

Artificial Intelligence And Genealogy

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24 May 2021

How is AI Used In Genealogy Today?

- Optical character recognition (OCR)
- DNA analysis
- Translating languages
- Search optimization
- Newspaper article extraction
 - Obituaries
 - marriage announcements

How is AI Used In Genealogy Today?

- Colorize photos
- Hint generation
- Suggested parents
- Find common ancestor of DNA matches
- Deep Nostalgia (animates faces)
- GenSmarts

What is Artificial Intelligence?

- Computer emulation of human behaviors
- Threshold of true AI rises over time

Turing's test

- 1950, Alan Turing
- A computer can “think” if it can carry on a conversation indistinguishable from a conversation with a human.
- Siri and Alexa can't think

Levels of AI

- Artificial Narrow Intelligence (ANI)
 - Focuses on one narrow task
 - Emulated one behavior of a human
- Artificial General Intelligence (AGI)
 - Ability to understand
 - Can learn any task that a human can do

AI In Chess

- 1997 Deep Blue defeated Garry Kasparov
- Created by IBM
- Deep Blue looked ahead more moves
- No new strategies resulted
- Today, some don't consider this AI

AI In Go

- 2017 AlphaGo beat Ke Jie
- Created by DeepMind (now owned by Google)
- AlphaGo's strategies are still studied today
- Later versions: AlphaZero and MuZero
- MuZero is also the world's best at chess and other games

How Does MuZero Learn?

- Figures out the rules
- Figures out what winning means
- Figures out strategies to win

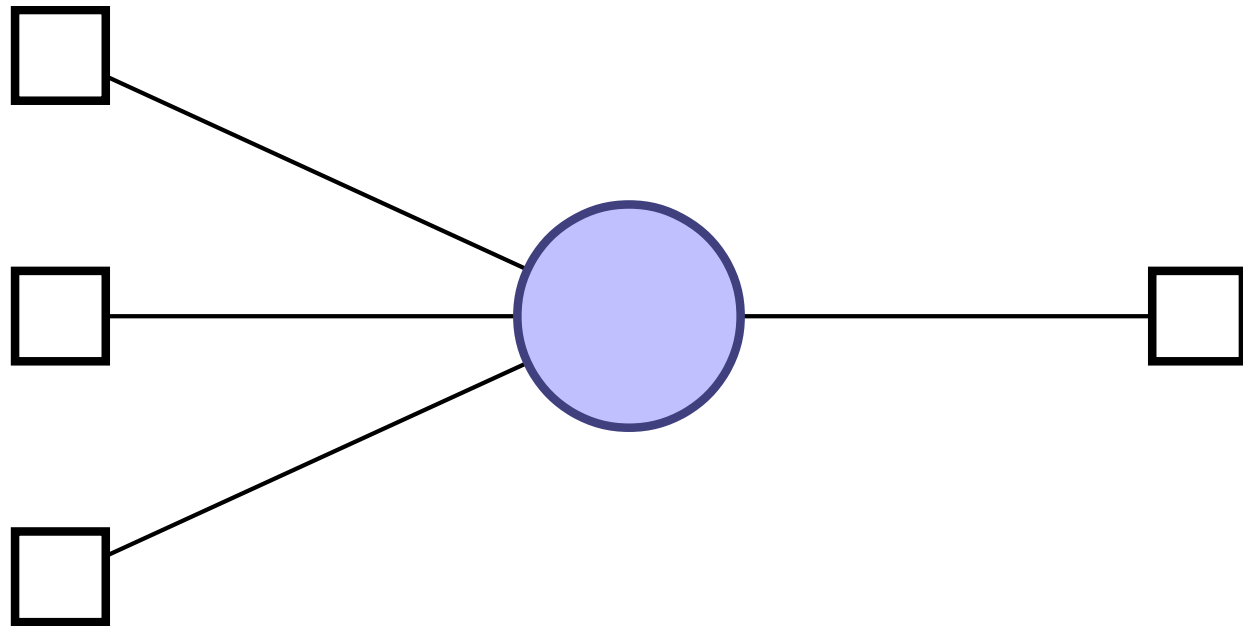
What Happened In Those 20 Years?

- Chess in 1997
- Go in 2017
- Deep Blue: Procedural programming
- AlphaGo: Neural Network

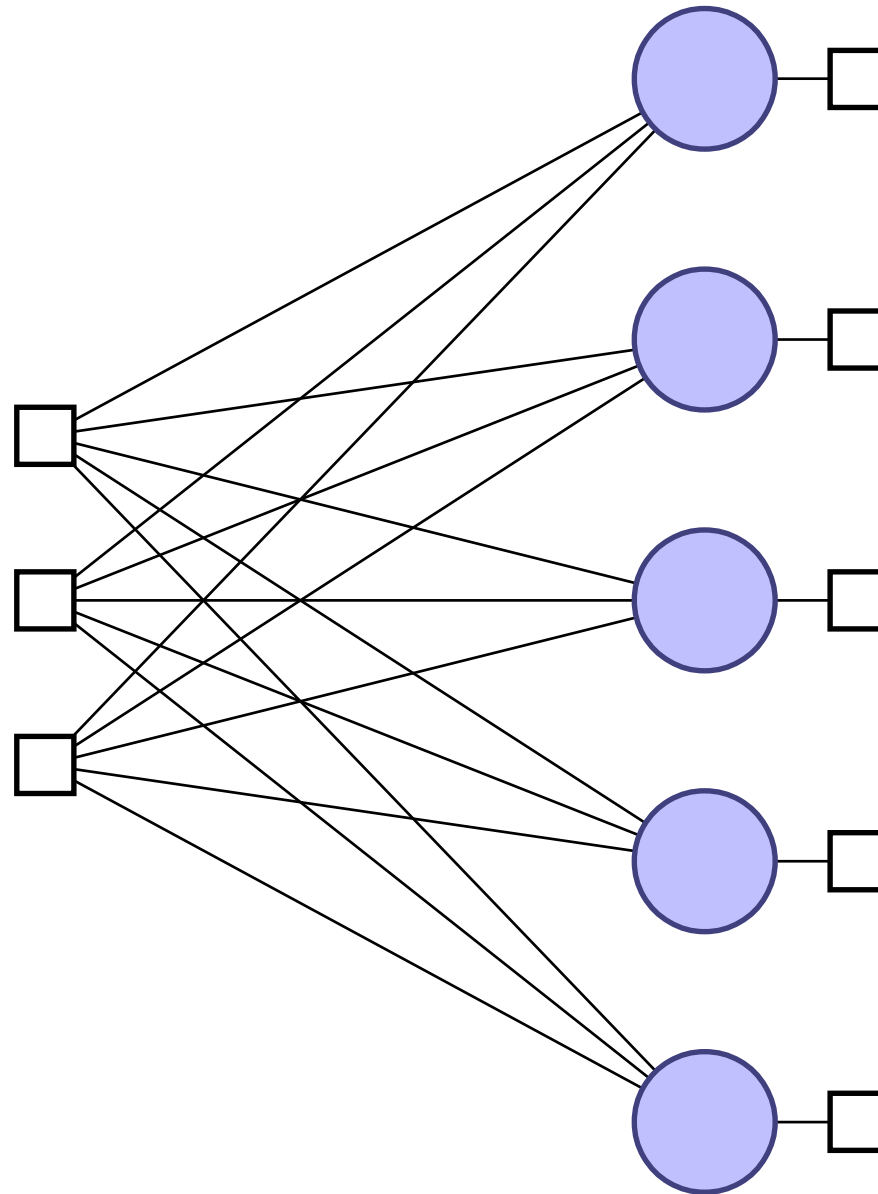
Neural Network

- A computer program that simulates a group of neurons

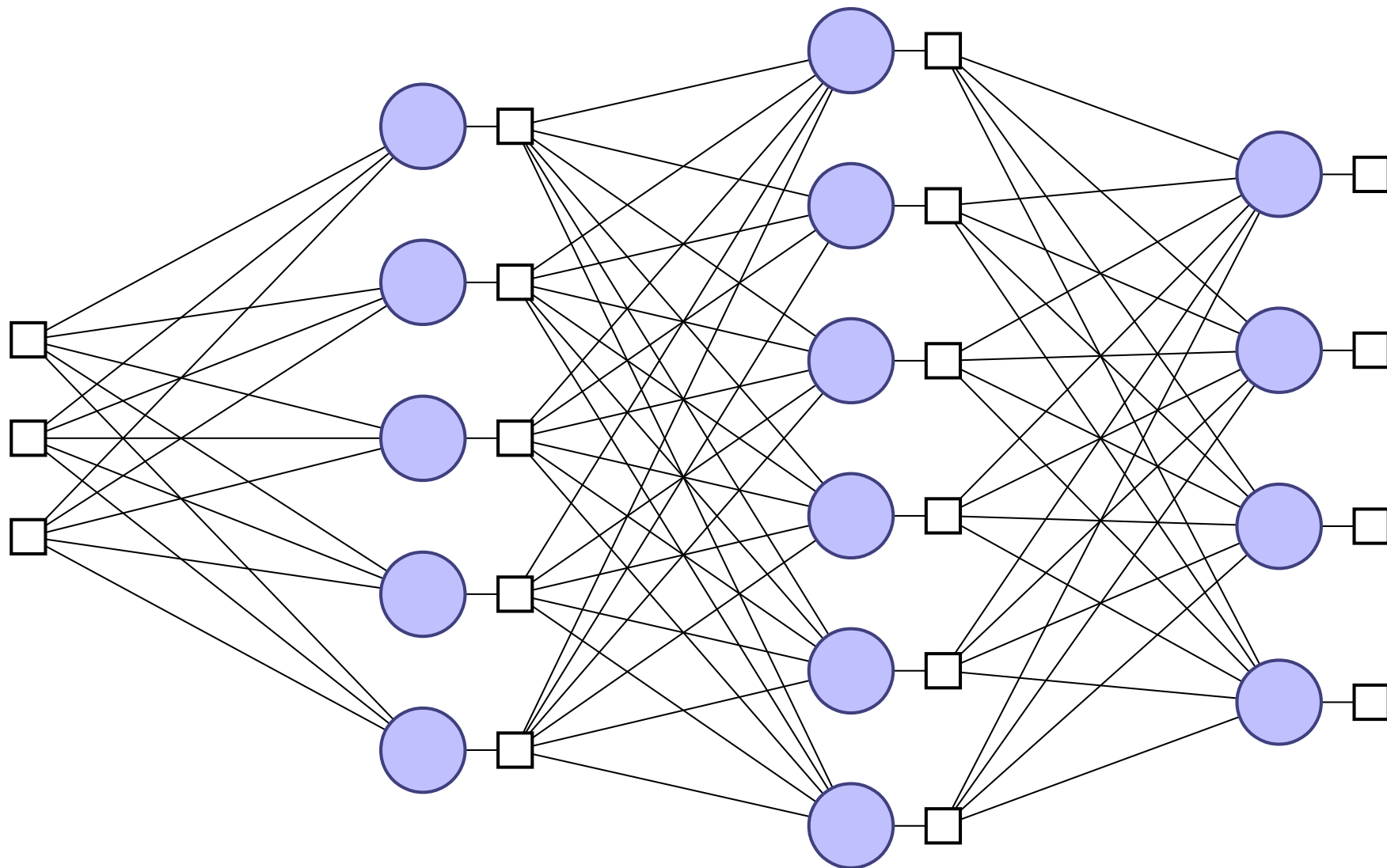
A Neuron



A Neural Network



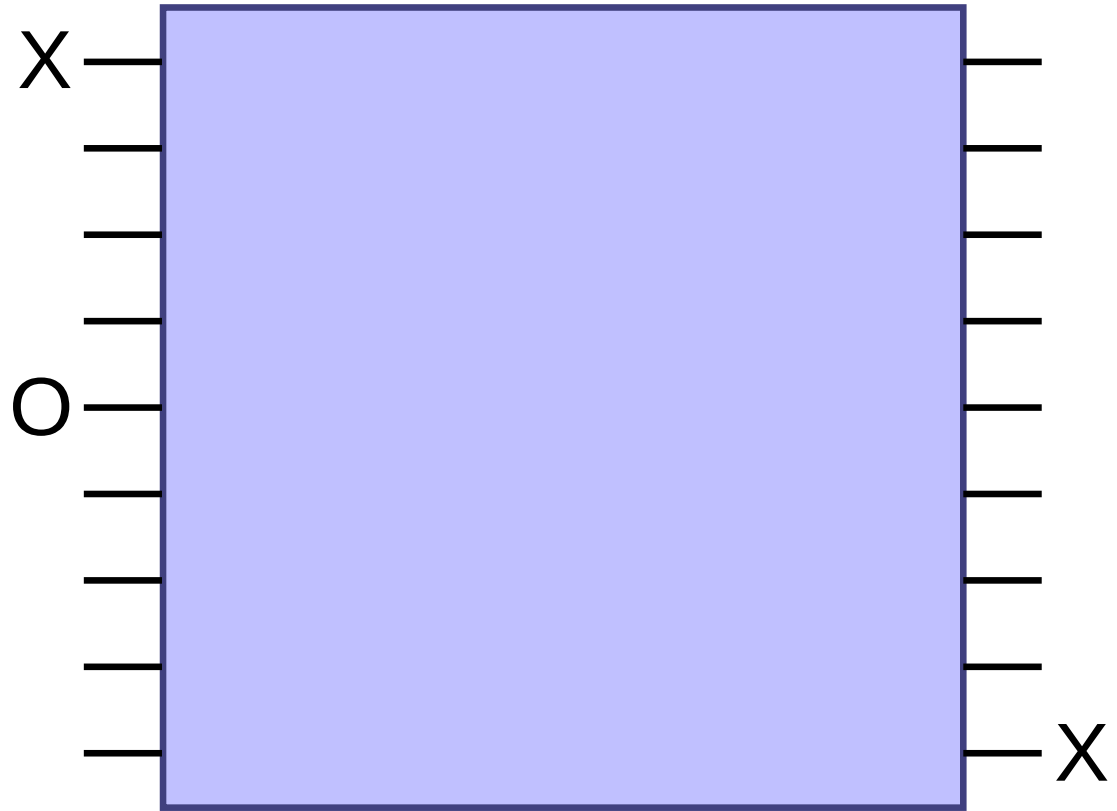
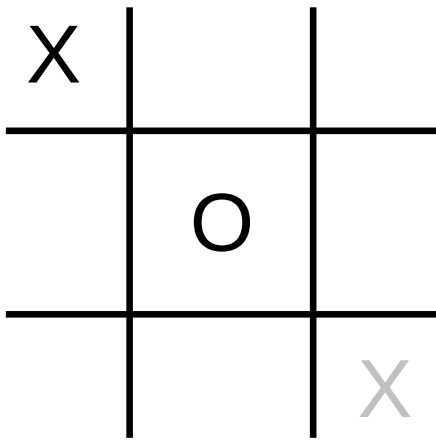
Deep Learning Neural Network



How Many Neurons In A Brain?

- Elephant: 250 billion
- Human: 85 billion
- Gorilla: 35 billion
- Raven: 2 billion
- Dog: 2 billion
- Rat: 200 million
- Cockroach: 1 million

Tic-Tac-Toe

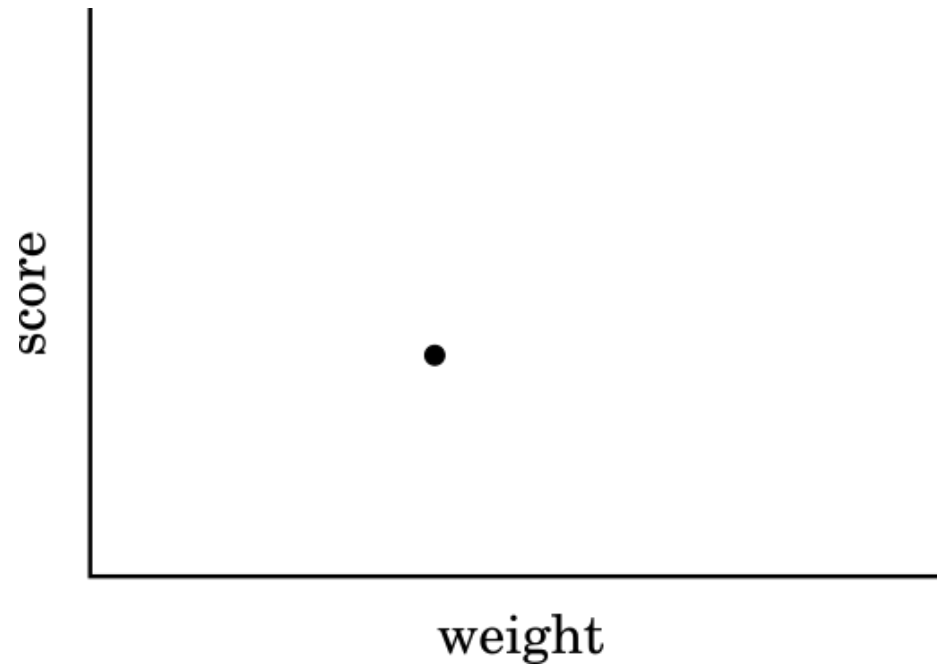


Training/Learning

- Randomly assign weighting factors
- Play many games
- Calculate a score based on wins and losses
- Make small adjustments to weighting factors
- Play more games
- If the score goes up, repeat
- If the score goes down, try different adjustments

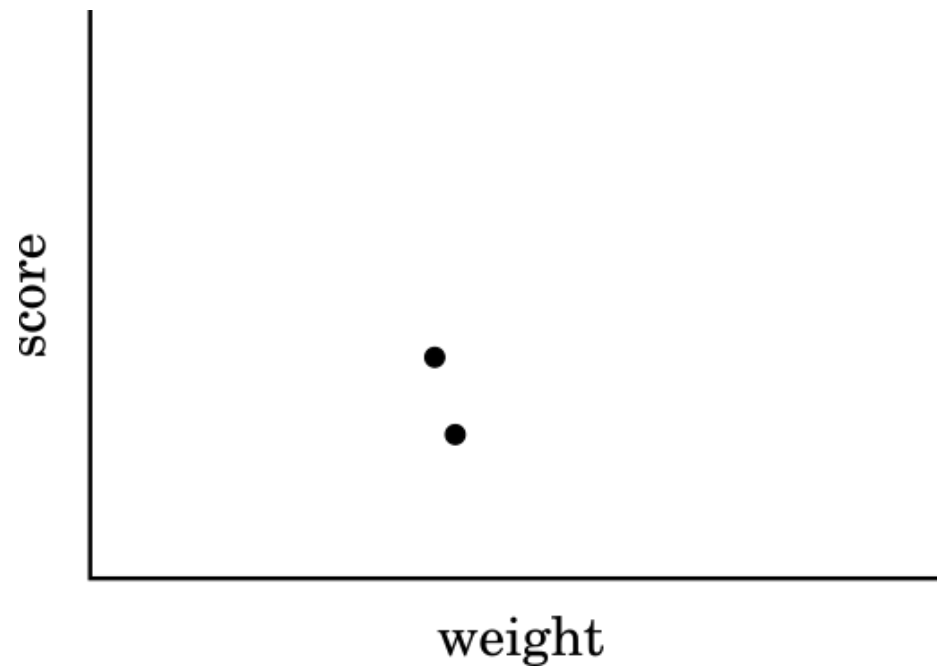
Training/Learning

- Adjust weighting factors to maximize score



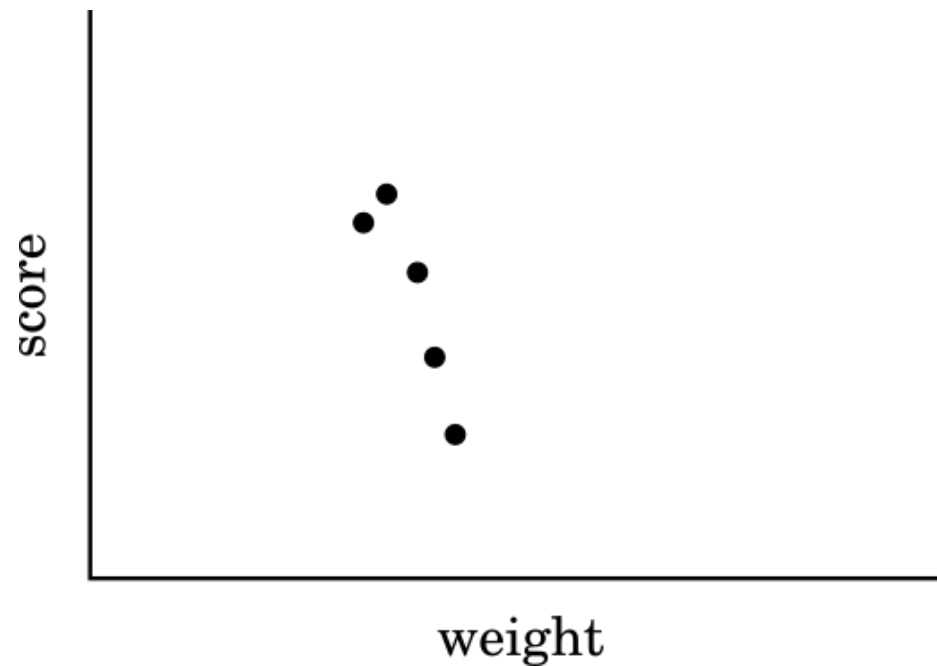
Training/Learning

- Adjust weighting factors to maximize score



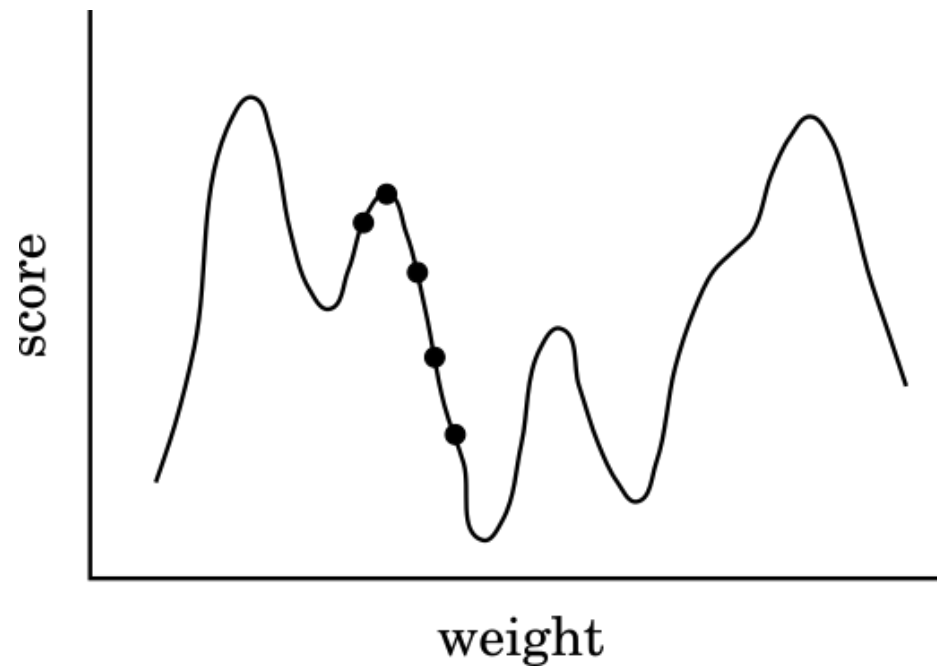
Training/Learning

- Adjust weighting factors to maximize score



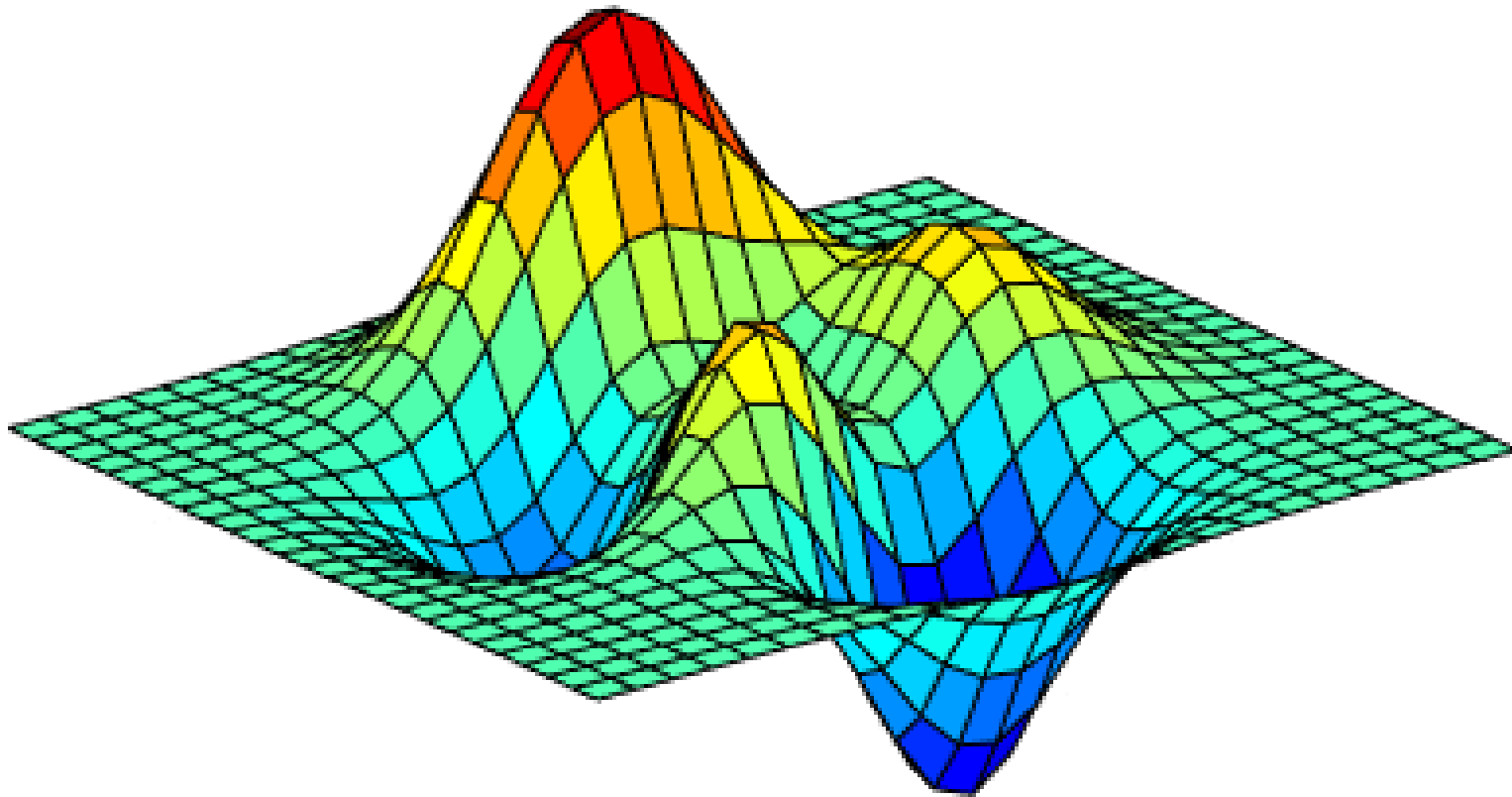
Training/Learning

- Adjust weighting factors to maximize score



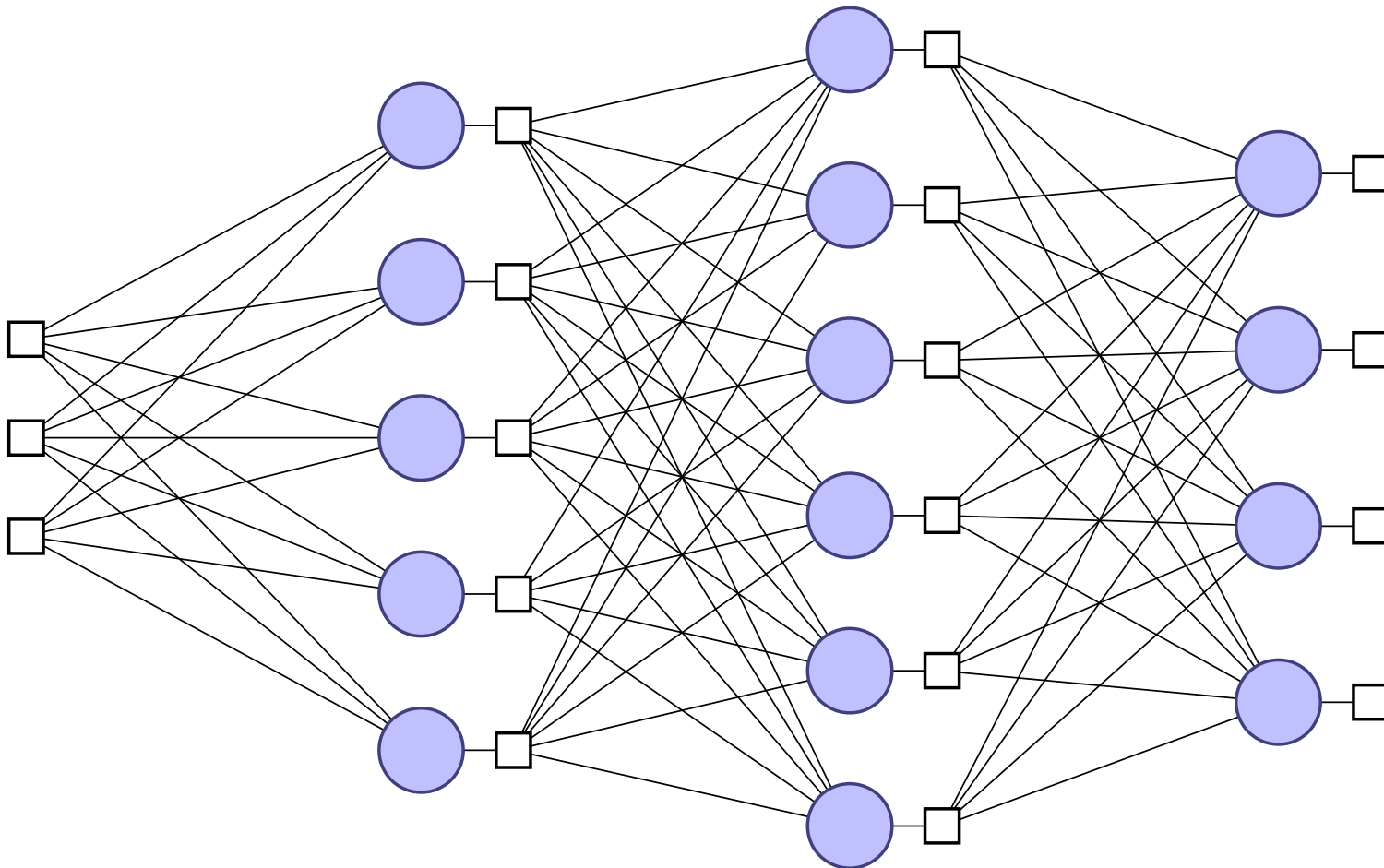
Training/Learning

- Adjust weighting factors to maximize score



Training/Learning

- $(3 \times 5) + (5 \times 6) + (6 \times 4) = 69$ weighting factors



Training/Learning

- Massive compute power to train
- Far less to use, once trained
 - May need super computer to train
 - Can run on your laptop
- GPUs (Graphic Processing Units)
 - Fueled by video gaming and bitcoin

Types of Neural Networks

- Artificial Neural Network (ANN)
 - The previous examples
- Recurrent Neural Network (RNN)
 - Back propagation (memory)
- Convolutional Neural Network (CNN)
 - More complex linkage

Why Do Neural Networks Work?

- We don't know!
- There are many theories

AI In the Near Future

- Handwriting recognition
 - Archaic, hard to read handwriting
 - Fuzzy images
- “Scan” a document with a simple camera
 - No need to place on the flat glass
 - Reconstruct torn and crumbled documents
- Automatically Label people in old photos

AI In the Near Future

- Construct a 3-D face from multiple photos
- Find inconsistencies in your family tree
- Verify your tree with DNA
- Suggest searches to extend your tree
- Find insufficiently documented parts of trees

AI In the More Distant Future

- Find newspaper articles about ancestors
 - Your grandmother attended a birthday party
 - Your cousin visited another relative
- Build lists of an ancestor's friends, neighbors and associates
- Automatically build your tree
 - Find sources automatically
 - Use DNA to verify and adjust