



If we can do
it, so can the
computer.

Basics of
AI/ML in
Golang

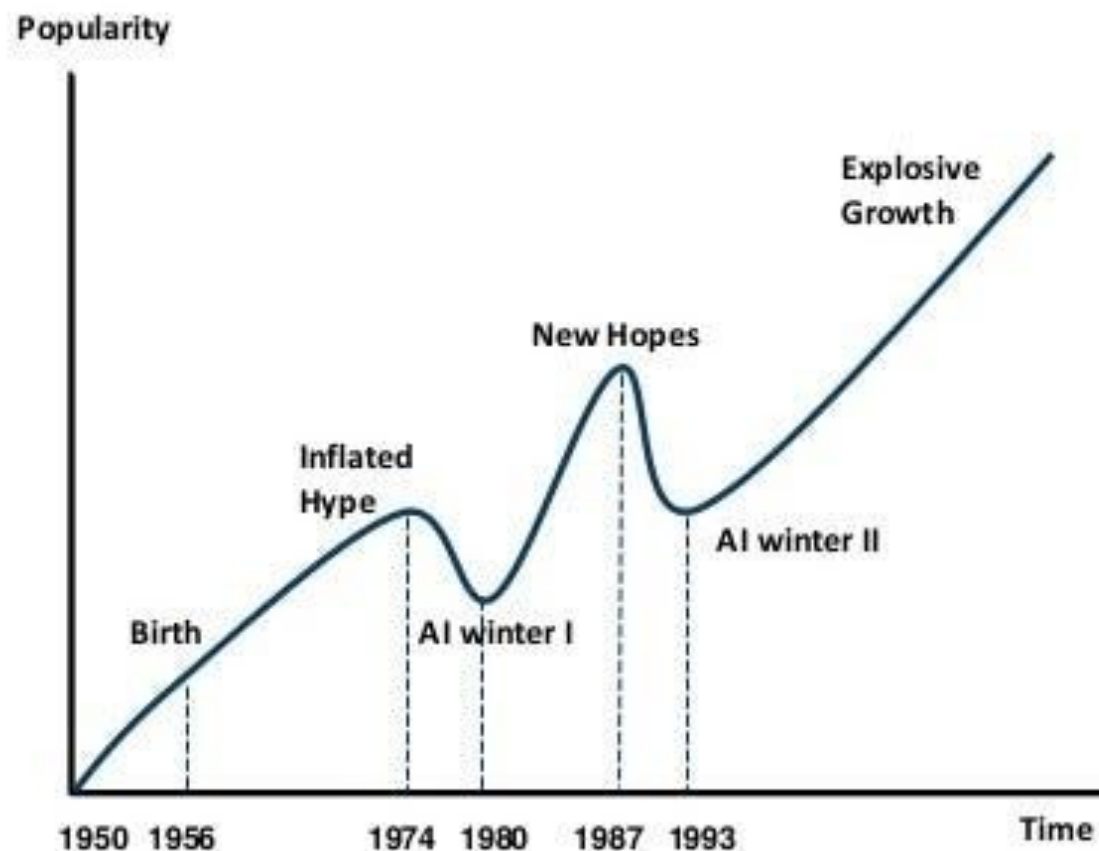


Vinod Vydier



Observability Specialist at Splunk
OpenTelemetry Contributor and Approver
ex-Observe, ex-New Relic

AI HAS A LONG HISTORY OF BEING “THE NEXT BIG THING”...



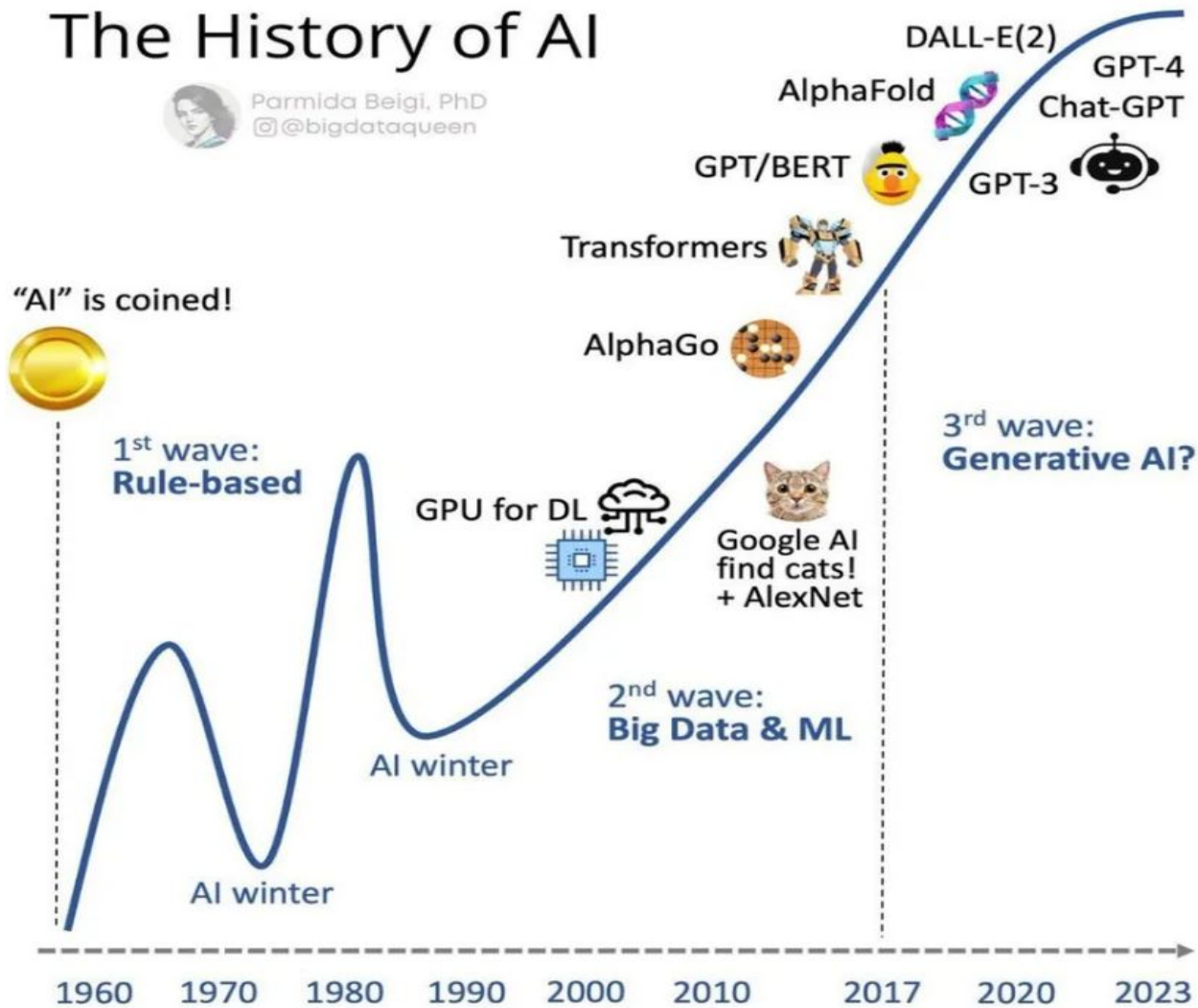
Timeline of AI Development

- **1950s-1960s:** First AI boom - the age of reasoning, prototype AI developed
- **1970s:** AI winter I
- **1980s-1990s:** Second AI boom: the age of Knowledge representation (appearance of expert systems capable of reproducing human decision-making)
- **1990s:** AI winter II
- **1997:** Deep Blue beats Gary Kasparov
- **2006:** University of Toronto develops Deep Learning
- **2011:** IBM's Watson won Jeopardy
- **2016:** Go software based on Deep Learning beats world's champions

The History of AI



Parmida Beigi, PhD
@bigdataqueen





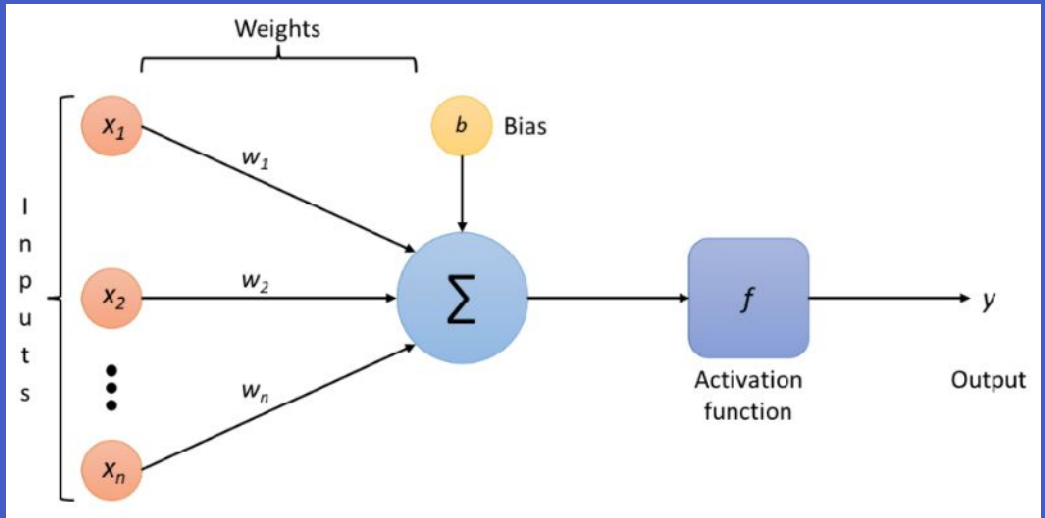
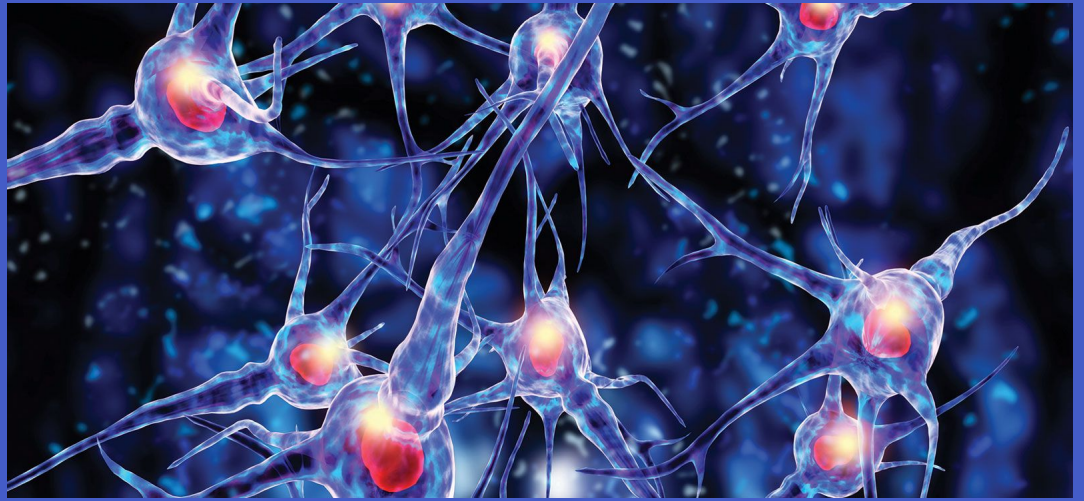
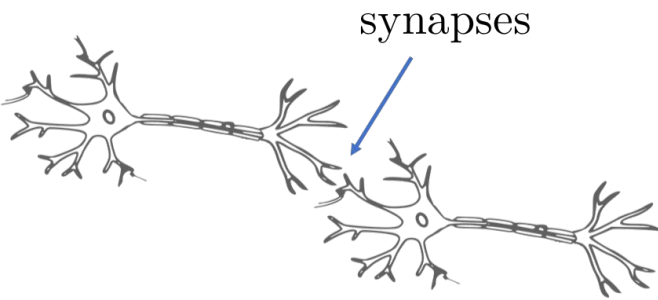
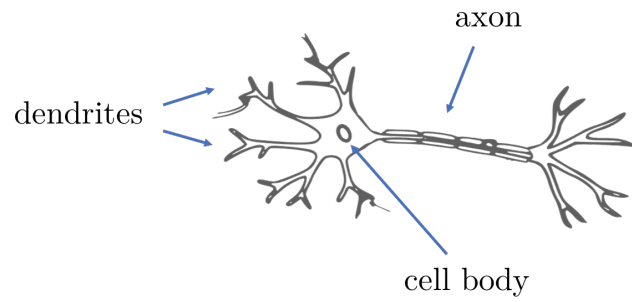
→ r e c o g n i t i o n → re·cog·ni·tion → recognition

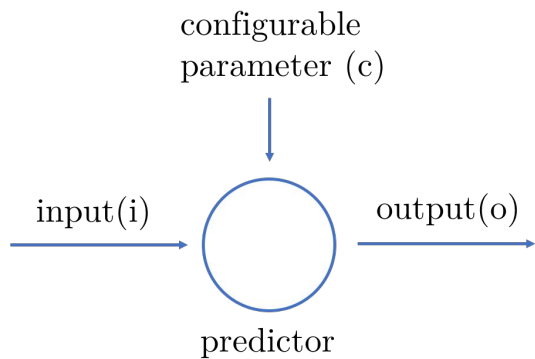
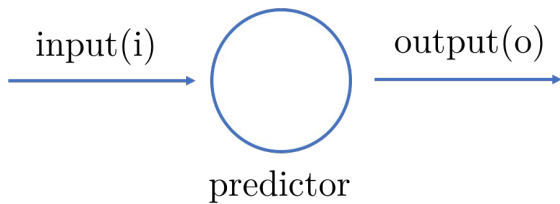
Raw audio

We will do basics:
Handwritten number
recognition
Based on the MNIST
dataset

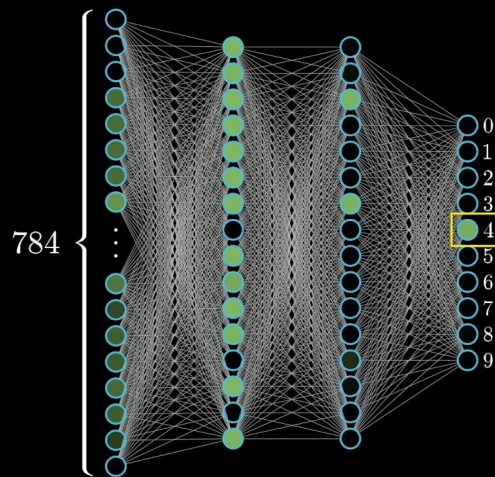
<https://yann.lecun.com/exdb/mnist/>

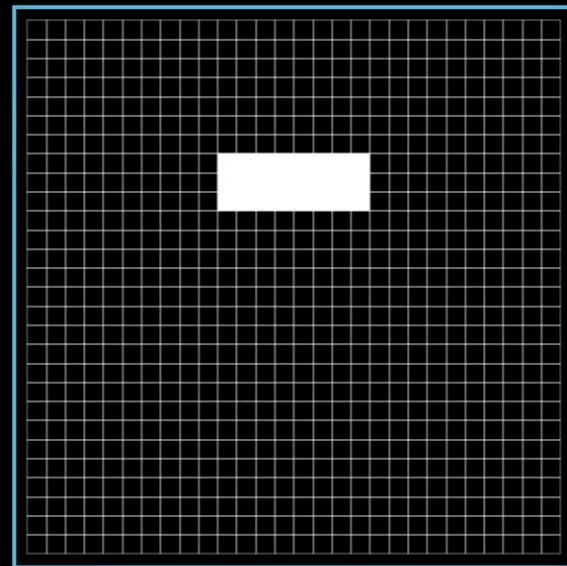
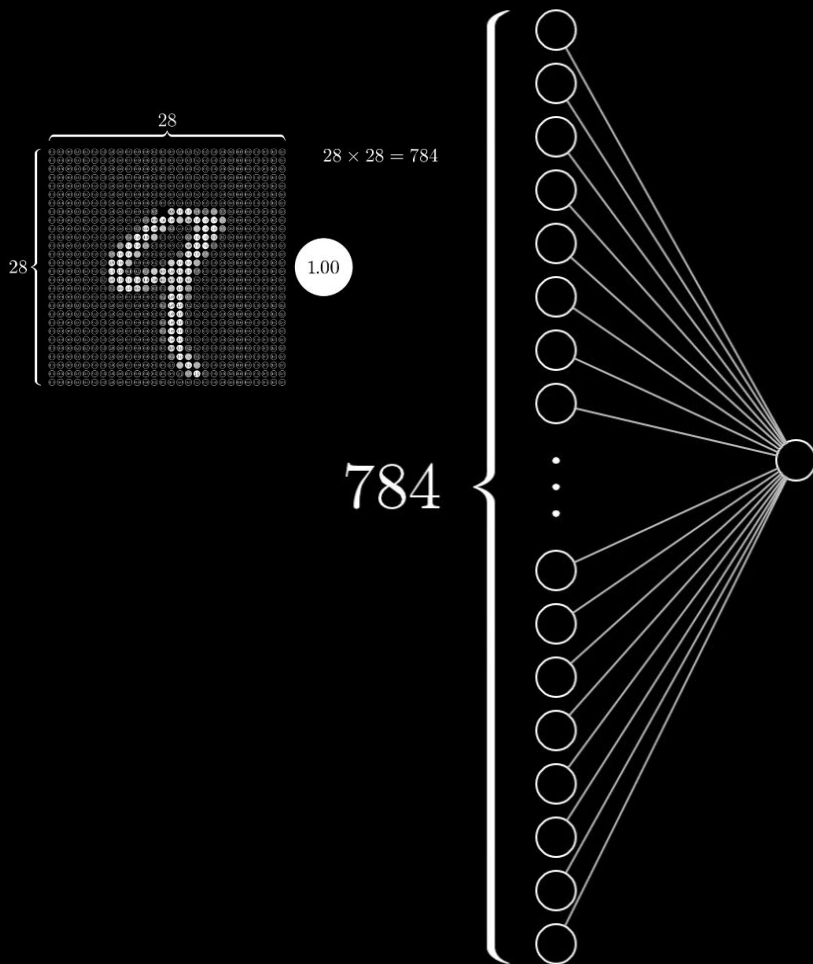






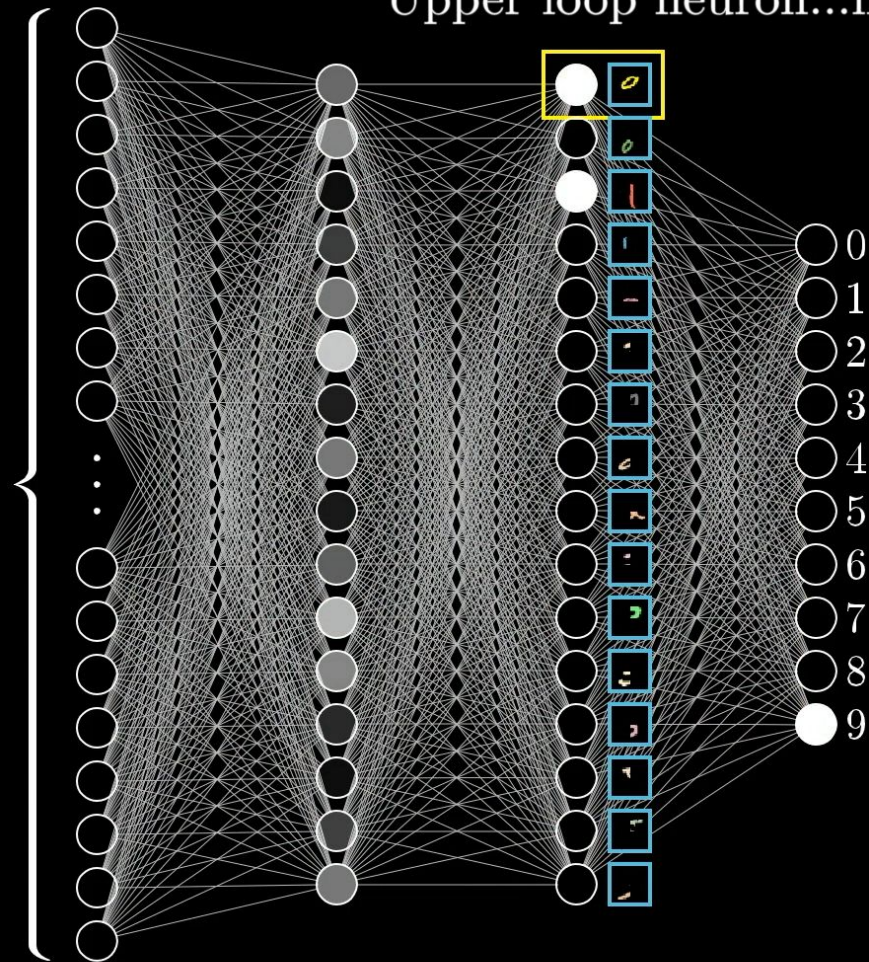
Plain vanilla (aka "multilayer perceptron")





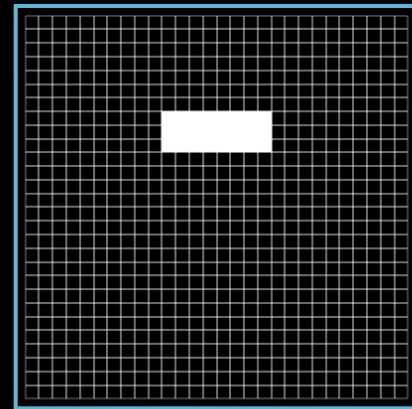
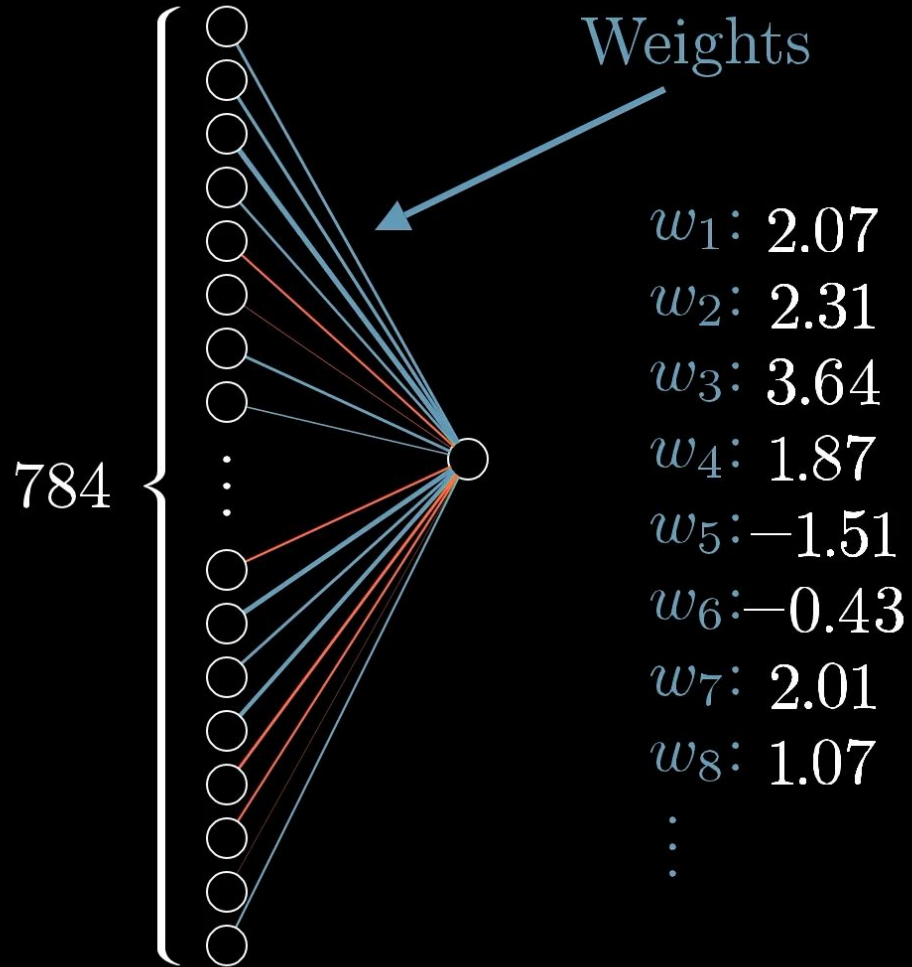


784



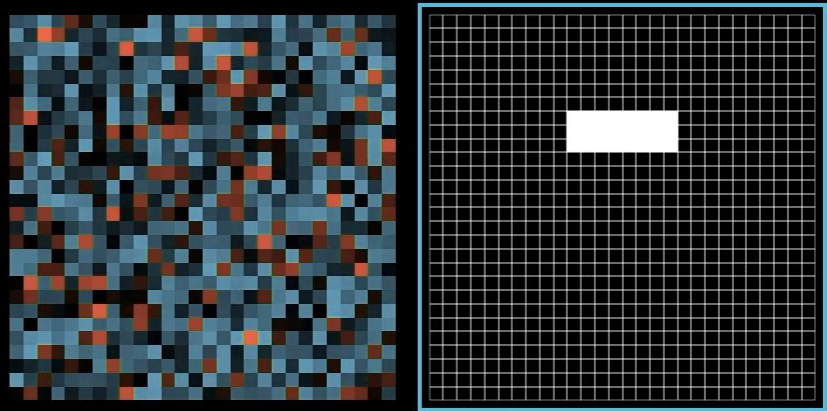
Upper loop neuron...maybe...

0
1
2
3
4
5
6
7
8
9



784

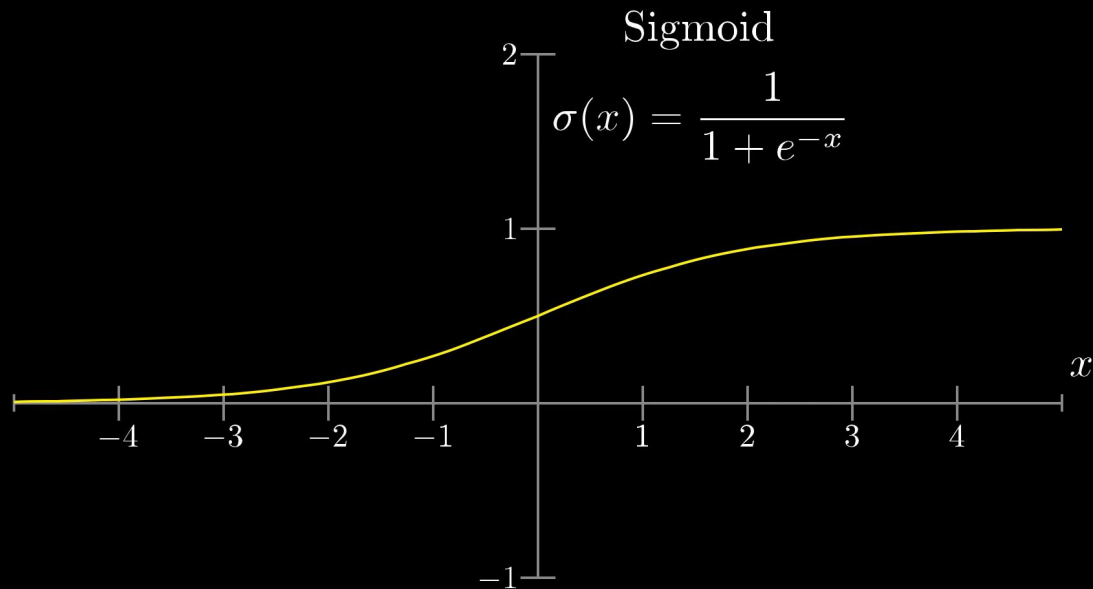
$$w_1 a_1 + w_2 a_2 + w_3 a_3 + w_4 a_4 + \dots + w_n a_n$$

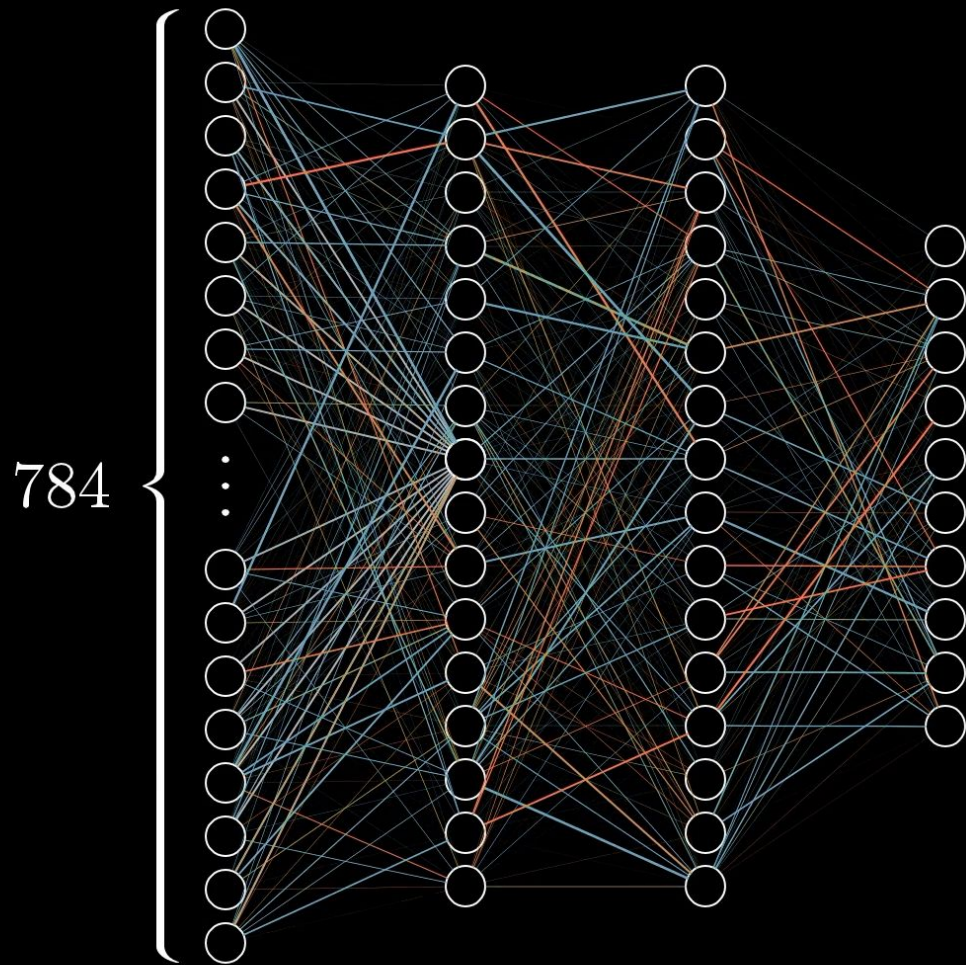


$$\sigma(w_1 a_1 + w_2 a_2 + w_3 a_3 + \cdots + w_n a_n \boxed{-10})$$

“bias”

Only activate meaningfully
when weighted sum > 10





$$784 \times 16 + 16 \times 16 + 16 \times 10$$

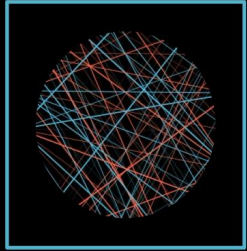
weights

$$16 + 16 + 10$$

biases

13,002

Cost function



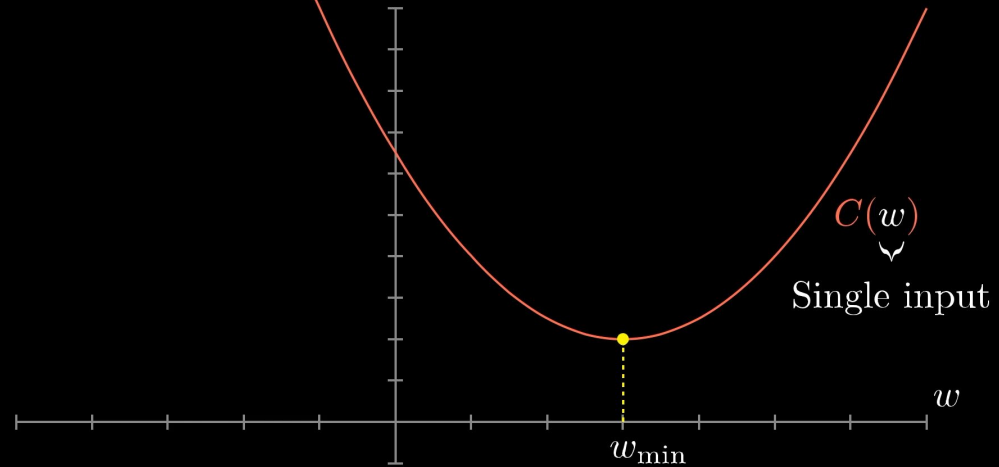
13,002 weights
and biases

$(9, 9)$ $(0, 0)$ $(2, 2)$ $(6, 6)$
 $(0, 0)$ $(4, 4)$ $(6, 6)$ $(7, 7)$
 $(7, 7)$ $(8, 8)$ $(3, 3)$ $(1, 1)$
 $(1, 1)$ $(1, 1)$ $(6, 6)$ $(3, 3)$
 $(1, 1)$ $(1, 1)$ $(0, 0)$ $(4, 4)$

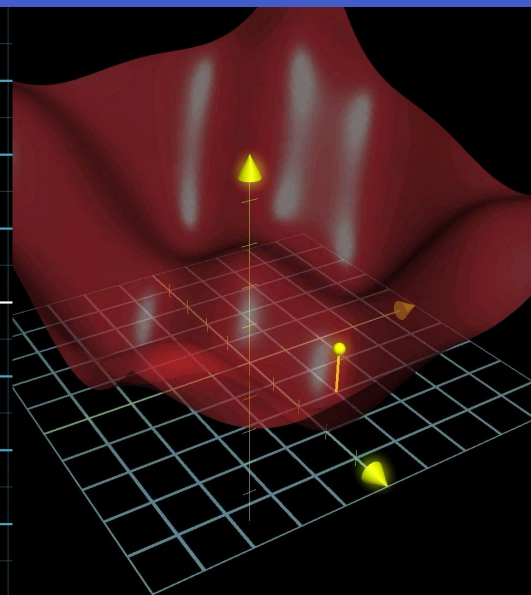
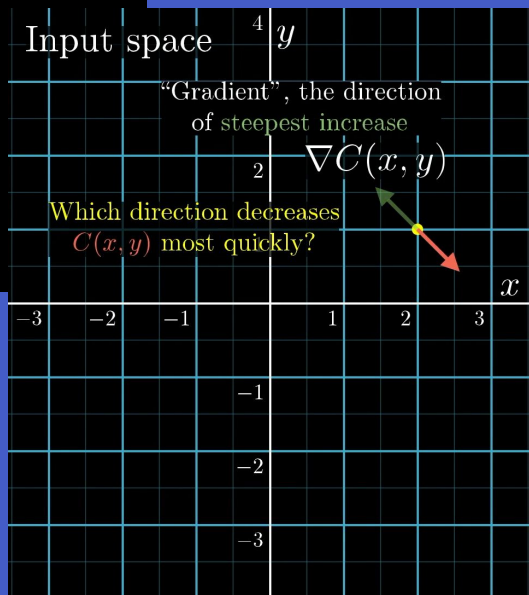
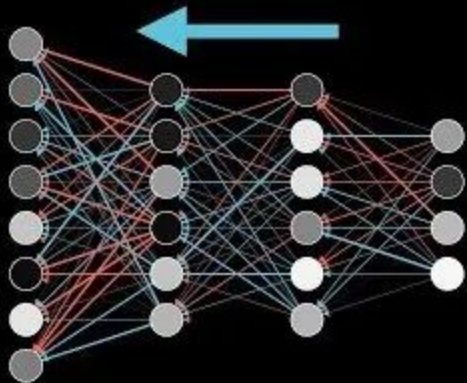
Lots of training data

3.37

One number



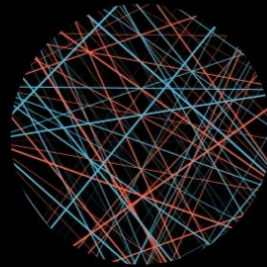
Backpropagation



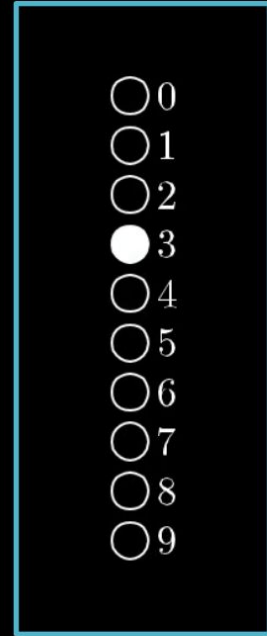
Neural network function



784 inputs



13,002 weights
and biases



10 outputs

Demo/Code