

Things You Don't Know about IC Design -Semiconductor/Chip, or Systems?

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EE-CS is ubiquitous and dominant nowadays

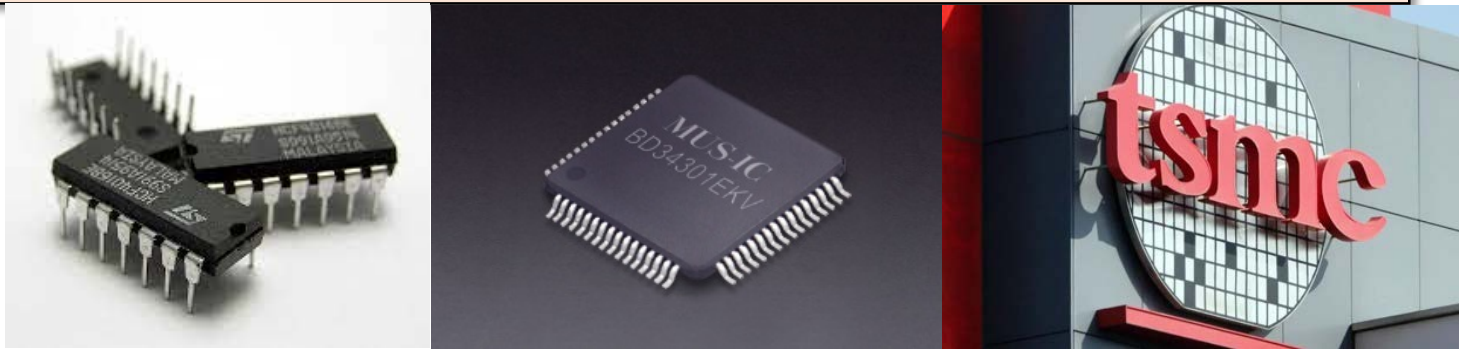


What they have in common?

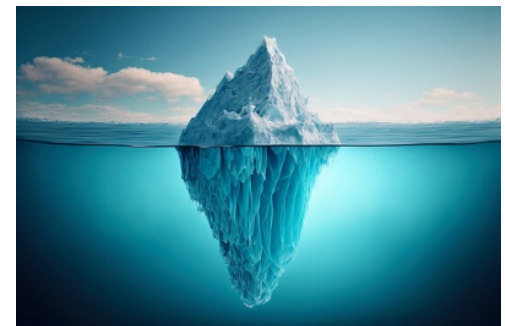


- Many guys would claim

Since they all have “IC-chips-inside”,
IC/semi-conductors must be prominent!

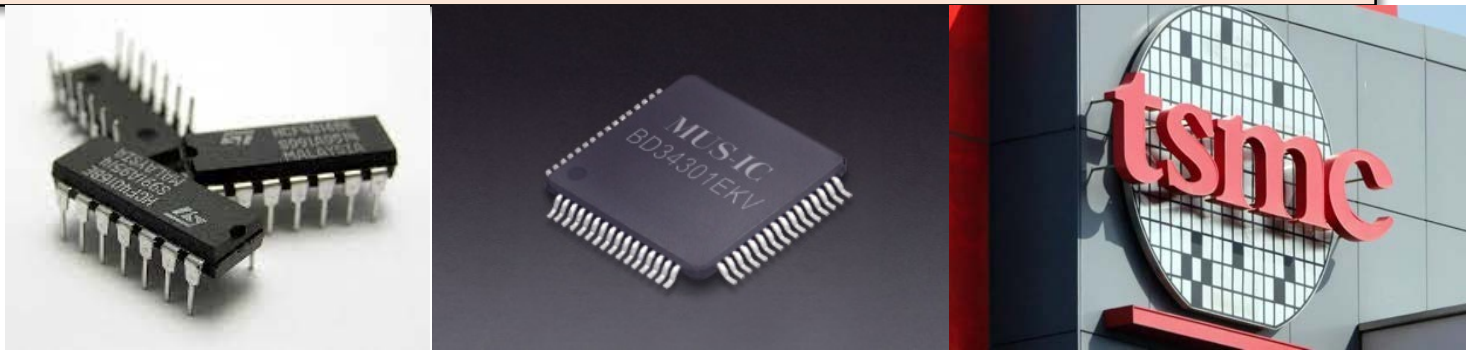


- Doubtlessly just a tip of the iceberg!
 - What's the whole?



What's all about **IC design**?

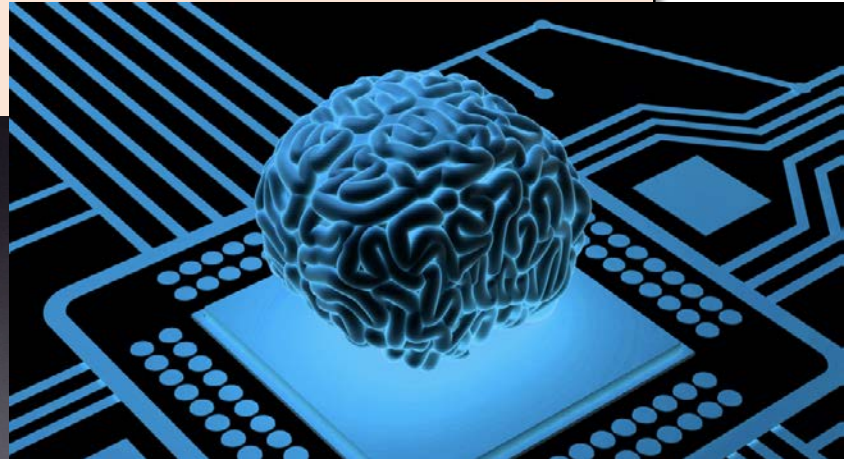
Immediately comes to your mind are:
Microelectronics, Circuits, VLSI,
Semi-conductor process...



- Yet, these are for **fast production** (nano processes) of IC chips, stressing hardware, a “**strong body**” (good conductivity, heat dissipation)!

What's all about IC design?

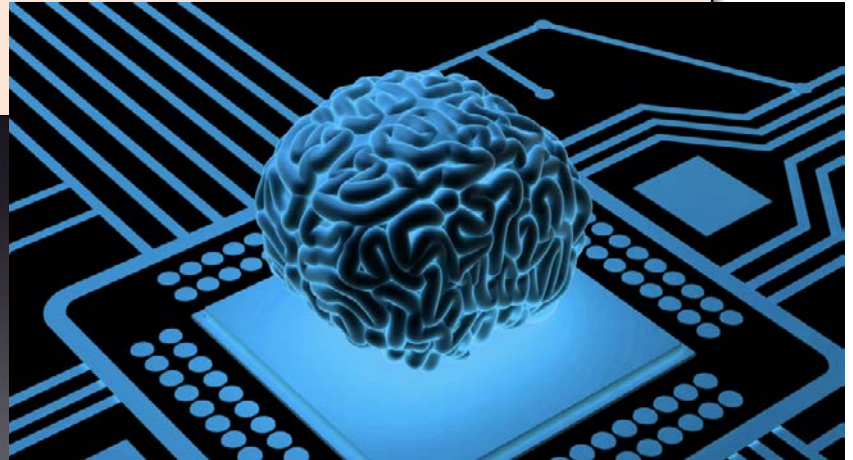
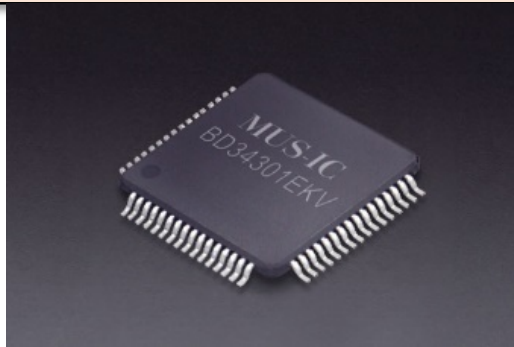
However, a strong body is overall just a body, **if without a brain, the software!**



- And a good brain of IC chips is **the key to smartness and intelligence!**

What's all about **IC design**?

What is the **brain** of an IC chip?

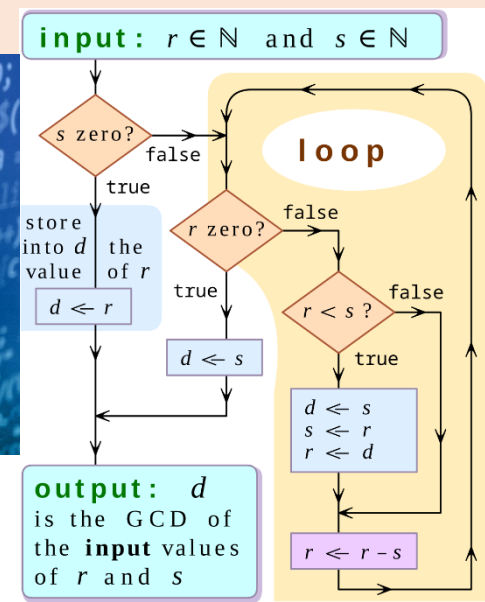
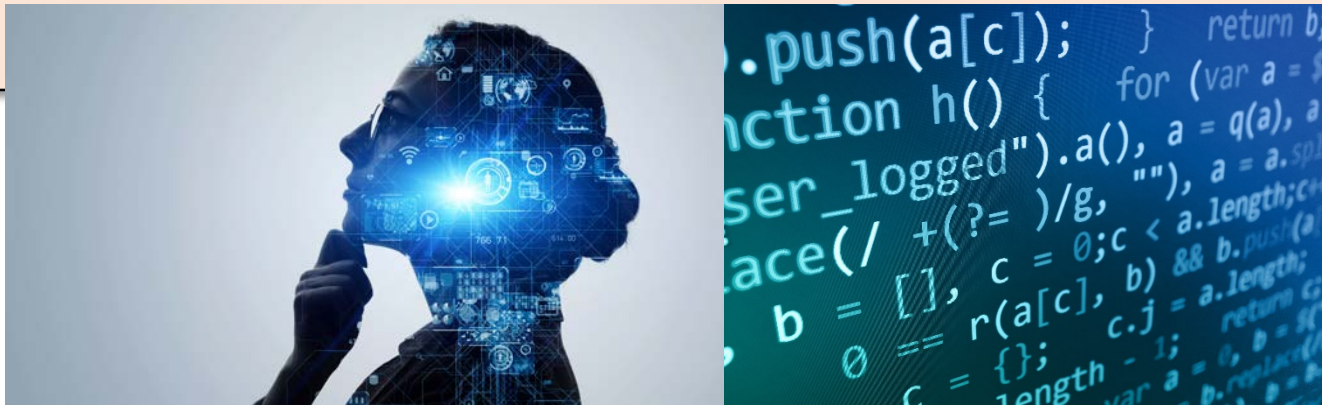


- The answer is **Algorithms**!



What's all about **IC design**?

An algorithm is a finite sequence of **mathematically rigorous** instructions, typically used to solve a class of specific problems or to perform a computation (from Wikipedia).



What's all about **IC design**?

Why “mathematically rigorous”?!

A chip's brain must **respond fast, work reliably, and make no errors**.....all the way to become **intelligent**!



- With a good brain/algorithm inside, IC chips can perform **fast and high-accuracy computations...intelligent processing!**

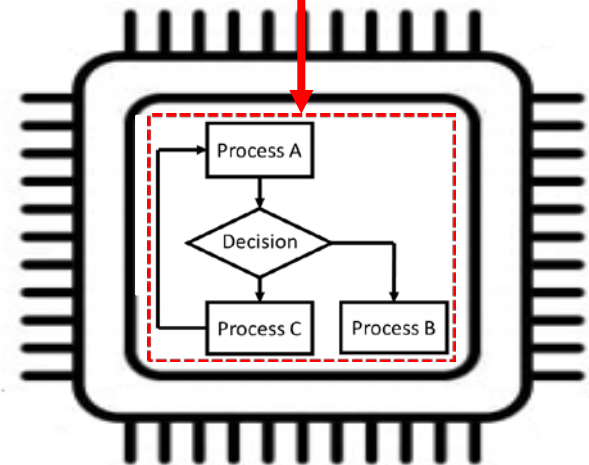
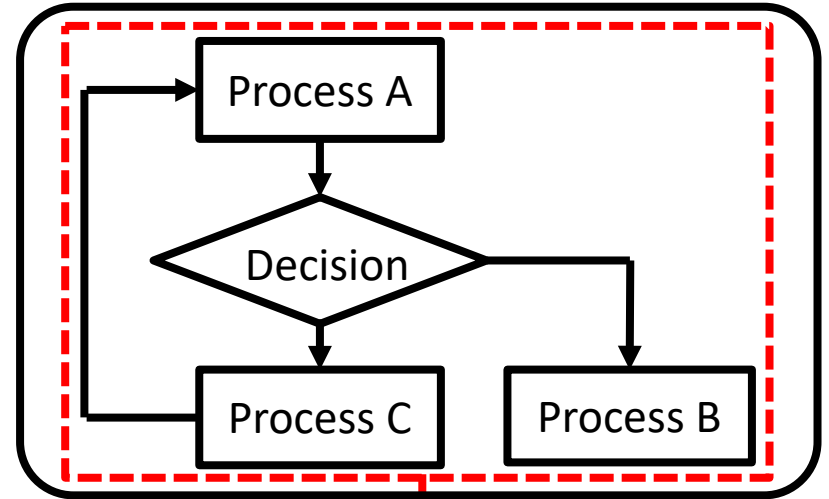
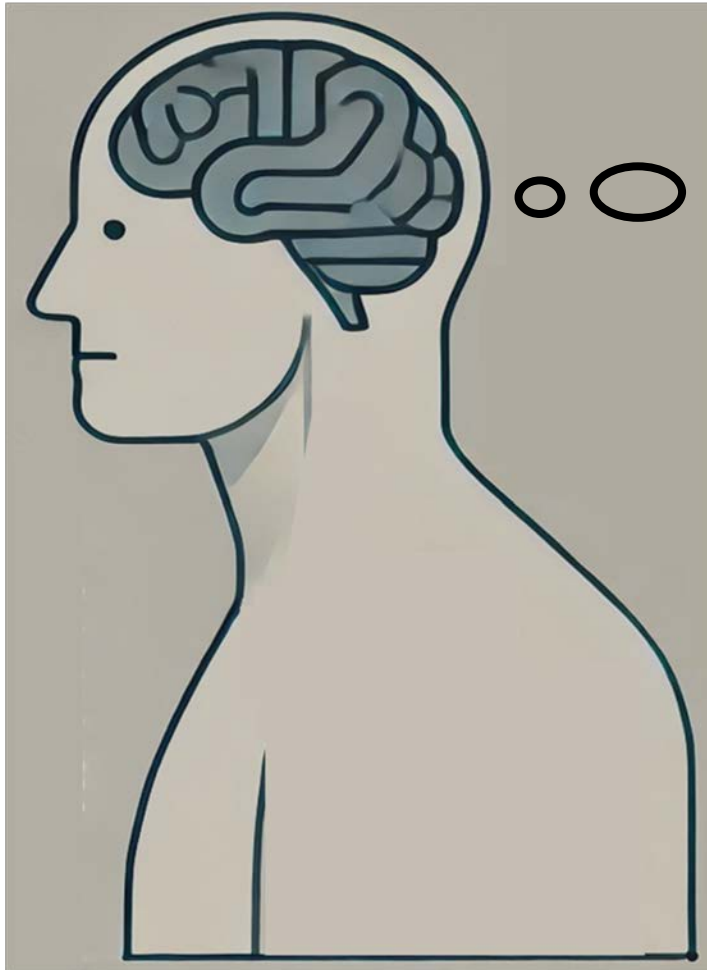
What's all about **IC design**?

- Where did mathematics come from?
- By “chip” only, you miss the cores

AI chips, **communication** chips, **control** chips, **sensor** chips, **bio-medical** chips,...many more, all “**system** + chip”

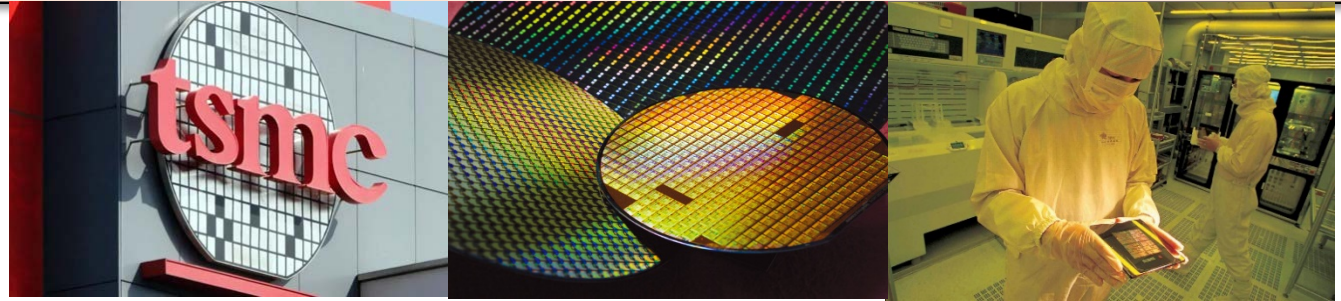
- Need mathematics to formalize system behavior
 - Mathematical system model
 - First step to design algorithm, the brain of chips

What's all about **IC design**?



- So, you have two IC-career options

Semiconductor and **IC production, foundry!**



Or...

IC/Algorithm Design: Invent/design new algorithms and systems, integrating tones of chips cleverly!



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large in LEMS extends beyond CEOs, internet companies, and private enterprises, countries and small-to-medium businesses, further bolstering this positive revenue

3Q23 Revenue Ranking for Top Ten IC Design Houses

(Unit: Million USD)

Rank	Company	Revenue			Market Share	
		3Q23	2Q23	QoQ	3Q23	2Q23
1	NVIDIA	16,512	11,332	45.7%	36.9%	29.8%
2	Qualcomm	7,374	7,174	2.8%	16.5%	18.9%
3	Broadcom	7,198	6,897	4.4%	16.1%	18.2%
4	AMD	5,800	5,359	8.2%	13.0%	14.1%
5	MediaTek	3,474	3,195	8.7%	7.8%	8.4%
6	Marvell	1,393	1,335	4.4%	3.1%	3.5%
7	Novatek	913	987	-7.5%	2.0%	2.6%
8	Realtek	842	856	-1.7%	1.9%	2.3%
9	Will Semiconductor	752	528	42.3%	1.7%	1.4%
10	Cirrus Logic	481	317	51.7%	1.1%	0.8%
Combined Total		44,737	37,980	17.8%	100%	100%

Notes:

1. This ranking only includes the top ten companies that publicly disclosed their financial reports.
2. The ranking considers Qualcomm's revenues solely from its QCT division, excludes OEM/IP revenues for NVIDIA, includes only semiconductor division revenues for Broadcom, and counts only semiconductor design and sales revenues for Will Semiconductor.

3. NTD:USD exchange rate= 3Q23 31.6957 ;2Q23 30.7124

4. RMB: USD exchange rate=3Q23 7.2445; 2Q23 7.0130

Source: TrendForce, Dec., 2023

Again, what they have in common?



Algorithms inside tones of chips!



Once again, a high-level look into them...



Data gathering, transfer, and processing!



That's all what 電信所 is all about!!



6G-Wireless Prosperity

以園區六大產業別區分，由於全球低軌衛星產業需求擴大，**通訊產業成長高達8.92%**，受到終端電子產品需求疲弱的影響，**積體電路產業跌約8.67%**。（自由時報，2024/03/12）



Share Price: **1,345**



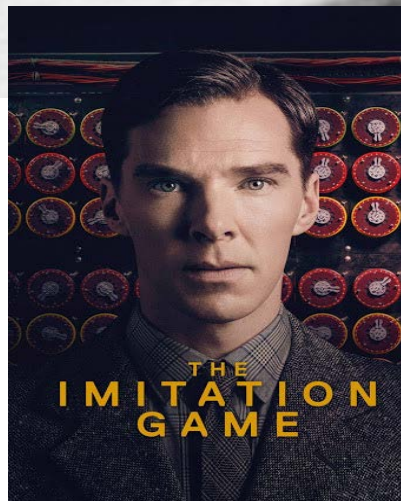
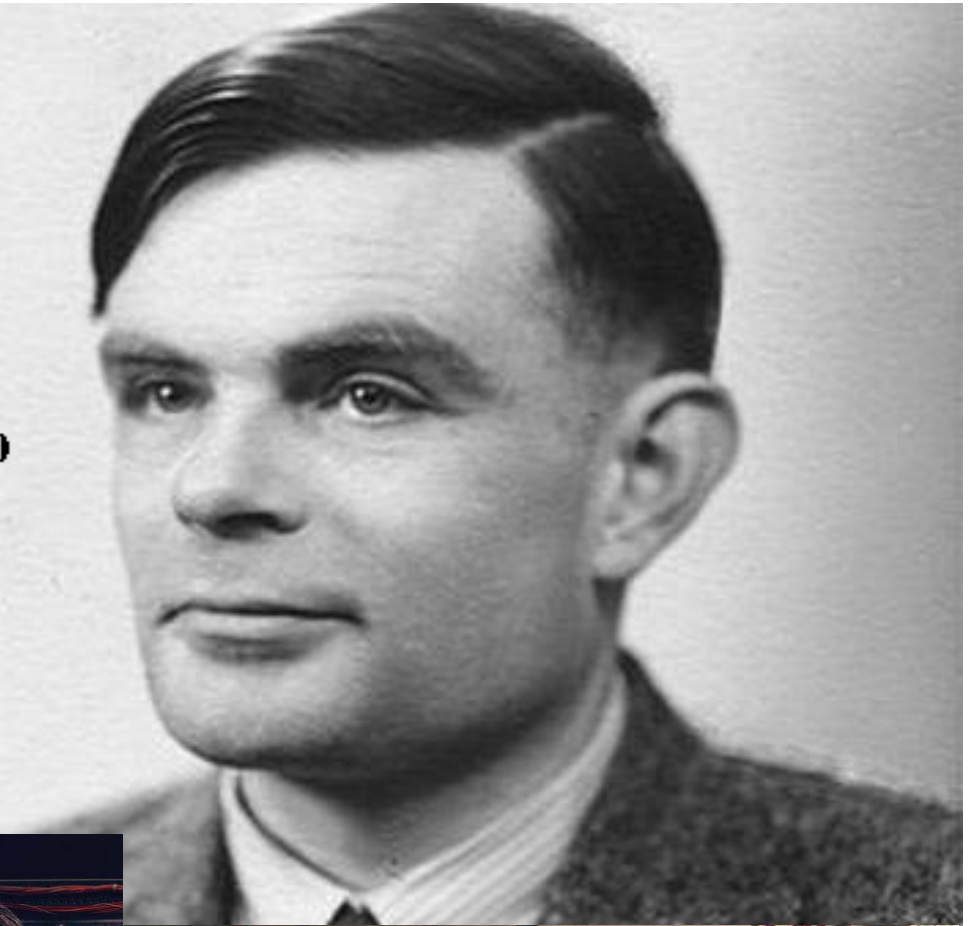
Share Price: **1,055**

Powerful algorithms and novel systems for connecting the world, and beyond...!



“Sometimes it is the people no one can imagine anything of who do the things no one can imagine.”

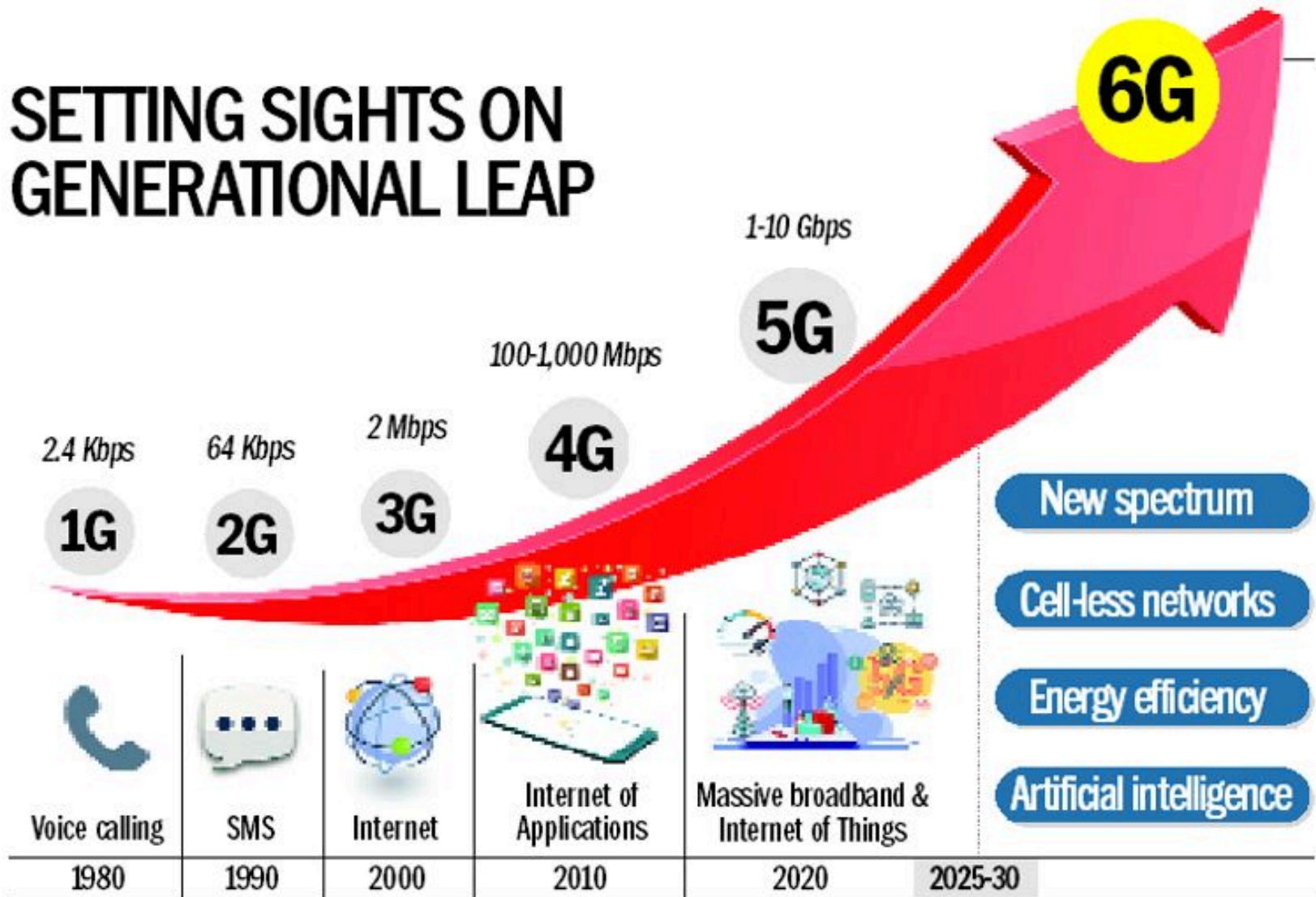
— Alan Turing



Appendix

6G方興未艾

SETTING SIGHTS ON GENERATIONAL LEAP



電信產業簡介

✓ 5G 企業用戶的市場規模

- 23億→317億美金(CAGR 54%)
- 主要集中在接取端

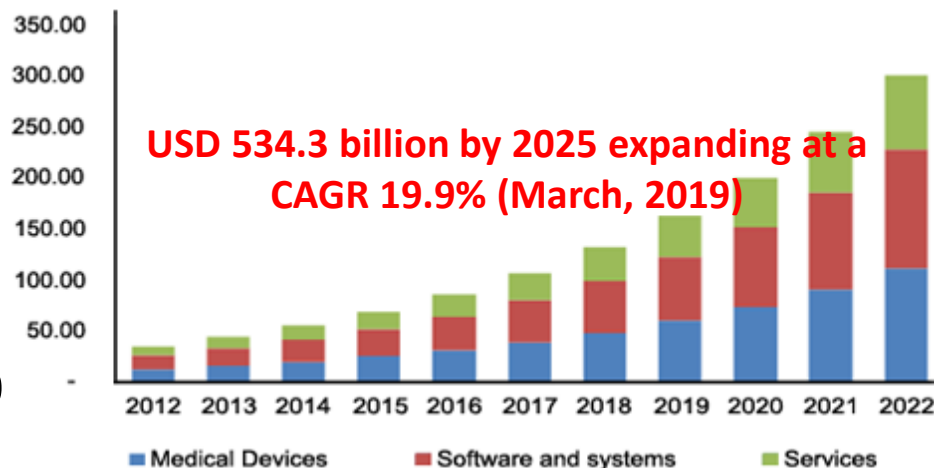
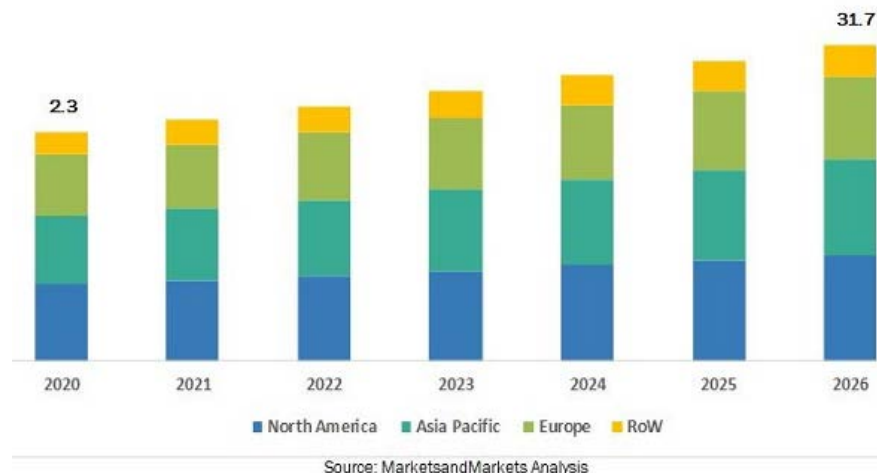
✓ 配合雲端開放電信網趨勢:

- 雲端軟硬整合通訊運算平台
- 通訊、邊緣運算、人工智慧
- mmWave & THz 射頻晶片
- 智慧雷達、天線技術

✓ AIoT健康照護

- 智慧醫療、數位醫學中心
- 2025→5,343億美金(CAGR 19.9)

5G ENTERPRISE MARKET, BY REGION (USD BILLION)



台灣電信產業聚落

✓ 台灣電信產業之焦點

➤ B5G /6G 智慧無線通訊網路

- 智慧物聯網: 智慧製造、健康照護、智慧運輸

➤ 無線通訊接取端與設備

✓ 台灣之電信走廊 (Telecom Corridor)

➤ 通訊晶片: 聯發科、瑞昱、絡達

➤ 網路通訊系統: 啟碁、合勤、智邦、正文、明泰、智易

➤ 行動通訊裝置: 鴻海、華碩、宏碁、廣達、仁寶、宏達電

➤ 工業物連網: 研華、微軟、亞馬遜

➤ 外商: Qualcomm、Apple、Intel、Broadcom、Google、Amazon