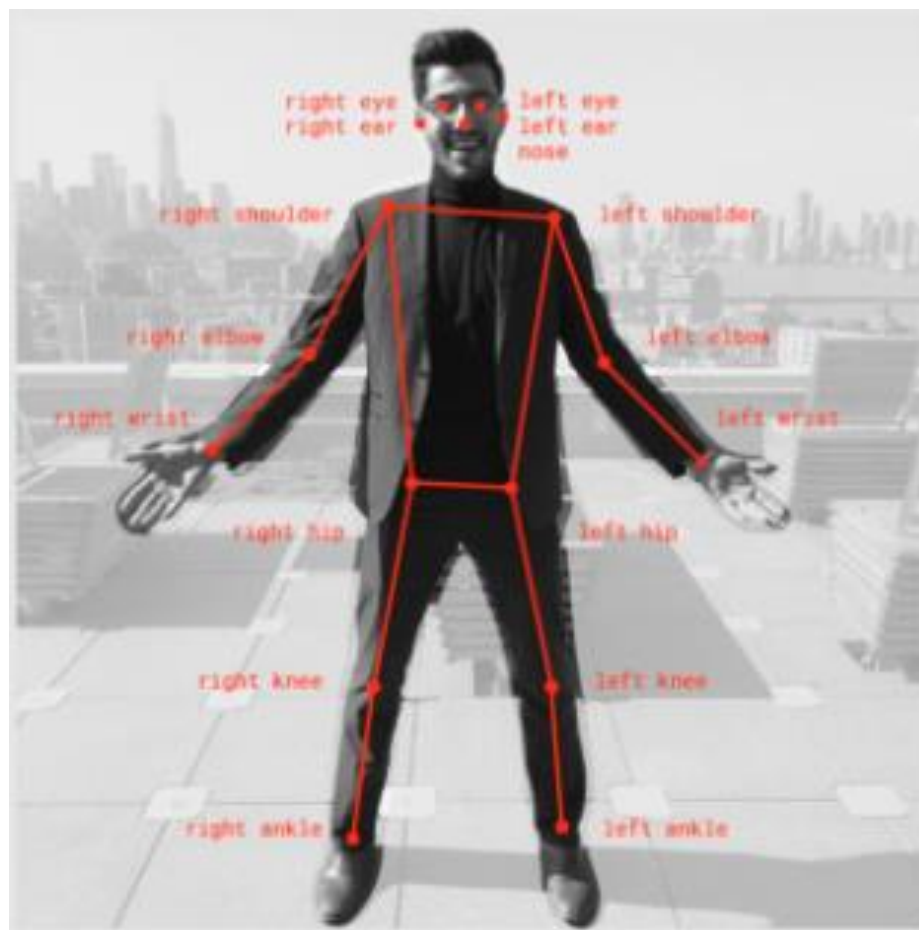
- 採用機器學習框架TensorFlow.js和姿勢判斷模型PoseNet，讓使用者透過網頁瀏覽器和電腦攝影鏡頭就能使用機器學習的姿勢判斷功能，Move Mirror就像鏡子，能找出與使用者上傳的動作影像相似的圖像

Source: <https://www.ithome.com.tw/news/124692>



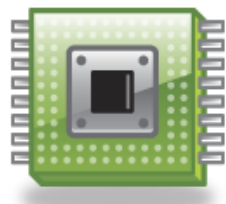


# Seventeen Pose Keypoints Detected by PoseNet.

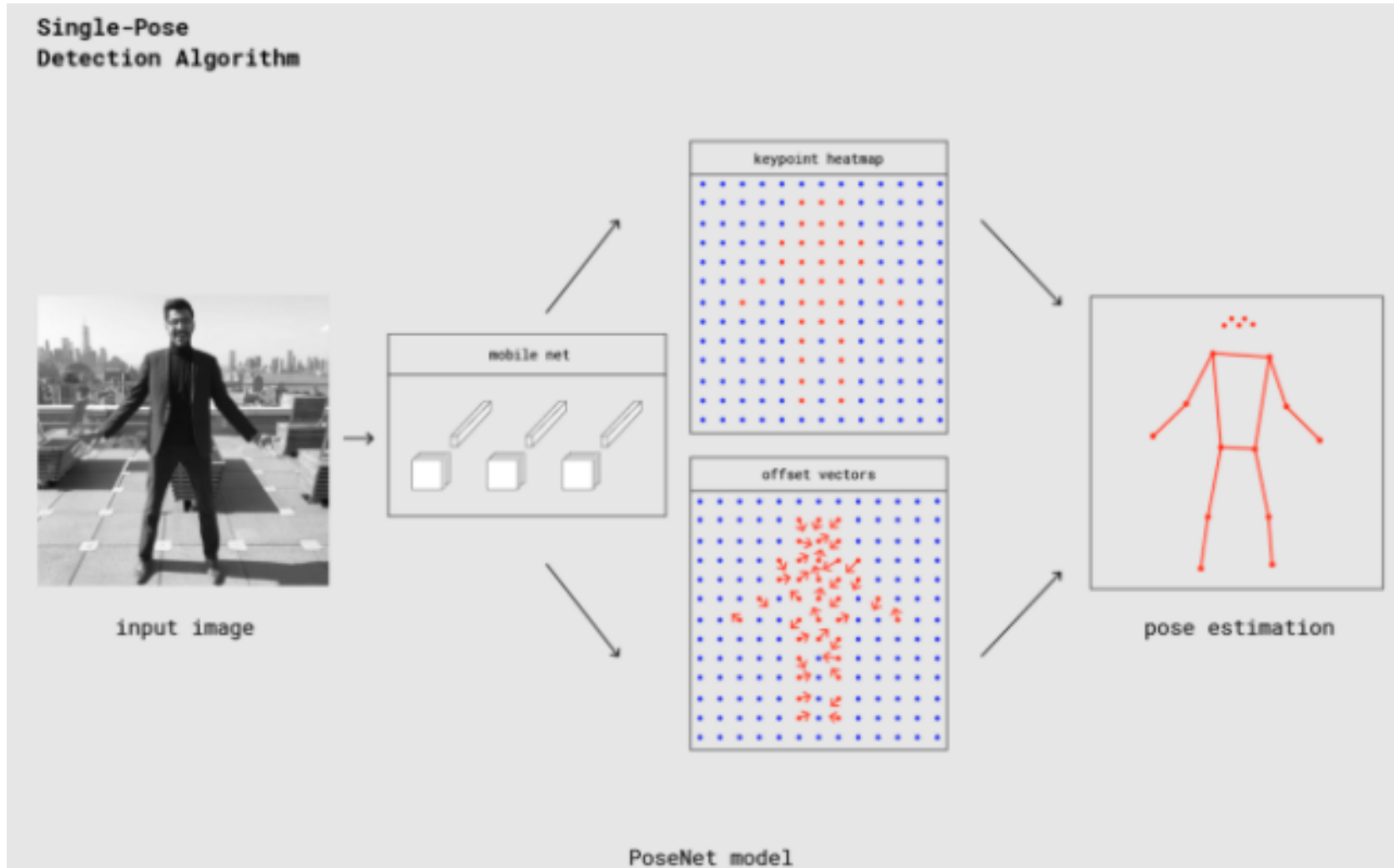


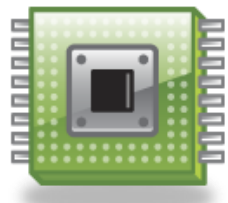
Source:

<https://medium.com/tensorflow/real-time-human-pose-estimation-in-the-browser-with-tensorflow-js-7dd0bc881cd5>



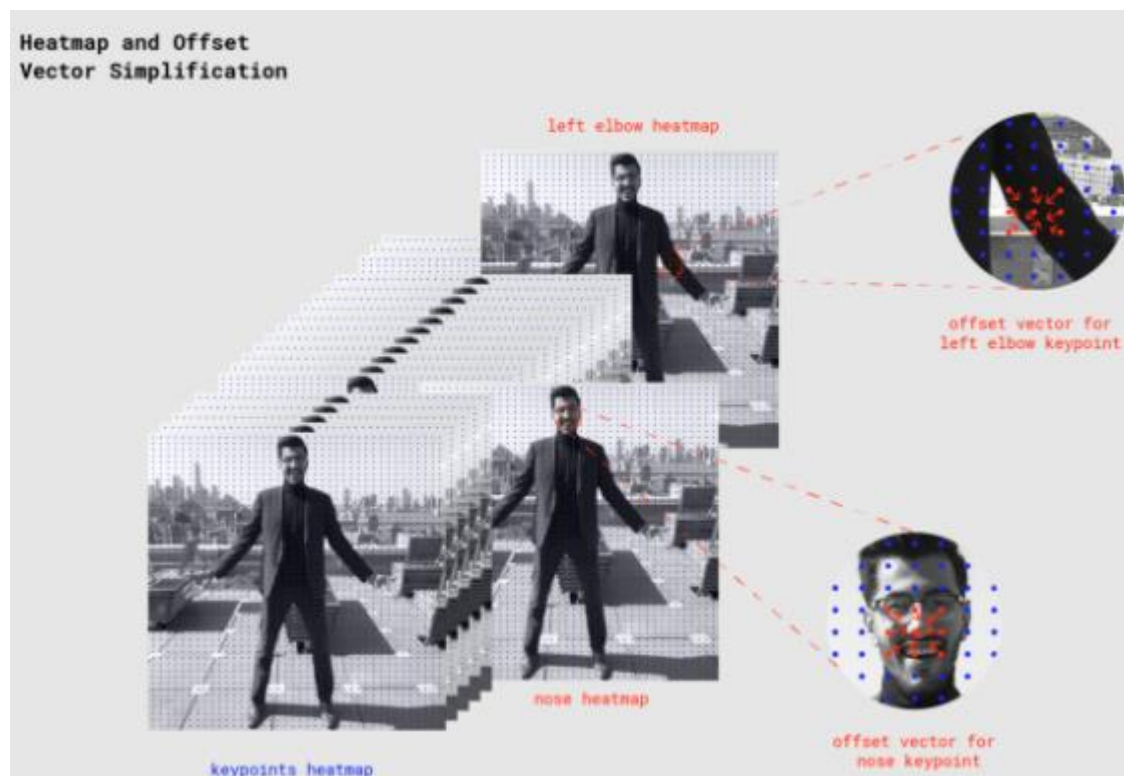
# Single Person Pose Detector Pipeline Using PoseNet

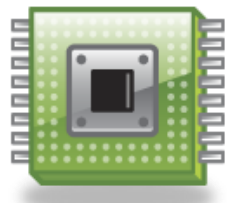




# Pose Detection

- Each of the 17 pose keypoints returned by PoseNet is associated to one heatmap tensor and one offset vector tensor used to determine the exact location of the keypoint.





# Question to Think

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- **How to detect “fall” based on PoseNet detection results?**