NEURAL NETWORKS

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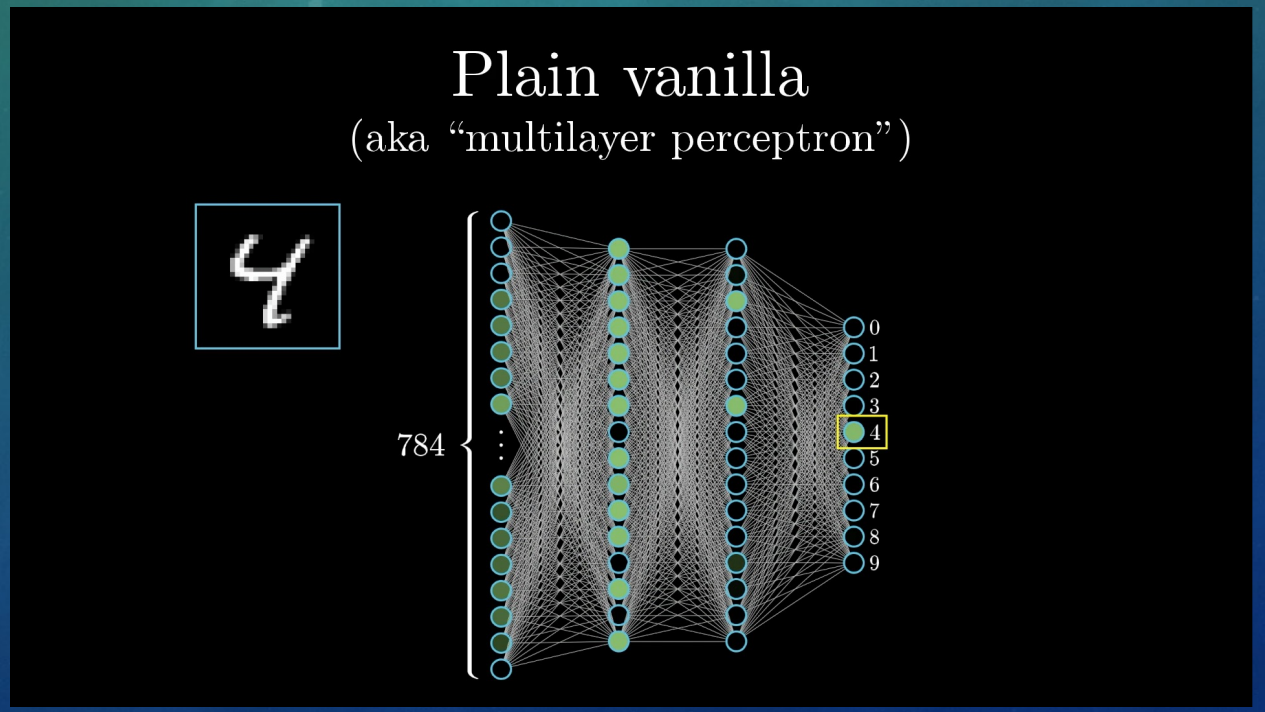
WHAT IS A NEURAL NETWORK?

- Using Google: “a computer system modeled on the human brain and nervous system.”
- Made up of two words (Neural -> neurons) (network -> group of interconnected things)
- Group of interconnected neurons -> like a human brain



WHY DO NEURAL NETWORKS MATTER?

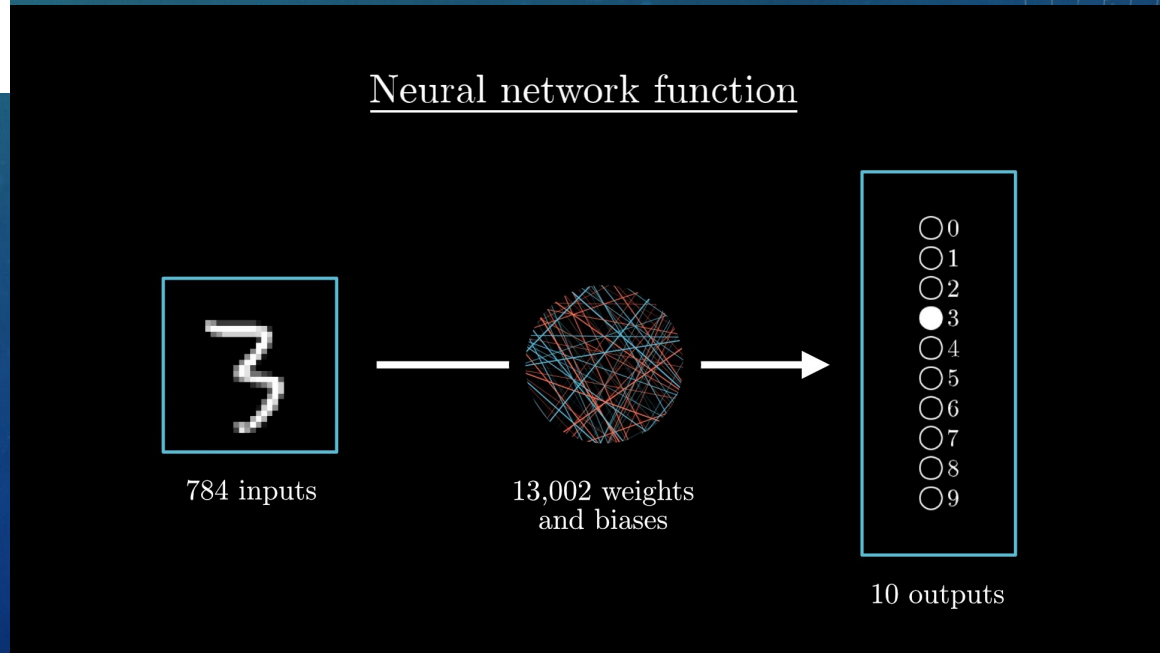
- Neural networks can improve decision processes in areas such as:
  - Neutrino Identification
  - Robotic Control System
  - Credit card and Medicare fraud detection
  - Electrical Load and energy demand forecasting
  - Process and quality control
  - And many more

HOW DOES IT WORK?

- Weights – decides how much influence the input will have on the output (strength of connection).
- Biases – “bias for inactivity” a number that decides whether a neuron activates meaningfully
  - Makes it so that the neuron has to cross a certain threshold.
- Response of the 2nd column on neurons onward

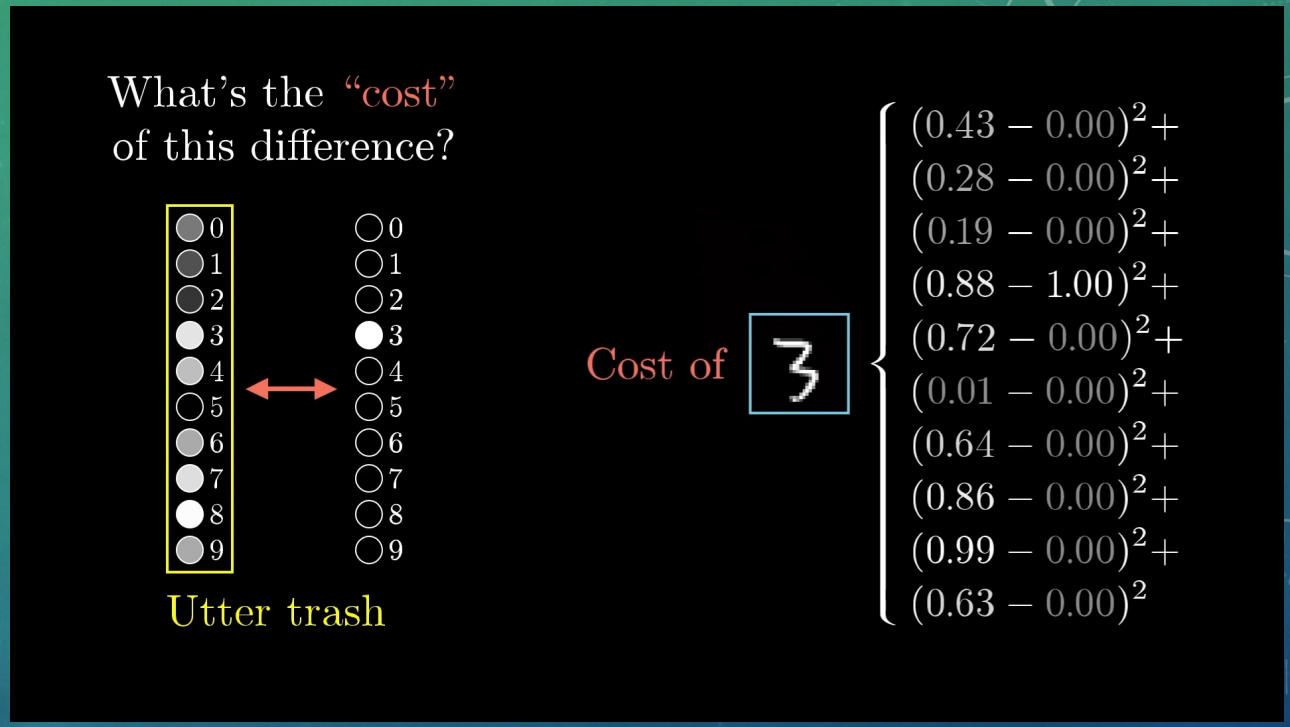
$$a_0^{(1)} = \sigma(w_{0,0}a_0^{(0)} + w_{0,1}a_1^{(0)} + w_{0,2}a_2^{(0)} + \ldots w_{0,n}a_n^0 + b_0)$$

- WEIGHTS (w) -> (784*16 + 16*16 + 16*10) = 12960
- BIASES (b) -> (16 + 16 + 10) = 42
- TOTAL PARAMETERS = 13002



WHAT IS TRAINING?

- Neural Network Function:
  - Input: 784 numbers (pixels)
  - Output: 10 numbers
  - Parameters: 13,002 weights/biases
- Cost function
  - Input: 13,002 weights/biases
  - Output: 1 number (lousiness)
  - Parameters: Many training examples



$$L(w,b) = \sum_{i=0}^{9} (\hat{y}_i - o_i(w,b))^2$$

AI VS NEURAL NETWORK

AI vs Neural Network

Comparison Chart

Artificial Intelligence	Neural Network
It is a branch of computer science that emphasizes on the creation of smart machines that embody a sort of intelligence, as opposed to the natural intelligence demonstrated by humans.	It refers to a network of artificial neurons or nodes vaguely inspired by the biological neural networks that constitute animal brain.
It is an idea of creating intelligent machines, ones that are as smart as or smarter than humans.	It is a network of interconnected nodes, whose functionality is loosely based on animal neurons.
Applications of AI include machine learning, knowledge reasoning, natural language processing, data processing, clinical diagnosis, pattern recognition, machine vision, etc.	Applications include text classification and categorization, named entity recognition (NER), paraphrase detection, pattern recognition, fraud detection, natural language processing, and more.

DB Difference Between.net

QUESTIONS I HAVE

- This is considered old (the multilayer perceptron), what are the other, newer types of neural networks?
- Are neural networks just one accept of machine learning?
- Are neural networks really learning or just memorizing?
- Would it be possible to replicate the human brain using neural networks?
- What are the other types of neural networks capable of?
- Would it be possible for a neural network to manage other, smaller neural networks?

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