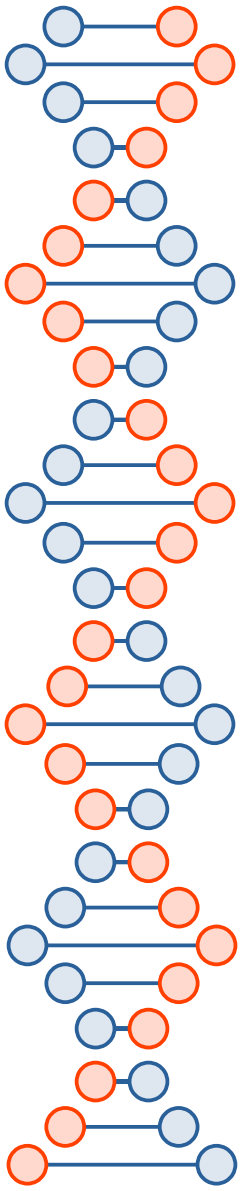
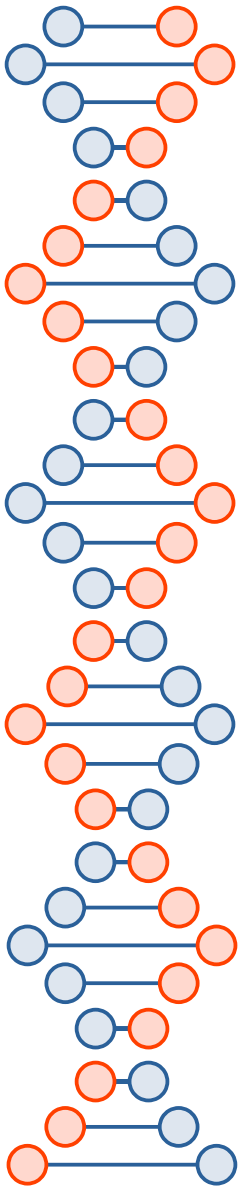


AI – Friend or Foe

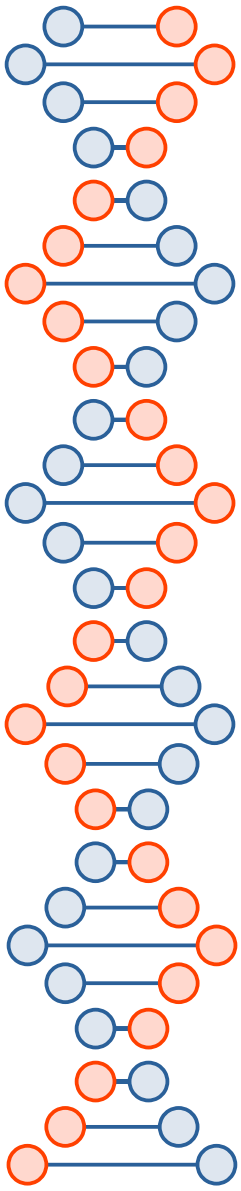
Nick Rossiter

Talk to Hexham Rotary Club 20 May 2024



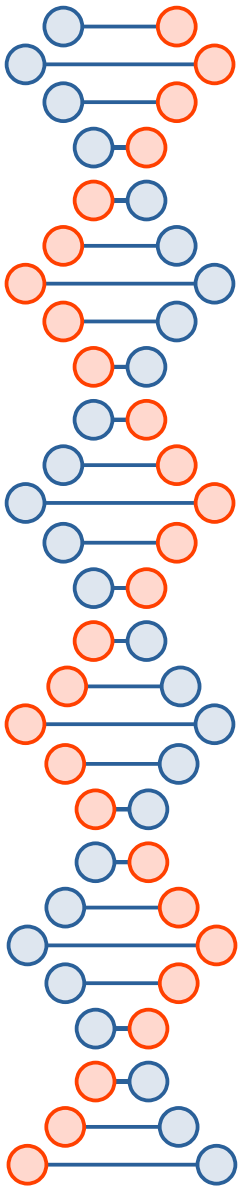
AI

- Sixty years ago would have been thought to be a farming practice!
- Now assumed to be Artificial Intelligence
- Alan Turing was prophetic:
  - If computers became so refined as to be indistinguishable from people, then that is AI
  - 1935: Universal Turing Machine (self-modifying programs)
  - 1948: Intelligent machinery (report)



Massive Hype for AI in 1980s

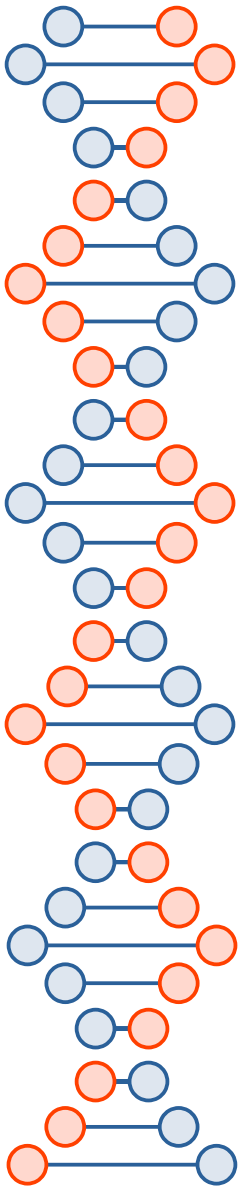
- Exciting developments in ideas
  - Neural nets
  - Machine learning
  - Genetic algorithms
  - Knowledgebases
  - Expert Systems
  - Logic programming
- But computers were tiny
  - US moon shot computer much less powerful than a modern phone
  - No hope of implementation
- False Dawn



Interesting Test Case – Language Translation

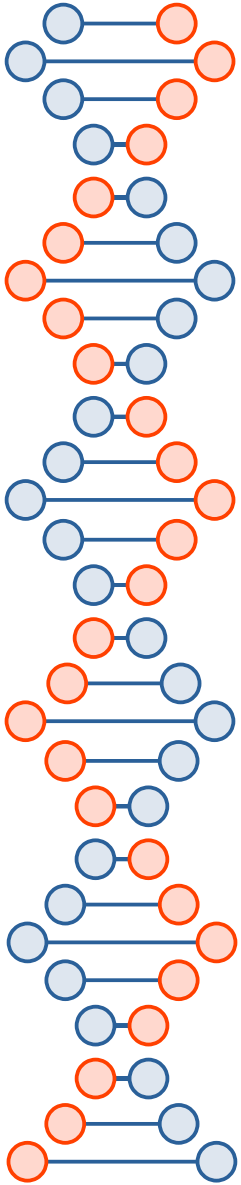
- Rule-based
  - Use grammar rules and dictionaries for translation
  - e.g. Prolog

  versus
- Idiom-based
  - Translate on a phrase basis using many, many examples
  - e.g. Systran
- The idiom-based won, illustrating the potential of training a system to make it AI-compliant



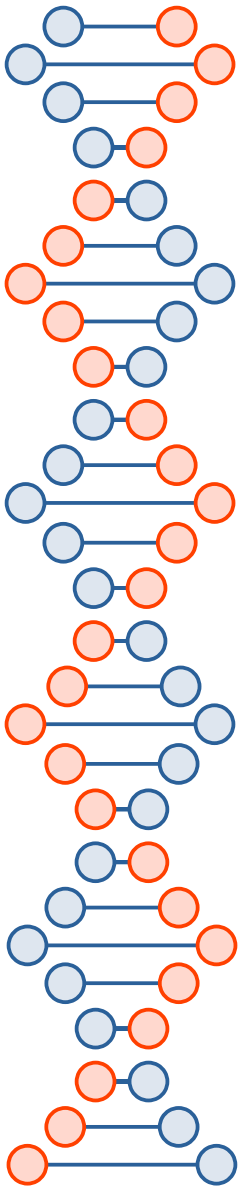
AI Fundamentals

- An AI system:
  - Trains itself with vast amounts of real-world data (deep learning)
  - Models neural-type structures/processes to emulate brain
    - Artificial neurons (65-90 billion neurons in brain), edges (synapses, 100-1,000 trillion in brain) with signals between them
  - Responds to new requests by
    - Precedence
    - Reasoning
  - Variety of algorithms
  - Is Narrow AI
    - Cannot reason outside its domain (no lateral intelligence)



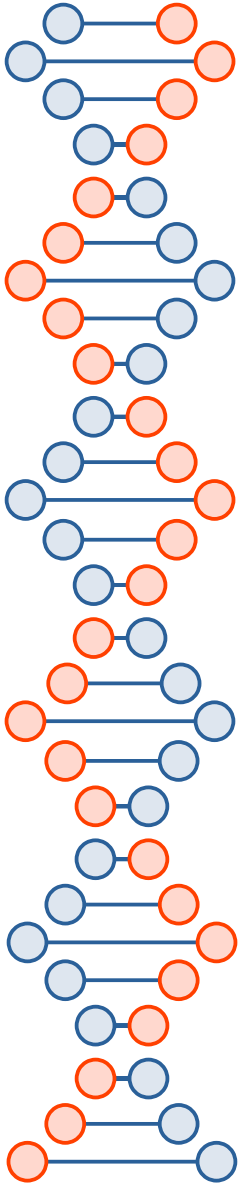
Recap -- Performance Limitations for AI

- Like much else in computing science
- Ideas were laid down in theories and algorithms in 1970s and 1980s
- But they could not be implemented
- The machines were not powerful enough



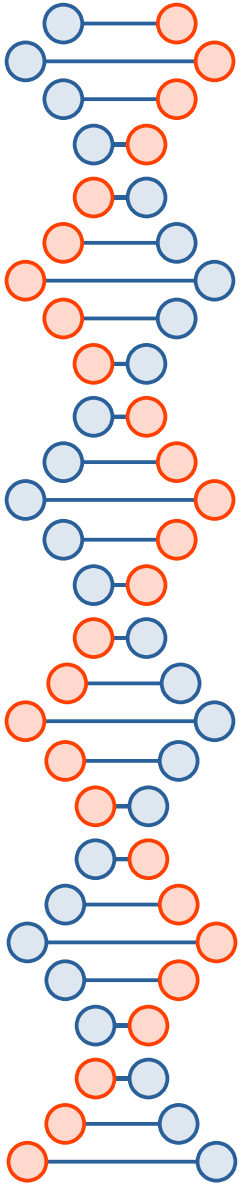
Chips with Everything

- Major advance in how computers work
- Work migrated from software programs to chips as part of core hardware of computer system
- Chips are termed semiconductors as use silicon for conducting, not metals
- Each chip is an integrated circuit, a mini-processor containing many transistors
- Silicon Valley is so named as it’s based on chips
- “Chip off the old block”



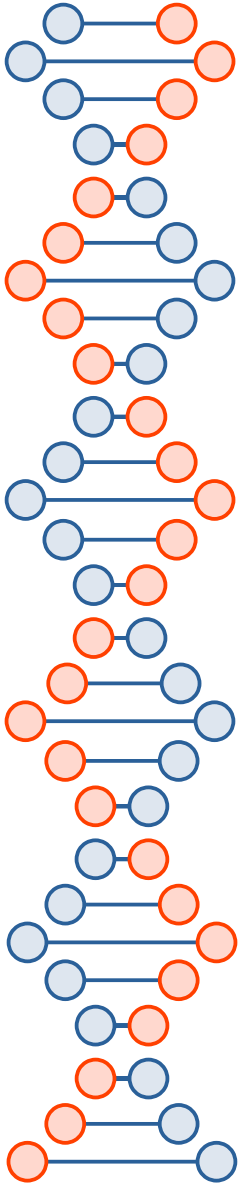
Massive Parallel Processing

- Chips can be aligned in parallel
- So searching an enormous block of data can be split across many chips, each handling a part of a stream



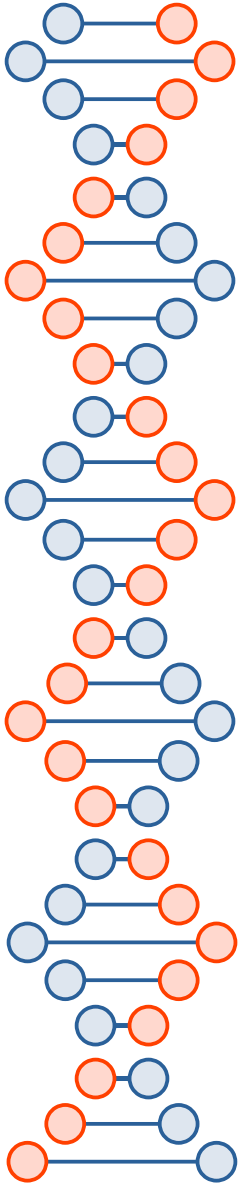
Specialised Chips

- Originally just arithmetic
- Machines measured on flops (floating point operations per second)
- Petaflops on fastest machines:
  - 1,000,000,000,000,000



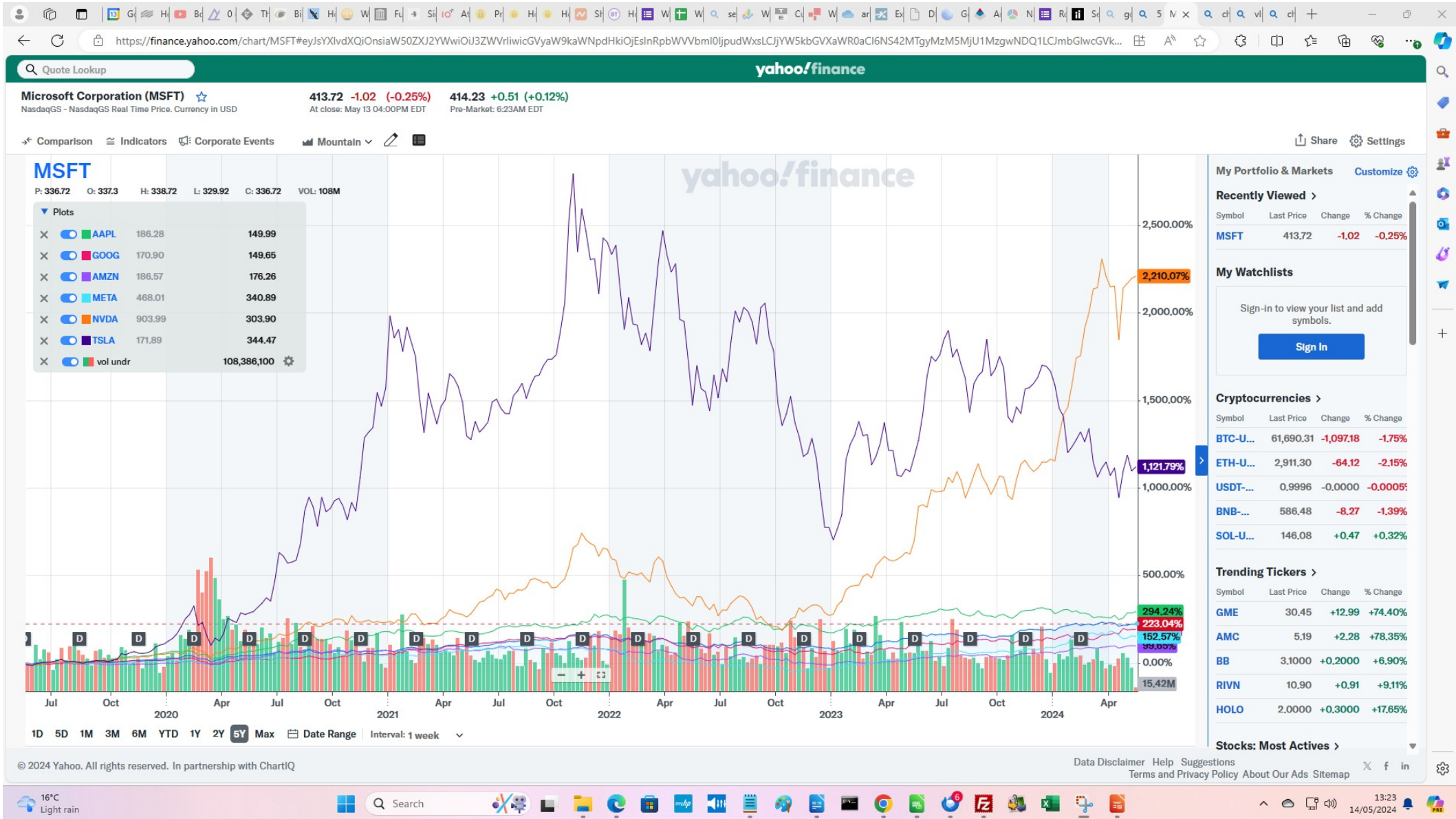
Then other areas

- Graphics
  - graphics card
  - GPU, Graphical Processing Unit
- Disk storage
  - SSD, Solid State Disk
  - No moving parts
  - Very fast load



Main Tech Companies

- Was FAANG in US
  - Facebook, Apple, Amazon, Netflix, Google
- Outside US
  - TSMC (semiconductors, Taiwan)
  - ARM (was Acorn, processors, Cambridge, UK)
- Now in US the magnificent seven
  - Meta, Apple, Amazon, Google, Microsoft, Tesla, Nvidia
- Let’s look at their share prices over last 5 years



https://finance.yahoo.com/chart/MSFT#eyJsYXlvdXQiOnsiaW50ZXJ2YWwiOiJ3ZWVrIiwicGVyaW9kaWNpdHkiOjEsInRpbWVVbmI0IjpudWxsLCJjYW5kbGVXaWR0aCI6NS42MTgyMzM5MjU1MzgwNDQ1LCJmbGlwcGVk...
Quote Lookup
yahoo!finance
Microsoft Corporation (MSFT)
NasdaqGS - NasdaqGS Real Time Price. Currency in USD
413.72 -1.02 (-0.25%)
At close: May 13 04:00PM EDT
414.23 +0.51 (+0.12%)
Pre-Market: 6:23AM EDT
Comparison
Indicators
Corporate Events
Mountain
Share
Settings
MSFT
P: 336.72 O: 337.3 H: 338.72 L: 329.92 C: 336.72 VOL: 108M
Plots
AAPL 186.28 149.99
GOOG 170.90 149.65
AMZN 186.57 176.26
META 468.01 340.89
NVDA 903.99 303.90
TSLA 171.89 344.47
vol undr 108,386,100
2,500.00%
2,210.07%
2,000.00%
1,500.00%
1,121.79%
1,000.00%
500.00%
294.24%
223.04%
152.57%
99.65%
0.00%
15.42M
Jul Oct Apr Jul Oct Apr Jul Oct Apr Jul Oct Apr Jul Oct Apr
2020 2021 2022 2023 2024
1D 5D 1M 3M 6M YTD 1Y 2Y 5Y Max
Date Range
Interval: 1 week
My Portfolio & Markets
Customize
Recently Viewed
Symbol Last Price Change % Change
MSFT 413.72 -1.02 -0.25%
My Watchlists
Sign-in to view your list and add symbols.
Sign In
Cryptocurrencies
Symbol Last Price Change % Change
BTC-U... 61,690.31 -1,097.18 -1.75%
ETH-U... 2,911.30 -64.12 -2.15%
USDT-... 0.9996 -0.0000 -0.0005
BNB-... 586.48 -8.27 -1.39%
SOL-U... 146.08 +0.47 +0.32%
Trending Tickers
Symbol Last Price Change % Change
GME 30.45 +12.99 +74.40%
AMC 5.19 +2.28 +78.35%
BB 3.1000 +0.2000 +6.90%
RIVN 10.90 +0.91 +9.11%
HOLO 2.0000 +0.3000 +17.65%
Stocks: Most Actives
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16°C
Light rain
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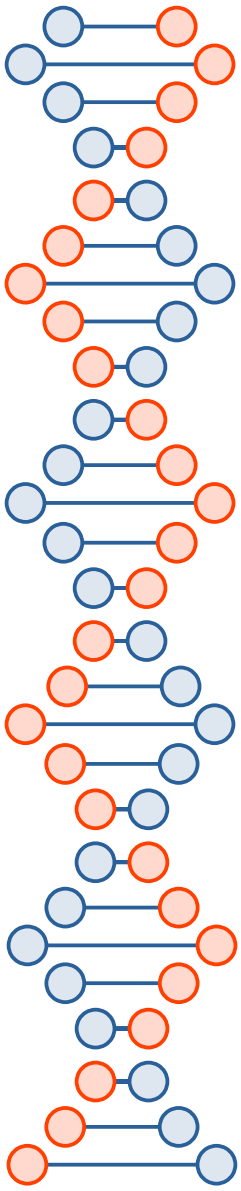
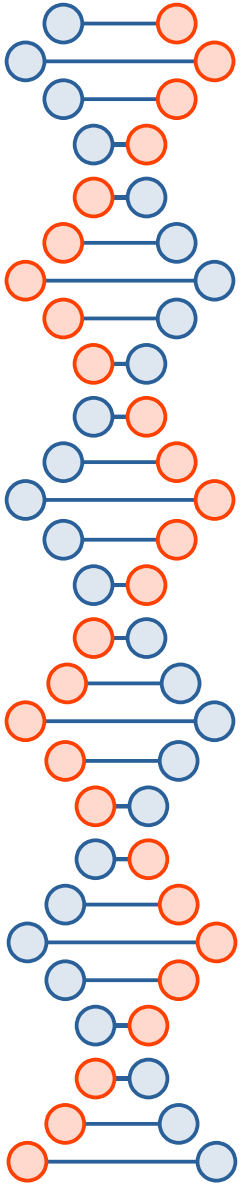


So who are Nvidia (en-vid-ea)

- They make chips, cards and GPU processors for AI
  - Chips can be used in
    - Massive parallel processing on large volumes of data
      - Terabytes (1,000,000,000,000 bytes)
      - That data can be text or images
    - Some AI algorithms within GPU
      - e.g. Pattern matching
- So processing transferred from slow software to fast hardware
- Facilitates AI in practice

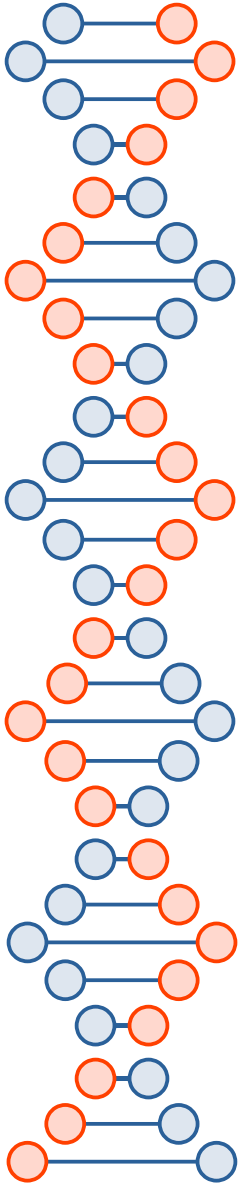
Nvidia AI Chip

- In 2020 Ampere was launched, manufactured by TSMC and Samsung:
  - “Nvidia unwrapped its Nvidia A100 artificial intelligence chip today, and CEO Jensen Huang called it the ultimate instrument for advancing AI. Huang said it can make supercomputing tasks — which are vital in the fight against COVID-19 — much more cost-efficient and powerful than today’s more expensive systems.”
- 54 billion (54,000,000,000) transistors (the on-off switches that are the building blocks of all things electronic)
- Die (size) of chip is 826 square millimetres (roughly 30 mm x 30 mm)
- Separation of transistors is 7 nanometres (0.000000007 metre), getting close to inter-atomic distances
- Can run optimally at 5 petaflops: 5,000,000,000,000,000 operations/second
- Cooling problems as much heat produced in tiny area
- Ideal for machine learning and pattern matching



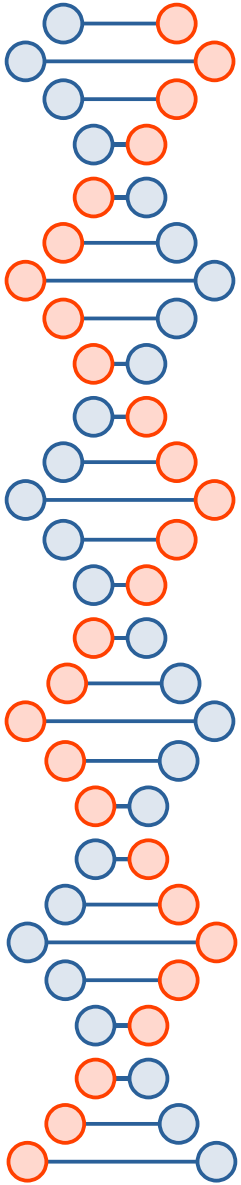
Applications of AI

- Language Translation
- Pattern Matching
- E-commerce
- Navigation
- Driving
- Touched all aspects of automation/ digitalisation



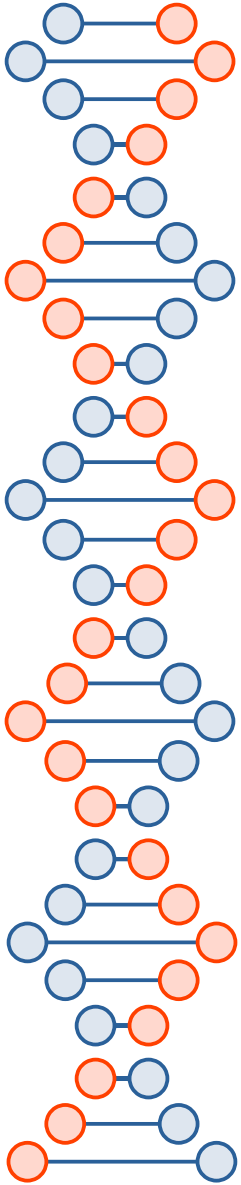
Pattern Matching

- Medicine
  - Detecting abnormalities in scans
  - Comparing a scan with healthy scans or previous scans
  - Used in NMR scans to look for early signs of cancer
- History
  - Detecting the writing on the Pompeii charred scrolls
  - Scans on rolled ultra-fragile scrolls
  - Finding crackles of writing on the charred scrolls



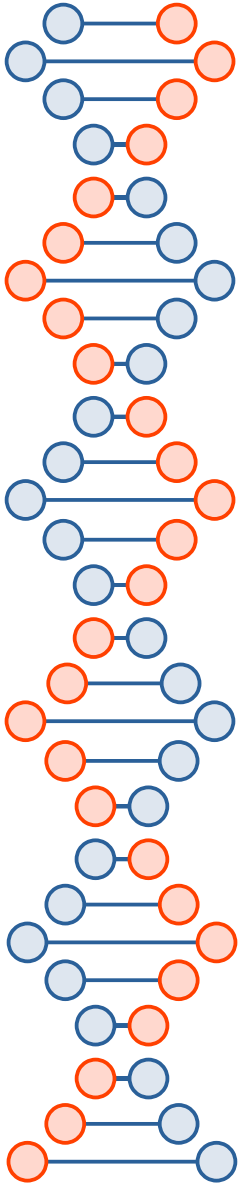
Generative/ Augmentative AI

- As opposed to analysis
- Generative AI
  - Creates new content e.g. ChatGPT
  - Will write a report based on literature research
  - Used extensively in education
- Augmentative AI
  - Allows a human to make final decisions



AI -- Friend

- Extends range of automation
- Removes ‘boring’ tasks
- Exciting breakthroughs in some areas



AI -- Foe

- Enormous demand for electricity by chips and their cooling systems
  - Reliance on strategic commodities
- Premature reliance may be dangerous
  - Answers may not be accurate
  - Safety issues
- Confirmation bias/ Homogeneity
- Copyright violations
- Redundancies
- Facilitates espionage/ hacking