

An Introduction to Machine Learning

When most people hear “Machine Learning,” they picture a robot: a dependable butler or a deadly Terminator depending on who you ask. But Machine Learning is not just a futuristic fantasy, it’s already here. In fact, it has been around for decades in some specialized applications, such as Optical Character Recognition (OCR). But the first ML application that really became mainstream, improving the lives of hundreds of millions of people, took over the world back in the 1990s: it was the spam filter. It was followed by hundreds of ML applications that now quietly power hundreds of products and features that you use regularly, from better recommendations to voice search.

Where does Machine Learning start and where does it end? What exactly does it mean for a machine to learn something? If I download a copy of Wikipedia, has my computer really “learned” something? Is it suddenly smarter? We will start by clarifying what Machine Learning is and why you may want to use it.

What is Machine Learning?

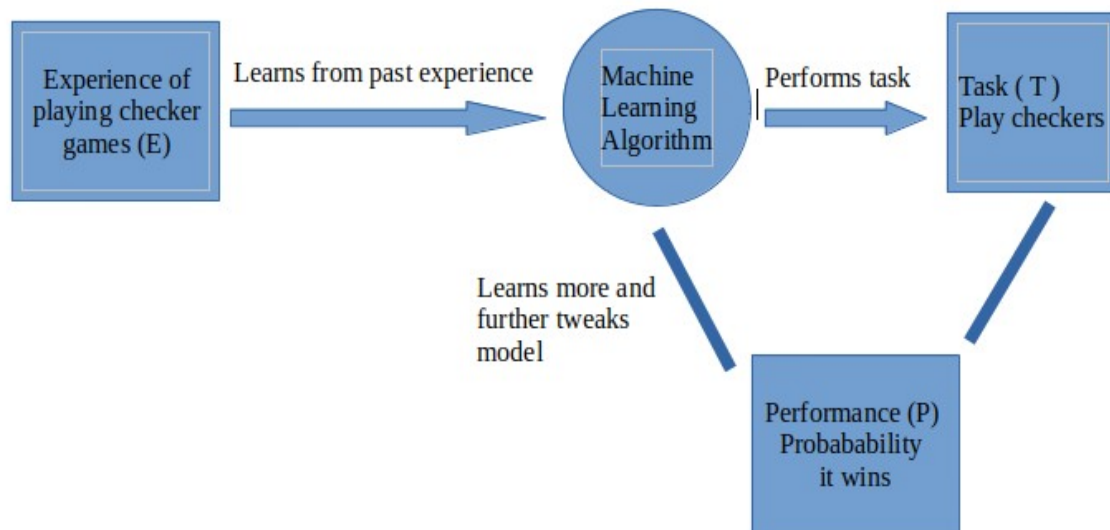
Machine Learning is the science (and art) of programming computers so they can learn from data.

Here is an engineering-oriented definition:

A computer program is said to learn from experience E with respect to some task T and some performance measure P , if its performance on T , as measured by P , improves with experience E .

Suppose we have to teach a computer to play a checkers game. The task (T) is to play a checkers game.

- Now to train the model we should have data of previous checkers games which is going to act as our experience E from which the algorithm learns.
- Now to evaluate how well the computer plays we keep a performance metric (P) which in this case I define as the probability that the computer wins the game.
- The computer can learn from the game it has played and further tweak the model to perform better.
- The process of learning happens over multiple iterations and with each iteration, the model should perform better.



Why do we need Machine Learning?

Machine Learning is great for:

- Problems for which existing solutions require a lot of hand-tuning or long lists of rules: one Machine Learning algorithm can often simplify code and perform better.
- Complex problems for which there is no good solution at all using a traditional approach: the best Machine Learning techniques can find a solution.
- Fluctuating environments: a Machine Learning system can adapt to new data.
- Getting insights about complex problems and large amounts of data.