

All About AI: Part 1

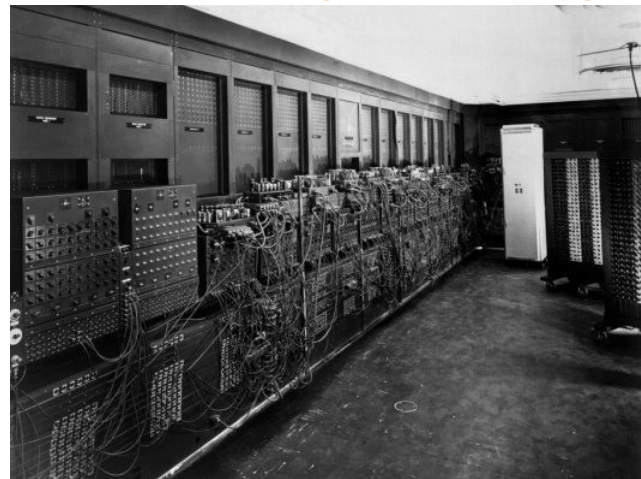
What it is, how it works and its history



Kautilya Katariya

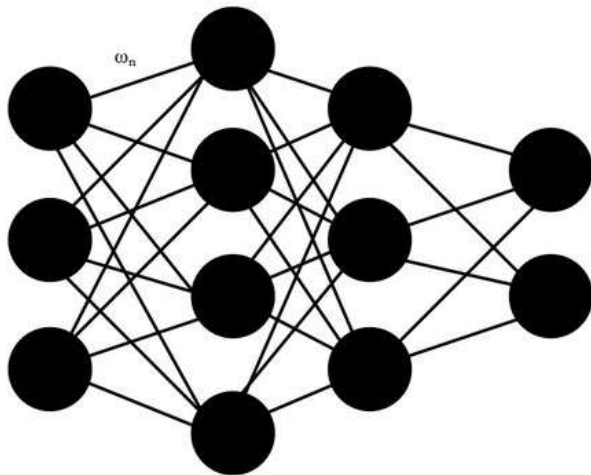
INTRODUCTION

AI is a field that has seen numerous advancements in the past two decades. But what exactly is it? Well, it is in the name. AI stands for Artificial Intelligence, which means machine (artificial) thinking (Intelligence). Artificial means not natural; intelligence is how you react based on past experiences. However, this is a misnomer. AI is just a machine trying to get as close to the best solution to fit the data. They cannot think as we do, or be truly creative (although it can look like they can). AI allows computers to handle tasks usually done by humans. These tasks include understanding language, solving problems, and learning. Many learning platforms like Duolingo (Birdbrain) and Khan Academy (Khanmingo) have already integrated AI chatbots into e-learning. This is a clear example of AI. On YouTube, an AI selects the recommended videos you see. A similar concept is in Netflix and Disney +. In video games, some NPCs (non-player characters) use AI. This helps them decide what to say. The conversion between text and speech usually also uses AI.



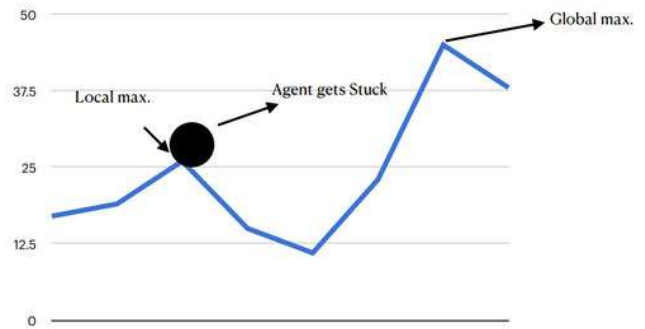
The idea of AI has been around longer than many believe. The first AI model, made in 1951, was a heuristic for playing checkers or draughts. This model used an algorithm to look ahead by several steps and determine the move it should make. Frank Rosenblatt created the perceptron in 1956, which was the first model that could learn as it played. The Perceptron used weights. Each weight was multiplied by an input. Then, these results were added together to get the net input function. After that, this function went through an activation function. The final output was a number. This number showed how strongly it favored choosing a specific option. However, perceptron could only be used for recognizing whether something was or was not something. Two techniques, the nearest neighbour algorithm and backpropagation, were introduced to enhance pattern recognition. This led to increased excitement about AI. In 1970, AI pioneer Marvin Minsky made a prediction. He said that within three to eight years, we would create a machine.

This machine would have the general intelligence of an average human being. More than 50 years later, we are nowhere near that point. This hype caused an AI winter (when AI was not used a lot for a long period). In 1980, expert systems were created, which used hard-coded if-then logic to make decisions. These systems can be visualized on decision trees. Computing power was limited in the past, and artificial intelligence was not very advanced. This led to another AI winter in 1987. By 1994, things had improved. Moore's Law, which says computing power doubles every two years, helped make this progress. Better algorithms were created as a result. These algorithms used training data to make their decision trees. Neural networks are a type of algorithm. They advance beyond the older Perceptron model by including many layers of nodes. In a neural network, each input node has weights. These weights connect the input nodes to the first hidden layer. Then, they connect the hidden layers to each other. Finally, they connect the last hidden layer to the output. It can be displayed like this:

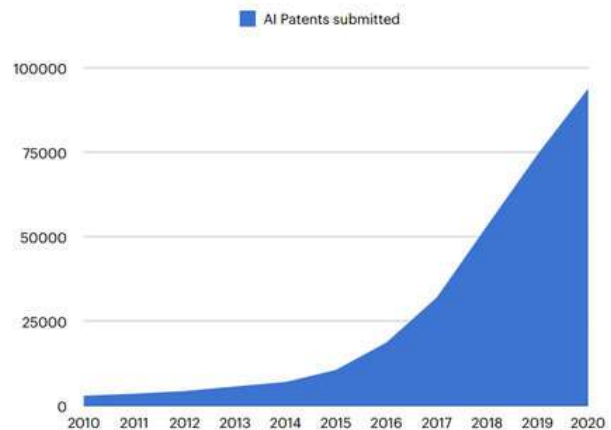


Each line represents a connection between two nodes. At times, connection weights are shown through their thickness or color. Alternatively, the Greek letter omega is placed above them, as I have done. The training data is used to refine the weights and improve the performance. At the end, an activation function (which I haven't displayed) is used to refine the output. Now, let's look at reinforcement learning. This is rewarding/punishing an agent based on how great it is doing. The agent applies gradient ascent. This strategy aims to find a local maximum point on a curve. Its goal is to achieve the highest reward.

You may notice that I said a local maximum instead of the maximum. I visualize the difference here:



An AI using reinforcement learning can hit a performance limit. This occurs if we don't carefully select the right loss function. Every AI uses a loss function. So, we must choose each AI's loss function with care, as with reinforcement learning. Lastly, I want to highlight the increase in AI patents from 2010 to 2020.



AI is becoming more and more dominant in our lives. For example, back in the 1980s and 90s, people dreamed of robots driving cars. It was even used in sci-fi movies. Nowadays, the robot is the car. AI has and will continue to appear in our everyday lives. Additionally, AI will be ever easier to access and create.

In part 2, I will show you how to create AI with minimal code using Python. I will cover how kids and teens can learn AI and ML for free. They can use different online resources that don't require coding.

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