

## Machine Learning

→ Field of computer science that uses statistical techniques to give computer systems the ability to 'learn' with the data, without being explicitly programmed.

→ In simple term **ML is all about learning from the data**

Now the question is, **what is explicit programming?**

→ In explicit programming we write the code for each possible scenario to handle.

but in **ML we don't do that**

→ we have an algorithm and we have data and we train that algorithm on that data

→ the algorithm find out the patterns from the data between input and output

→ then we give the algorithm the new unseen data, and on the based of pattern algorithm learned it makes predictions

### ML vs Traditional Programming:

→ In traditional programming, we provide logic (program) and the data to the computer, and it produces the output.

→ In Machine Learning, we provide data and outputs (labels) to the computer, and the system automatically learns the logic (program) by finding patterns in the data.

→ and the good part is we don't have to handle each case manually in ML, the algorithm handles each case by itself.

## Traditional Programming



## Machine Learning



## **Scenarios Where ML can be Used:**

There are a lot of scenarios where ML can be used but the most 3 important scenarios are:-

### **Scenario 1: Problems with complex, ever-changing rules**

→ It is difficult to write explicit code for every possible case.

- Example: Email Spam Classifier. A programmer might write if-else rules based on keywords like 'discount' or 'huge'. However, spammers can simply change the words (e.g., use 'big' instead of 'huge'), forcing the programmer to constantly update the code.
- An ML model, in contrast, learns from the data itself. If the data changes, the model's logic automatically adapts.

### **Scenario 2: Problems with an unimaginable number of cases**

→ This applies to situations where you cannot even conceive of all the possible variations.

- Example: Image Classification (detecting a dog). It would be impossible to write code to account for every dog breed, colour, size, and angle.
- ML uses the same approach as humans: it learns by being shown many examples (data) of what is and isn't a dog.

### **Scenario 3: Data Mining**

- Data Mining is the process of extracting hidden, important patterns from data that may not be apparent through standard data analysis like plotting graphs.
- ML is a very important tool for data mining. You can apply an ML algorithm to the data and then inspect the patterns the model has learned to gain insights.