Introduction to Machine Learning

Relevant slide show: 🟨 MACHINE LEARNING 🧠⚡

Slide 2, Setting the Scene
New York, 1997, on the tenth floor of a towering skyscraper, a chess match would be played between the reigning human champion and the best chess computer of the time. Gary Kasparov vs. IBM's Deep Blue would last a week, with the first of six matches being played on May 3, and the last match being played on May 11.

Most people have heard of the match, but not a lot of people know the amazing technology behind how exactly the engineers at IBM taught a computer to play chess.

Section 3, What is Machine Learning?
Put simply, machine learning is when we teach computers to make guesses about the world by giving it a lot of information. Based on what we want the computer to learn, we might have to give it varying amounts of information. Having looked at a bunch of examples, the computer tries its best to figure out patterns, and it applies them to whatever task needs to be done.

An example would be showing a computer a bunch of different games of tic-tac-toe, and telling the computer who won each game. A machine learning algorithm could then "learn" how to play the game by looking at patterns; for example, the computer might notice that the majority of the time, the player who takes the middle square wins the game, or that in the majority of the games it analyzes, the player who goes second has a significantly different strategy than the player who goes first. With a sufficiently advanced program and enough data, a computer could learn to play tic-tac-toe better than a human very quickly!

Slide 4
The example I used involved a computer playing a strategy game, but machine learning can be used for a whole host of other tasks. Remember when you'd make an account on a website, and Google would make you prove you weren't a robot by selecting all the pictures with a traffic light in it? A lot of people theorize that Google uses these CAPTCHAS to train self-driving cars! In this case the data being fed to the machine learning algorithms aren't tic-tac-toe games, but rather information on what exactly counts as a stoplight, a stop sign, a pedestrian, etc. Whether we knew it or not, we've all been training machines for years!

Section 5, Challenges
Machine learning is a powerful tool, but there are still a lot of hurdles standing between the chess-playing box from earlier, and the fictional superintelligent AIs in movies. One big

challenge in Machine Learning is bad data. Remember how machines learn from being fed lots and lots of data? Imagine if we taught our computer how to play tic-tac-toe using games where the players broke rules, or what if we taught our computer how to play tic-tac-toe using games of Connect 4? The final result would be useless. Another challenge we can run into is using data that isn't representative. If all the games we fed the computer had one player making the same sets of moves over and over again, sure the computer would be great at playing against that exact moveset, but what if we ask if to play someone who doesn't use those exact same moves?

Even as machine learning grows and becomes more and more popular, there are still many challenges that come with its development and application to everyday life.

Slide 6, Back to the game…
When Deep Blue was being developed in the 1980s, the team behind it had faced the exact same techniques and challenges as those I mentioned relating to the tic-tac-toe machine. Its creators fed the Deep Blue algorithm hundreds of thousands of chess grandmaster games, and allowed the machine to "learn" how to play by analyzing the masters. Deep blue was allowed to play thousands of games against itself, honing in its strategy all in preparation of the big day when it would be pitted against the then world chess champion. When the dust settled, Deep Blue had won 3½ points to Kasparov's 2½ points. To a lot of scientists and engineers, this match represented machines catching up to humans in terms of intelligence, and signaled the coming importance of machine learning and artificial intelligence.

Slide 7, Applications of Machine Learning
These experts recognized that the same technology that was able to best humans in the game of chess could also be applied to almost anything else one could think of. Today, machine learning algorithms are responsible for much more than most people realize; this ranges from Spotify recommendations, to Tesla's collision avoidance technology, to groundbreaking diagnosis software that can help doctors identify potential tumours in CT scans of patients.

Section 5, Conclusion
Machine learning is a powerful tool, and the science behind it is absolutely fascinating. Try taking a look around to see where you can find machine learning in everyday life!