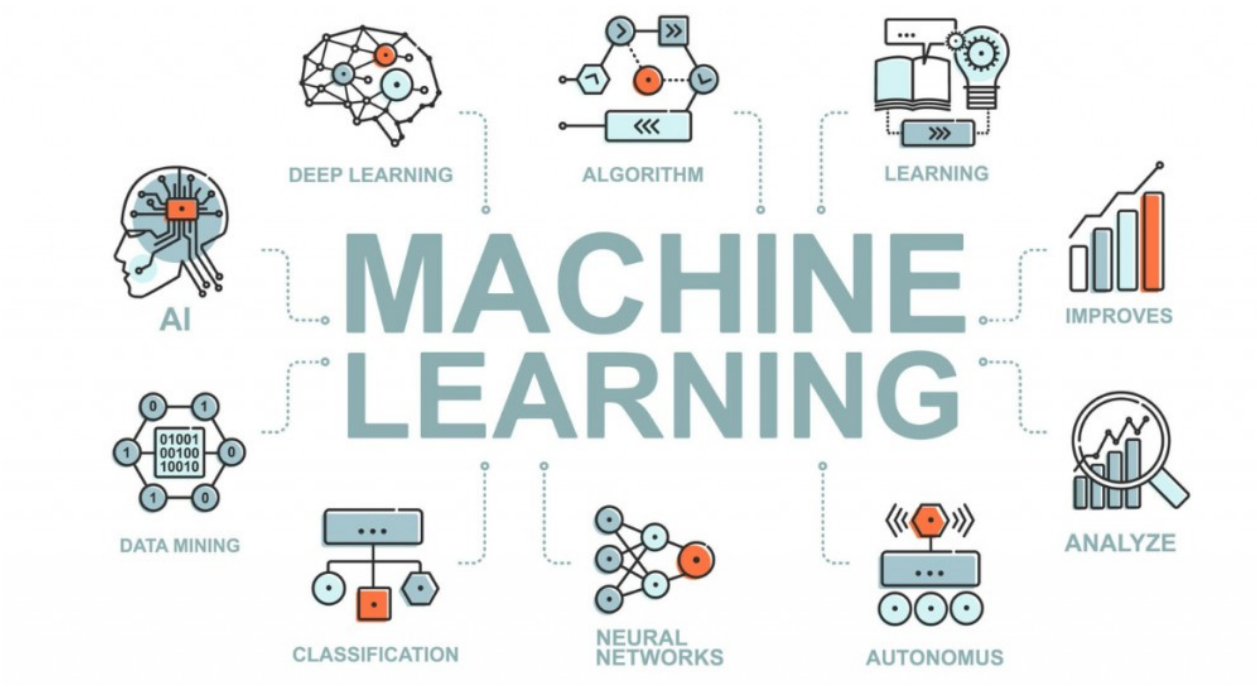
👉 **Definiton** of **Machine Learning (ML)**



The term was introduced in **1959** by **Arthur Samuel**, an American IBMer and pioneer in computer gaming and artificial intelligence. He described Machine Learning as:

📖 *"ML: Field of study that gives computers the ability to learn without being explicitly programmed."*

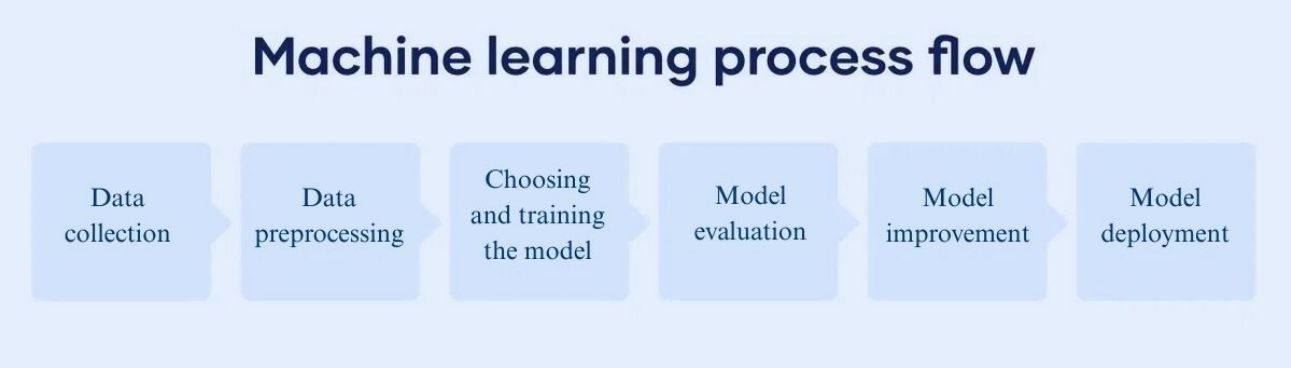
In other words, Machine Learning is a scientific field focused on analyzing and interpreting **patterns** 📊 and **structures** ⚙️ in data, enabling learning, reasoning, and decision-making with minimal human intervention.

However, this definition is somewhat broad and might not give beginners a concrete understanding. To make it clearer, **Tom M. Mitchell** proposed a more formal definition:

📝 *"A computer program is said to learn from experience **E** with respect to some class of tasks **T** and performance measure **P**, if its performance at tasks in **T**, as measured by **P**, improves with experience **E**."*

🧠 Machine Learning Workflow

After understanding what Machine Learning is, it is equally important to look at the general workflow that guides how ML models are developed and applied.



1️⃣ **Data Collection** – Gather datasets either from your own sources or from reliable, publicly available repositories. Using authoritative sources ensures accuracy and enables the model to learn effectively.

2️⃣ **Data Preprocessing** – Clean, normalize, label, encode, and extract features while reducing dimensionality if needed. This step is usually the most time-consuming, often taking up more than 70% of the project timeline.

3️⃣ **Model Training** – Train the algorithm on the preprocessed data so it can learn patterns and relationships.

4️⃣ **Model Evaluation** – Assess performance using appropriate metrics. A model with accuracy above 80% is generally considered strong.

5️⃣ **Model Improvement** – Retrain or fine-tune the model if results are unsatisfactory, iterating from training until the desired performance is reached. These final steps usually account for about 30% of the total project time.

💡 Illustrative Example

There are some practical example for you to better understand how ML works in different contexts:

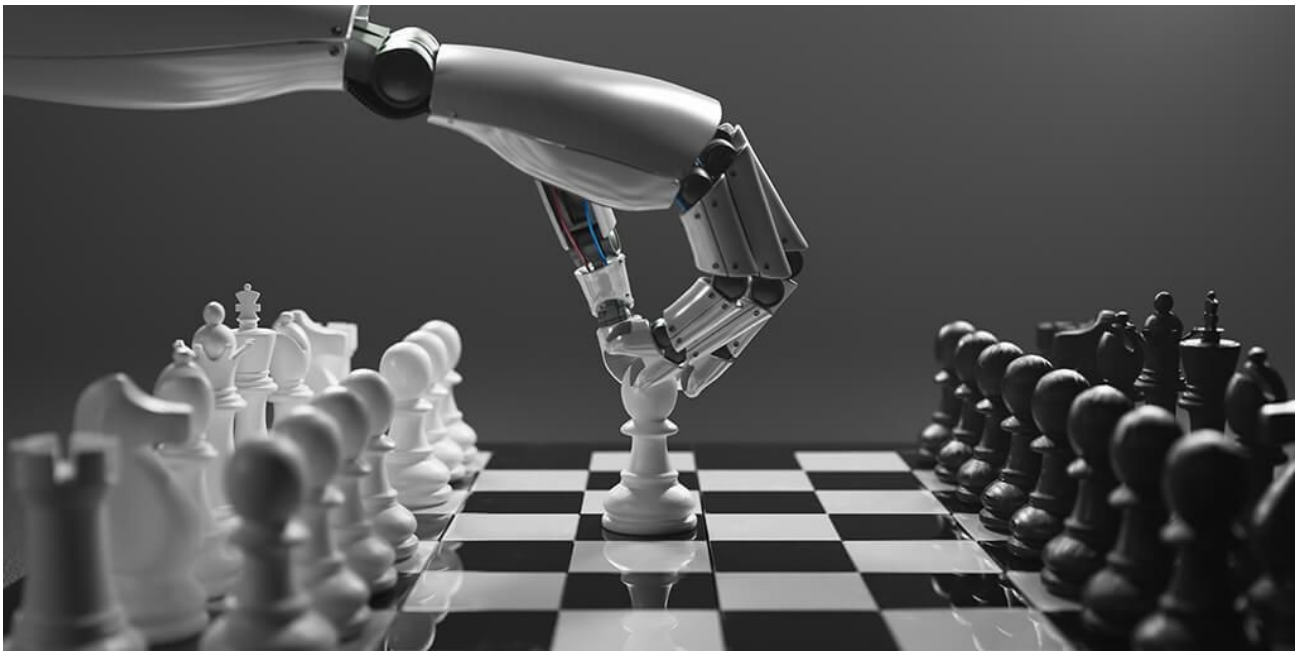
♟️ Teaching a model to play chess

🎯 **T** = playing chess games

📚 **E** = the experience gained from previous games

📈 **P** = the probability of winning the next game

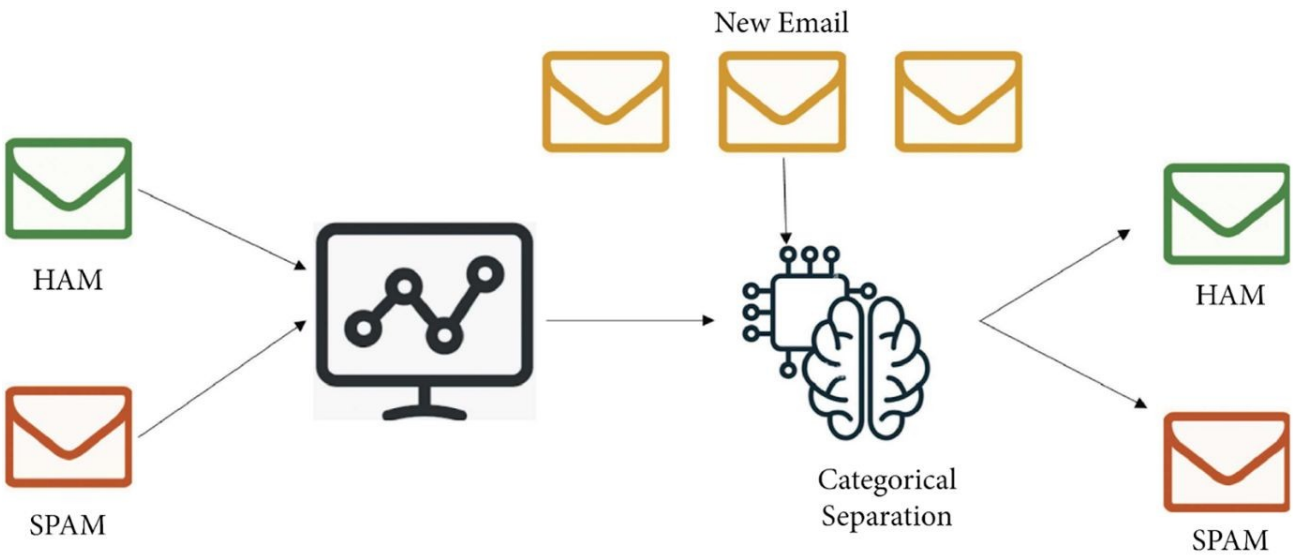
As the program plays more games – with different **strategies** ⚔️ and increasing difficulty – it accumulates **diverse experiences** 📦 (openings, mid-game tactics, endgame strategies). These experiences help it learn and improve its **chances of winning** 🏆 in future games.



📨 **Teaching a model to classtify email (Email Spam Filtering)**

- 🔀 **T** = classifying incoming emails as spam or not spam
- 📩 **E** = a labeled dataset of emails
- ✅ **P** = ability to correctly classtify new incoming emails

The program is trained on a 🏷️ **labeled dataset**, where spam emails often contain **"keywords"** – writing styles ✍️, frequencies ⏱️, reputations 👤, and IPs 🌐. The more **emails** it sees, the more **accurately** it can detect and filter spam



🥺 **"Flirt with a girl" (Learning Social Skills)**

- 💬 **T** = starting conversations and building connections with the girl
- 🗣️ **E** = the experience gained from past interactions
- 💖 **P** = the success rate in future interactions

With each experience, the program learns to **identify patterns**: which ways are the good to start a conversation 👋, which topics engage girls 😊, etc. Over time, by 🛠️ **build approach tips** based on 💬 **feedback** , their ability to **maintain engaging conversations** and **"win her over"**.

Sources: [TopDev.vn](#) | [vdigital.vn](#) | [42AbuDhabi.ae](#)