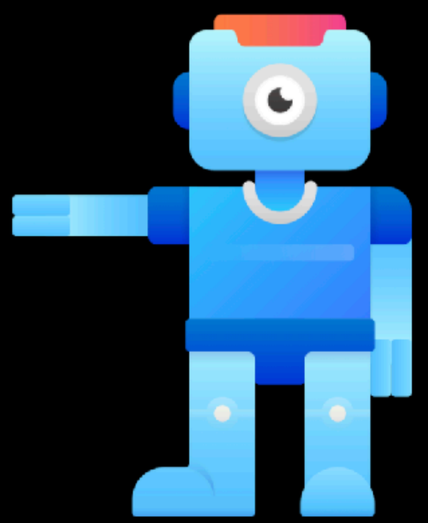


MODERN COMPUTER VISION

BY RAJEEV RATAN

Deep Learning History

Why now is the best time to be a Deep Learning Practitioner

Now is the best time to be a Deep Learning Practitioner

- We’re in the Golden Age of AI
- Fast Graphics Processing Unit (GPU) hardware is relatively cheap and readily available
- Cheap even free cloud GPUs are available
- Deep Learning Libraries are mature and relatively easy to use
- But it wasn’t always this way….

History of Deep Learning

- The concept of using neuron like algorithms in Computer Science was first introduced in 1943 by Warren McCulloch and Walter Pitts.
- Progress was slow until 1960 when Henry J. Kelly developed the basics of a Continuous Back Propagation Model.
- Things progressed nicely as Statistical Modelling and early Machine Learning algorithms were introduced
- However, the execution of many of these algorithms were slow, inefficient and error prone.

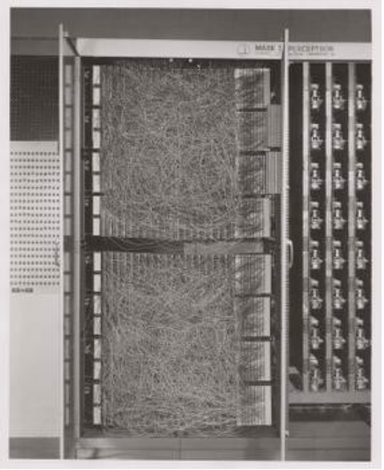
A PROPOSAL FOR THE

DARTMOUTH SUMMER RESEARCH PROJECT

ON ARTIFICIAL INTELLIGENCE

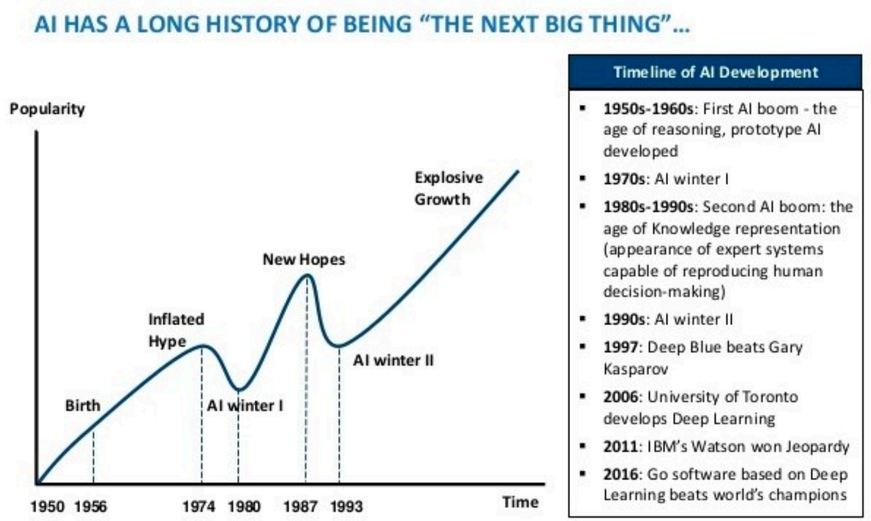
1956

J. McCarthy, Dartmouth College
M. L. Minsky, Harvard University
N. Rochester, I. B. M. Corporation
C. E. Shannon, Bell Telephone Laboratories



History of Deep Learning - AI Winter 1

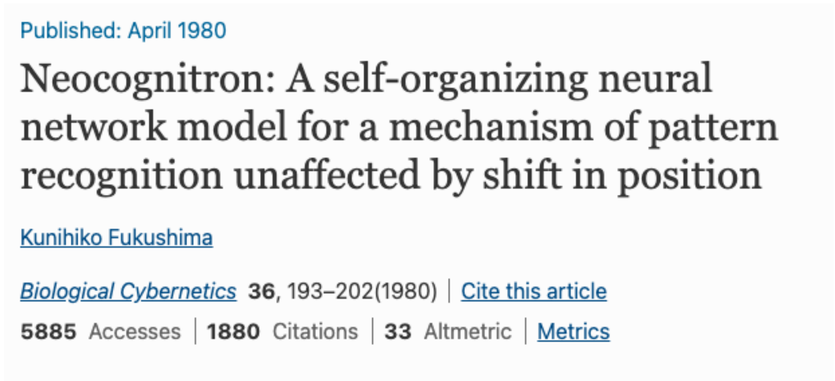
- In the 1970s, the AI promises of the 1960s were unfilled and it lost favour with researchers at the time.
- Funding was slashed and many claimed **AI was just hype.**



https://www.actuaries.digital/2018/09/05/history-of-ai-winters/

History of Deep Learning - Neocognitron

- Research still continued and in 1979, Kunihiko Fukushima designed the first Convolutional Neural Network, called **Neocognitron**.

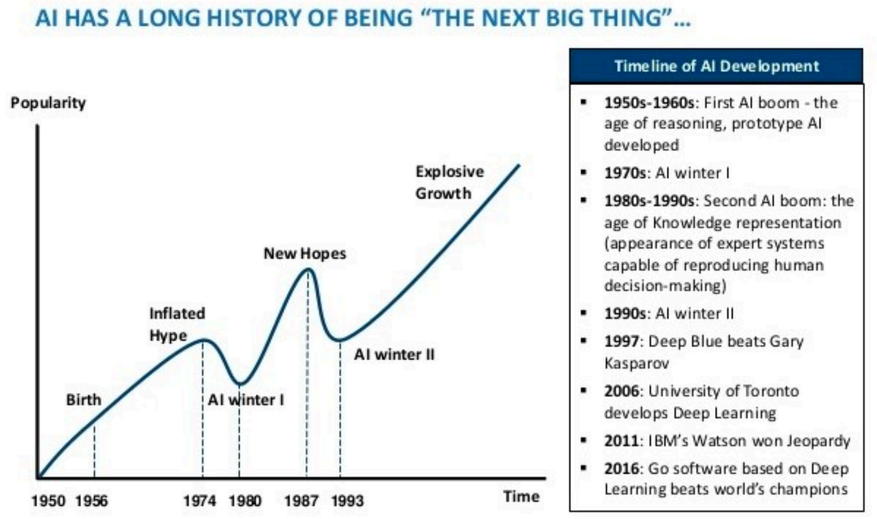


https://link.springer.com/article/10.1007/BF00344251

Back Propagation in FORTRAN

- Though it was implemented in the 1970s, it was only in 1985 it was applied in Neural Networks
- Things picked up at this point, however, it led to over promising and under delivering thus leading to the second AI winter.

```
1  module kernel_m
2    interface zero
3       attributes(global) subroutine zero(a) &
4            bind(C,name='zero')
5         use iso_c_binding
6         real(c_float) :: a(*)
7       end subroutine zero
8    end interface
9  end module kernel_m
10
11 program fCallingC
12   use cudafor
13   use kernel_m
14   integer, parameter :: n = 4
15   real, device :: a_d(n)
16   real :: a(n)
17
18   a_d = 1.0
19   call zero<<<1,n>>>(a_d)
20   a = a_d
21   write(*,*) a
22 end program fCallingC
```

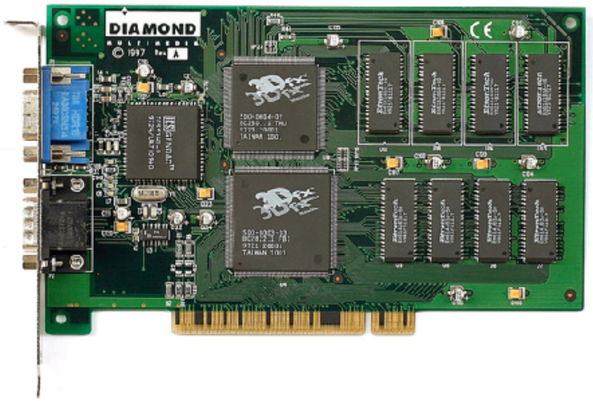


https://www.actuaries.digital/2018/09/05/history-of-ai-winters/

GPUs and Deep Learning a Match Made in Heaven

- In the late 1990s 3D gaming necessitated GPUs which early Deep Learning methods also utilised.
- GPUs are suited for both rendering graphics and Deep Learning as they provide specialised processors that perform floating point operations with dedicated memory (high bandwidth).

- Think of CPUs as a 4-door sedan, good all round vehicle
- Think of GPUs as huge Truck (good for one thing, not good at others)

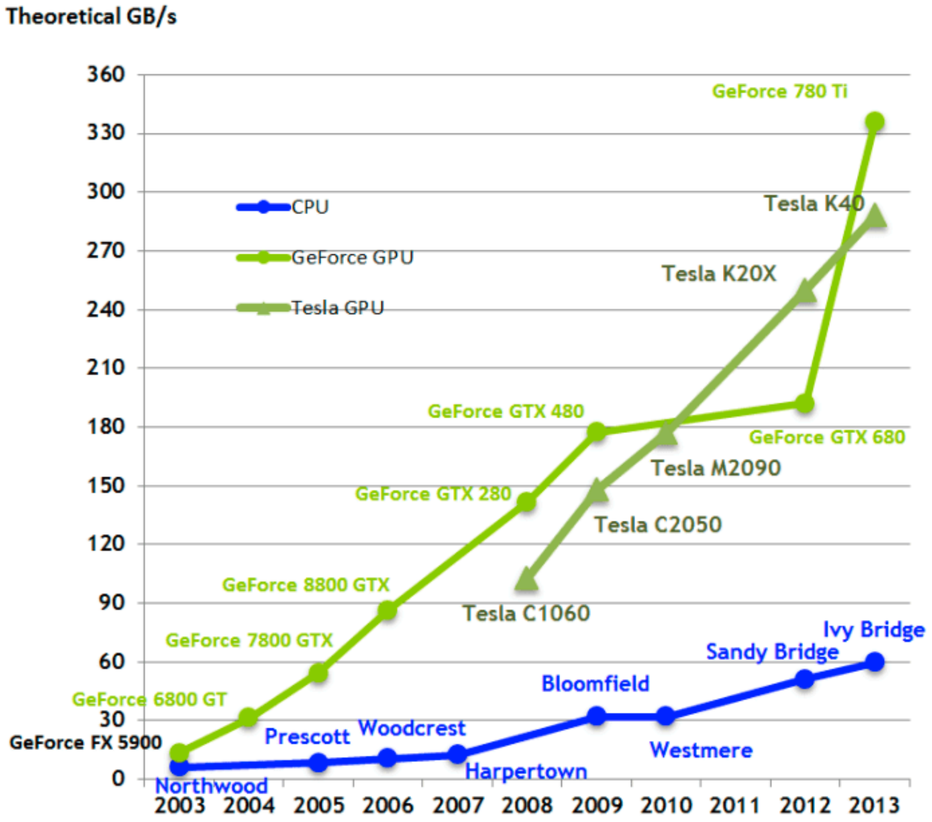


3DFX Voodoo

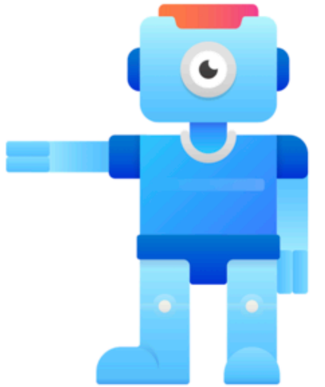
GPUs have come a long way

- GPU speed continues to increase at a faster pace than CPU speed

- Keeping up pace with this was the development of Deep Learning Libraries…



https://medium.com/@shachishah.ce/do-we-really-need-gpu-for-deep-learning-47042c02efe2



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Next...

Deep Learning Libraries