

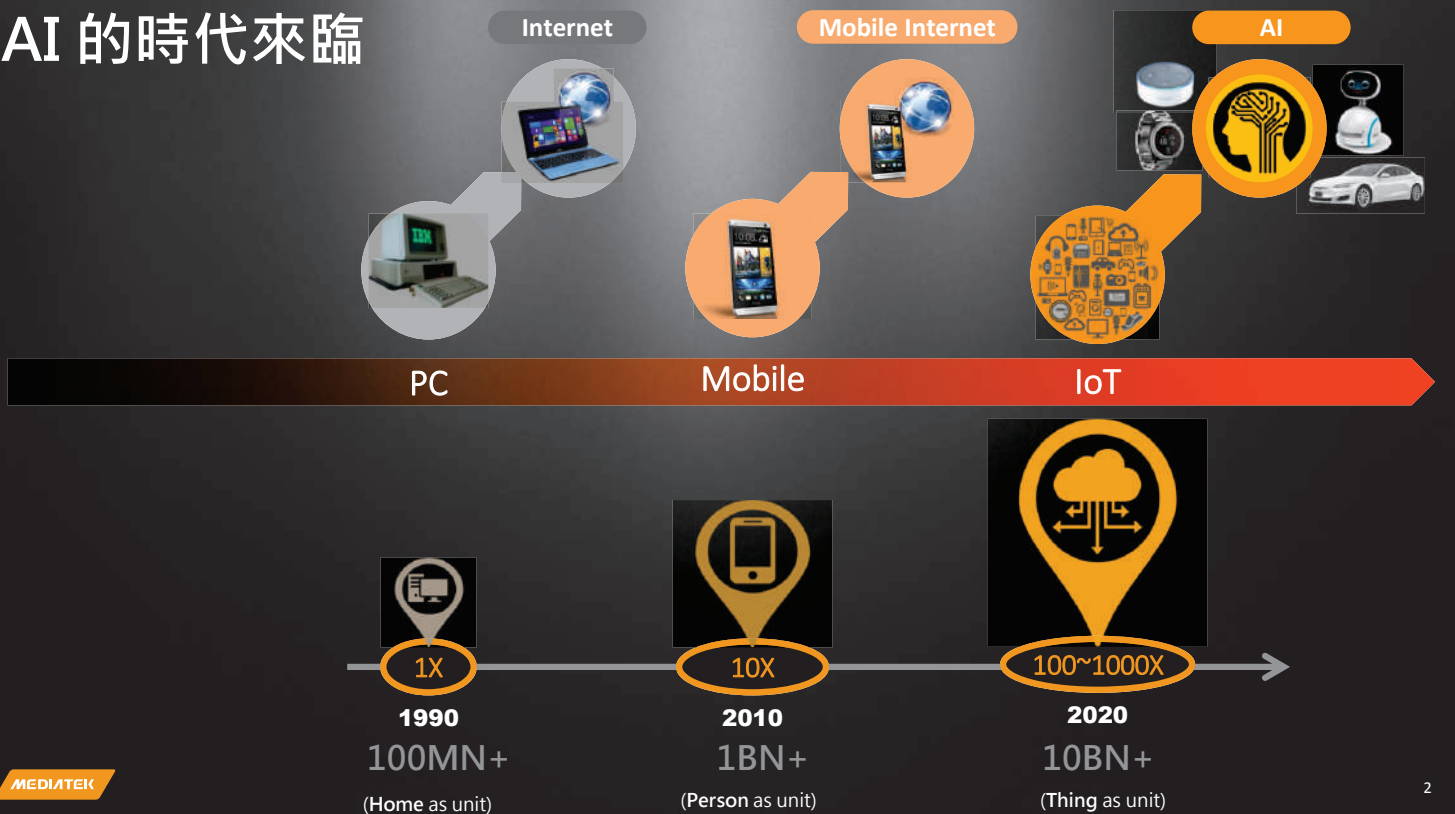
智慧系統與晶片技術之發展前景

聯發科技

2017. 7. 10



AI 的時代來臨



IoT : 智慧型設備進入人類生活各層面



IoT + AI : 人工智慧技術全面提升智慧型平台的能力



SENSING

RECOGNITION

UNDERSTANDING

DECISION

LEARNING

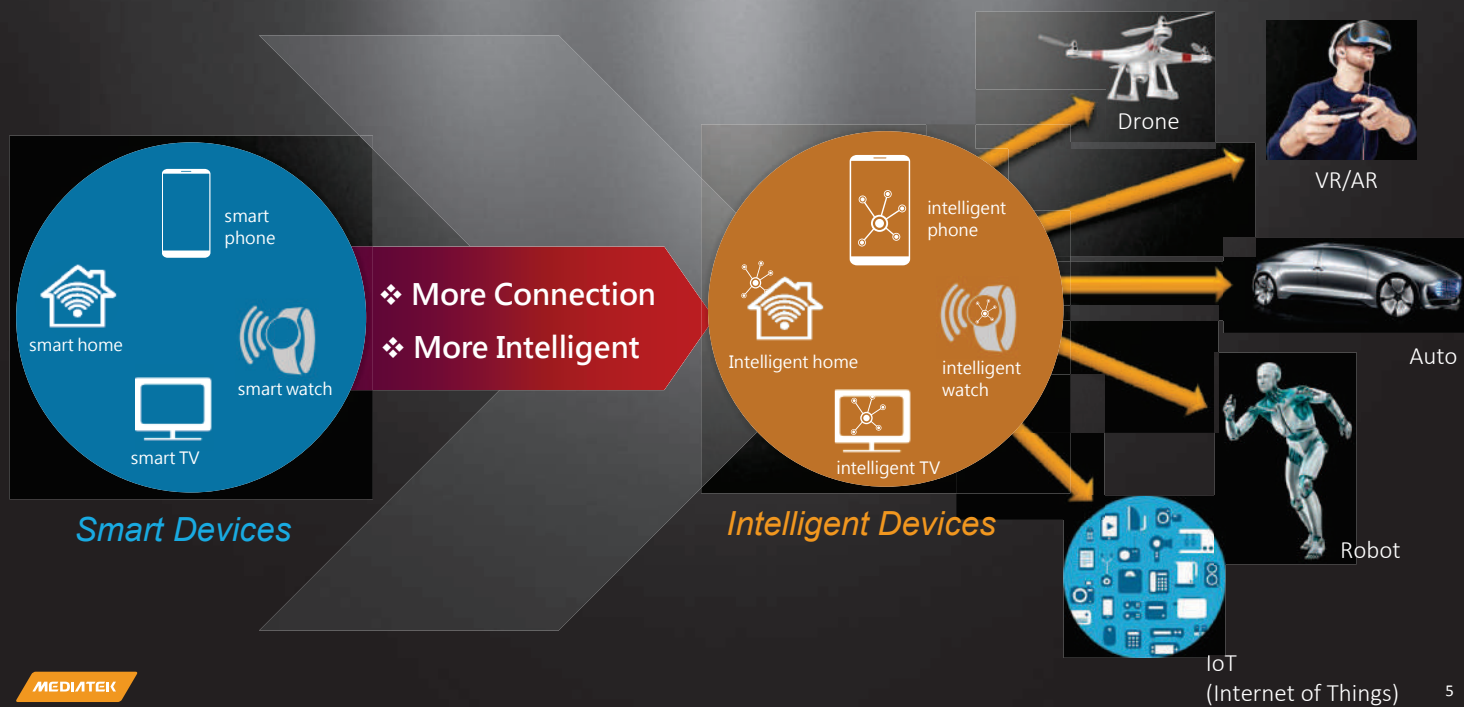
REASONING

PLANNING

PROBLEM SOLVING



From Smart Devices to Intelligent Devices

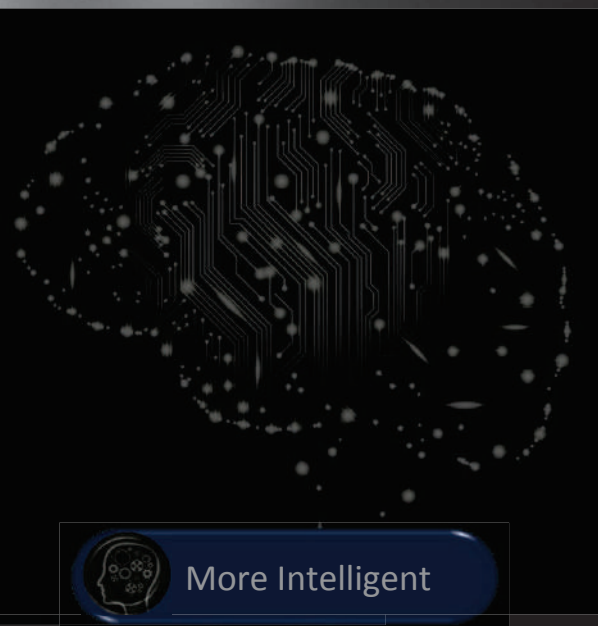


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智慧裝置兩大核心技術趨勢



智慧裝置兩大核心技術趨勢：更多網路聯結



More Connection

AUTO



Telematics



Info-tainment

MOBILE



Smart-phone



Tablet

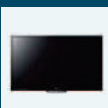


Chrome-book

HOME A/V



Setup Box



Smart TV



Game Console



BD Player

INFRASTRUCTURE



IP CAM



Wireless AP

(1) More Bandwidth

❖ Cellular Communication

- 4G : LTE-A, Pre-5G
- 5G : eMBB (enhanced Mobile Broad Band)
 - Sub-6G
 - mmWave

❖ WiFi

- 802.11 ax (HEW: High-Efficiency WLAN)
- 802.11 ad (WiGig), 802.11 ay

❖ Cellular Communication with Unlicensed band

- LWA (LTE-WLAN aggregation)
- LTE-U (LTE in Unlicensed band)
- LAA (Licensed Assisted Access)



More Connection

(2) More Devices

VEHICLE



Trunk



Sharing Bike

WEARABLE



Heartbeat belt



Smart-watch



Wrist Band

- ❖ LPWAN (Low-Power Wide-Area Network)
 - LTE cat. NB1 : NB-IoT (NarrowBand IOT)
 - LTE cat. M1 : eMTC (enhanced Machine-Type Comm.)
 - EC-GSM-IoT
 - 5G: mMTC (massive Machine Type Comm.)
 - LoRa
 - Sigfox

- ❖ WPAN (Wireless Personal Area Network)
 - Bluetooth
 - BLE (Bluetooth Low Energy), Bluetooth Smart
 - Zigbee
 - Ant+

- ❖ WIFI

IoT



Smart Sensor



Smart Outlet



Smart Button



Smart Lighting



Smart Meter

INDUSTRIAL & INFRASTRUCTURE



Robot Control



Industrial Control



Traffic Control

HOME APPLIANCE



Washing Machine



Refrigerator

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More Connection

(3) Lower Latency

AUTO



Navigation



Telematics



V-ADAS



mmWave Radar



Driverless Car

- ❖ Vehicular communication systems
 - V2I (Vehicle-to-Infrastructure)
 - V2V (Vehicle-to-vehicle)
 - V2P (Vehicle-to-Pedestrian)
 - V2D (Vehicle-to-device)
 - V2G (Vehicle-to-grid)
 - V2X (Vehicle-to-everything)

ROBOT



Industrial Robot



Medical Robot

VEHICLE



UAV



Drone

- ❖ DSRC (Dedicated short-range comm.)
 - IEEE 802.11p

(WAVE: Wireless Access in the Vehicular Environment)

- ❖ Cellular V2X
 - LTE-V2X

- ❖ 5G : uRLLC (Ultra Reliable and Low Latency Communication)

AR/VR



AR



VR

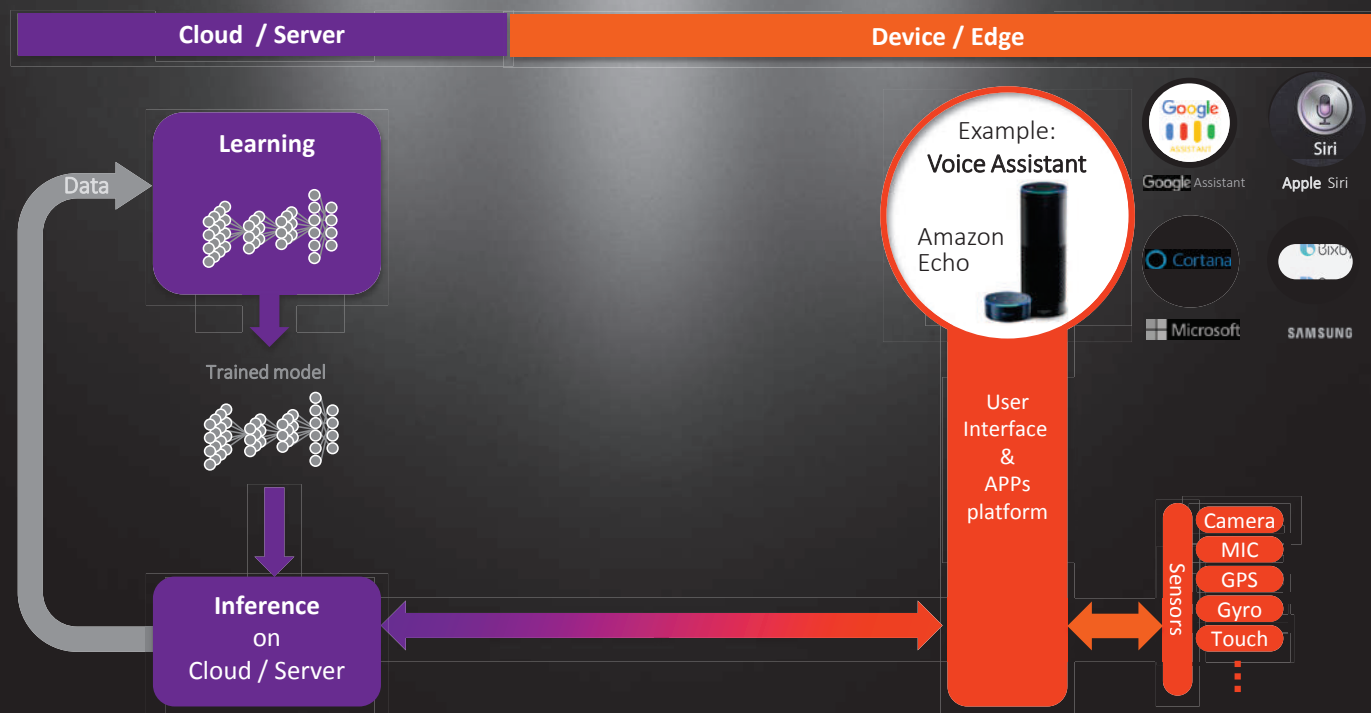
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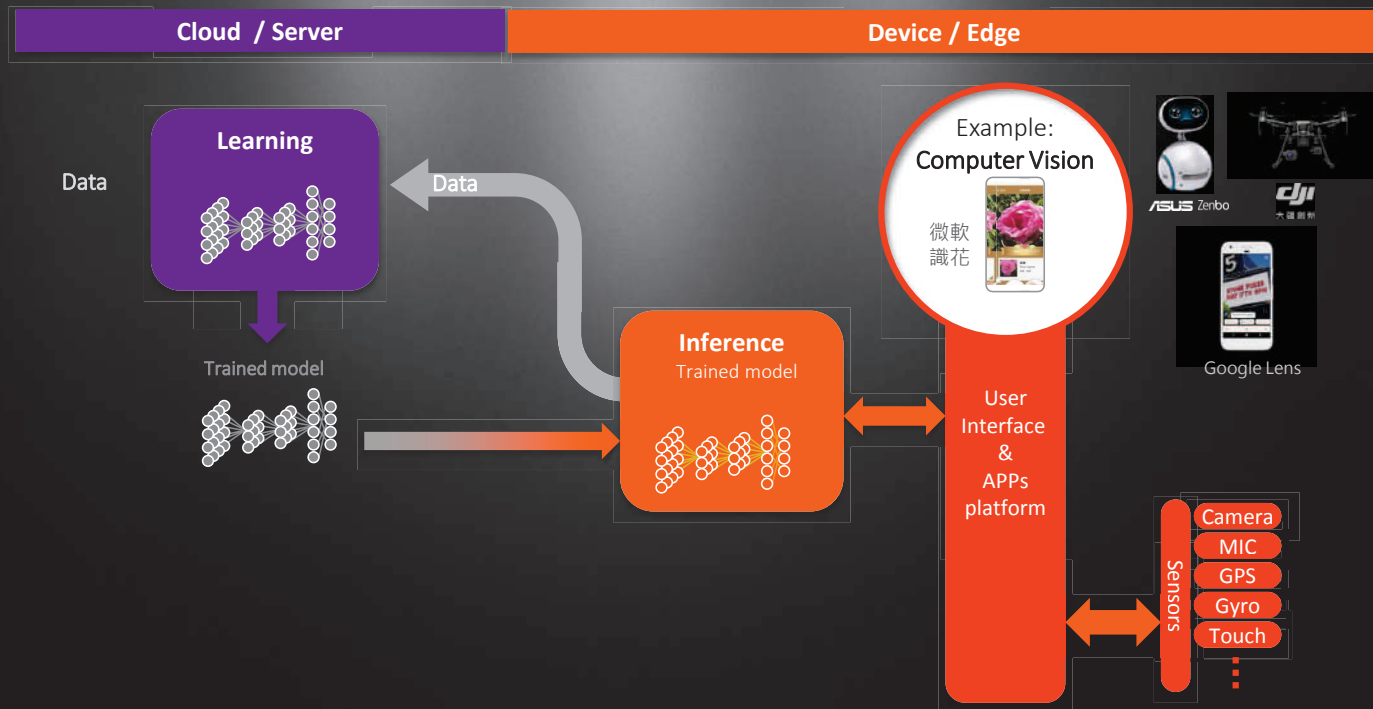
智慧裝置兩大核心技術趨勢：更多智慧



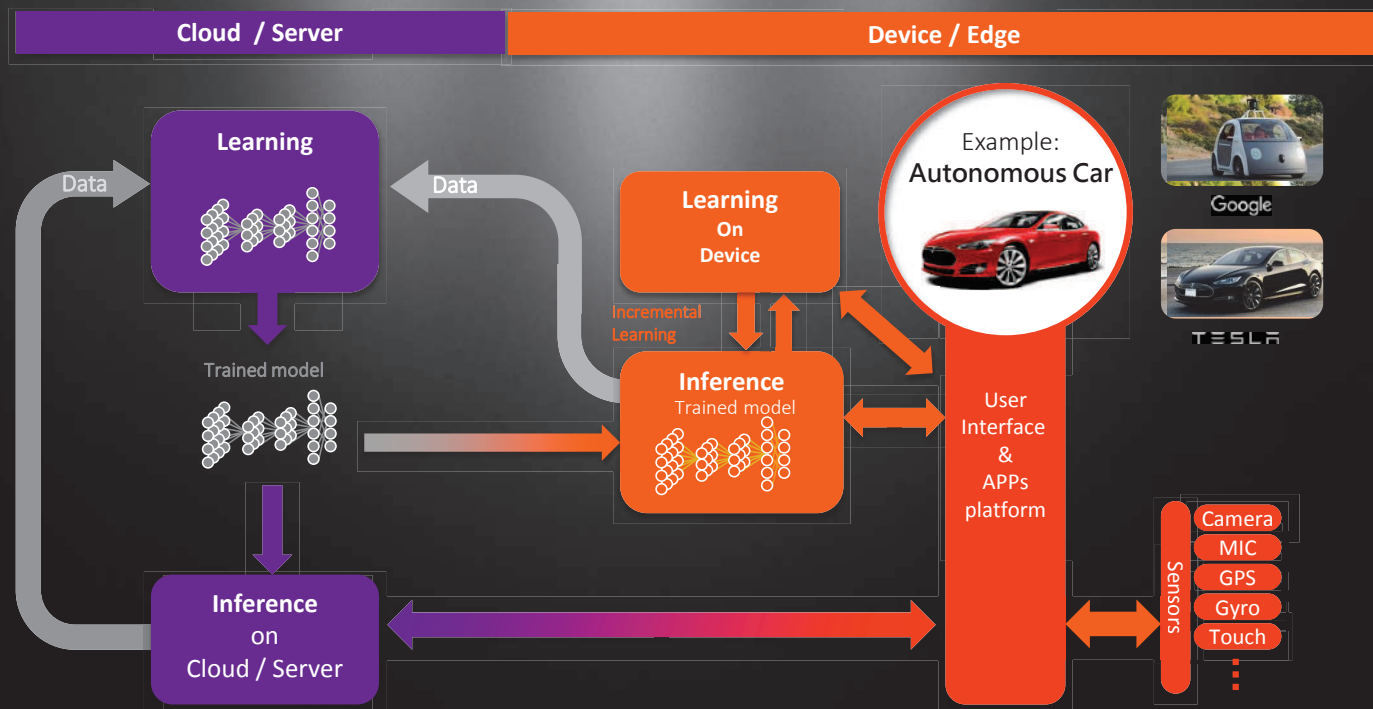
AI 應用基本架構 (1)：學習與推理在雲端進行



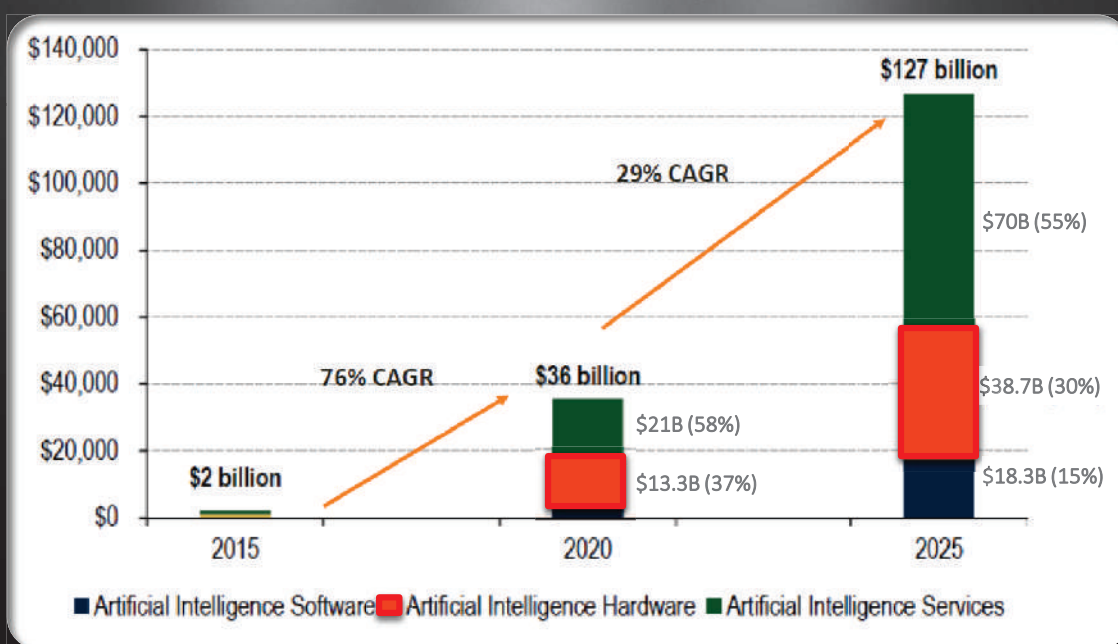
AI 應用基本架構 (2)：雲端學習，設備端進行推理



AI 應用基本架構 (3)：雲端與設備端均有學習與推理能力

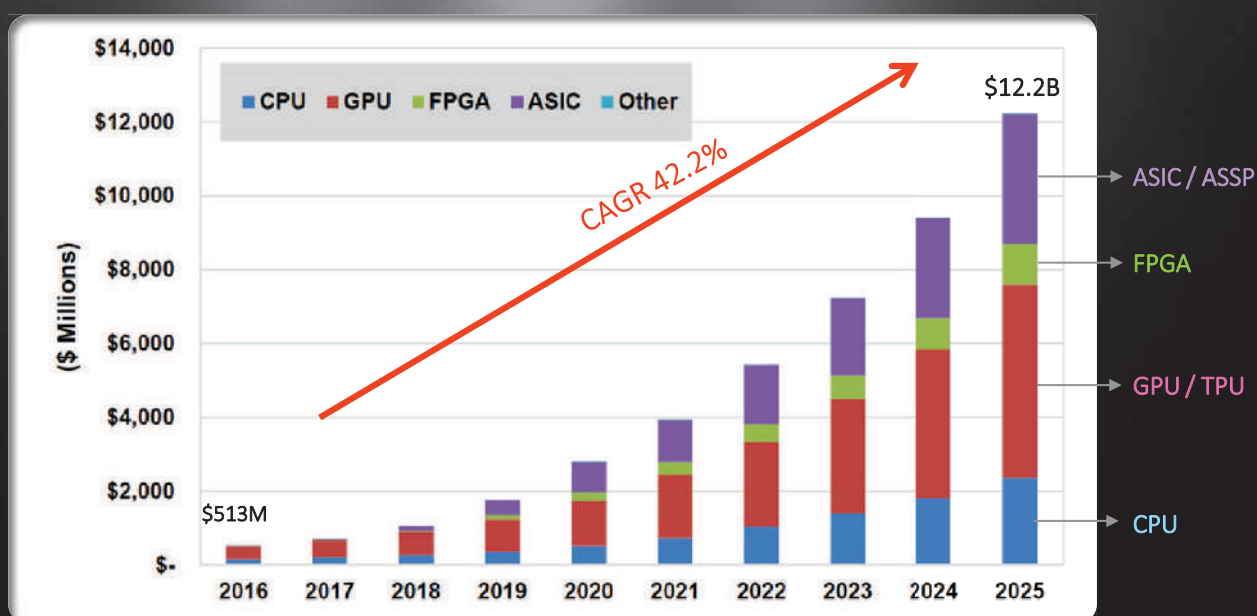


AI 系統的產值 硬體佔 30%

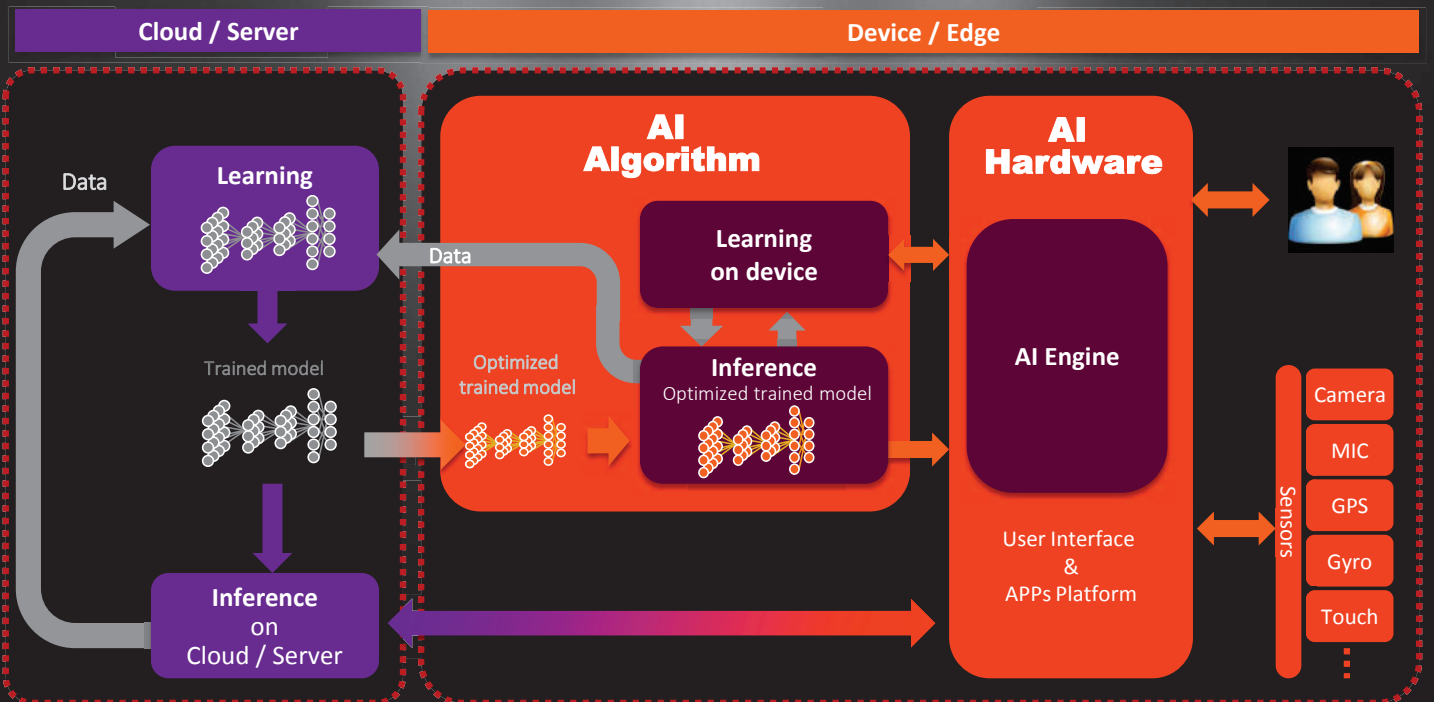


AI 晶片的產值 2025年達 \$12.2B

Deep Learning Chipset Revenue by Type, World Markets: 2016-2025



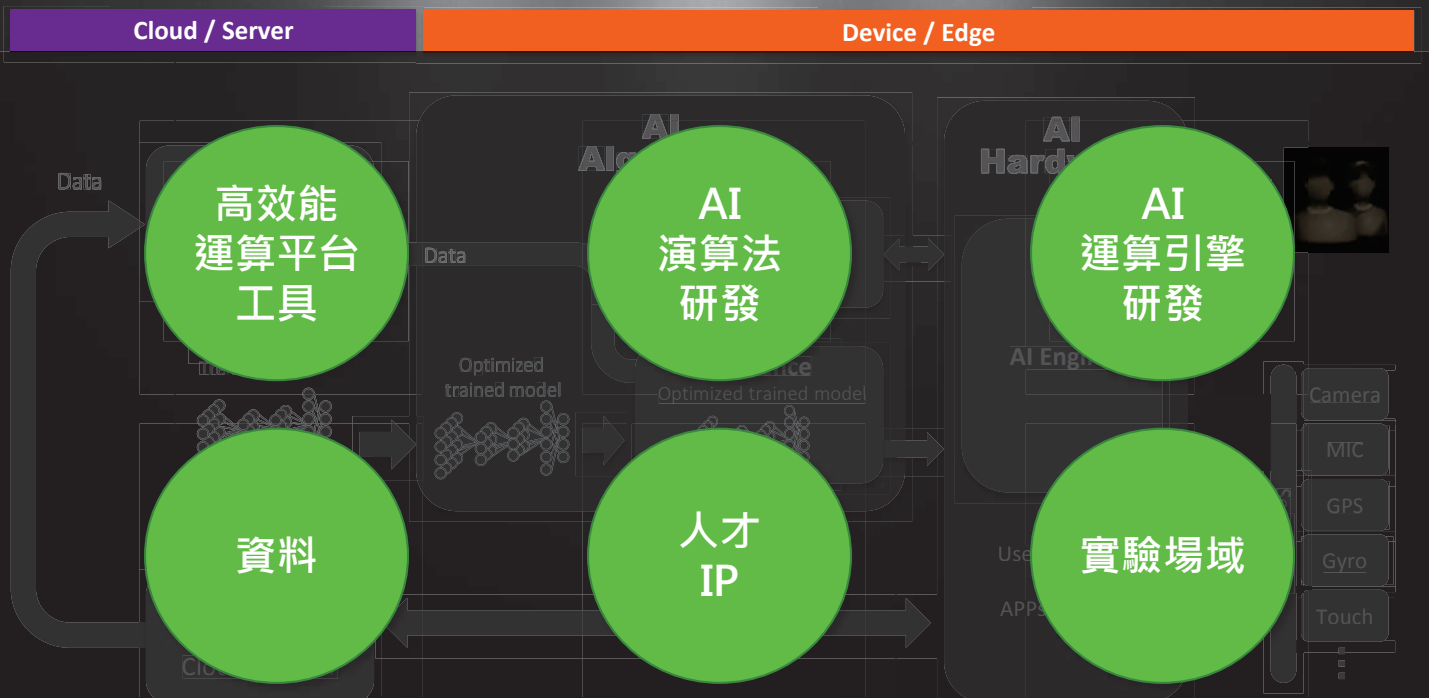
On-Device AI 為台灣重要發展領域



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AI 技術發展的關鍵



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Future: Connecting the Next Billions with AI



Summary

- ❖ 科技發展由 PC/Internet, Mobile Internet, 進入 IoT/AI 世代
平台也由 Smart Device 演進成 Intelligent Device
- ❖ Intelligent Device 應著重的技術方向
 - ❖ More Connection
 - 技術核心：Wireless Comm. (5G, WiFi, LPWAN,..)
 - 技術方向：More Bandwidth, More Devices, Less Latency
 - ❖ More Intelligent
 - 技術核心：AI 人工智慧 (Deep Learning, Machine Learning,..)
 - 技術方向：On-Device AI, AI algorithm, AI Hardware
- ❖ Wireless Comm. 與 AI 是未來 Intelligent Device 的核心技術基礎。
政府應加強 Wireless Comm. 與 AI 的技術投資，培養人才，鼓勵創新，
以建立台灣在智慧系統與晶片技術的國際競爭力。

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