What is Machine Learning?

Machine Learning (ML) is a field of Artificial Intelligence (AI) that allows computers to **learn from data** and improve their performance **without being explicitly programmed**. Instead of following strict rules written by a programmer, ML models analyze **patterns in data** and make predictions or decisions based on **what they have learned.**

Normal Programming:

In traditional programming, we explicitly **define the rules** that the program follows to make decisions. Let's take an example of email spam detection using an **if-else condition**:

```
def is_spam(email):
    if "lottery" in email.lower() or "free money" in email.lower():
        return "Spam Email"
    else:
        return "Not Spam"

# Test Cases
print(is_spam("Congratulations! You won a lottery!"))  # Output: Spam Email
print(is_spam("Hello, let's catch up for a meeting.")) # Output: Not Spam
```

How Machine Learning Works?

Instead of manually writing rules with if-else, Machine Learning **learns patterns from data.**

Example : Email spam detection:

1. We collect thousands/Lakhs of emails labeled as spam or not spam.

Text	Result
Congratulations! You've won a $1,000,000 lottery! Click here to claim your prize now!	Spam
Get FREE MONEY instantly! No work required. Just sign up now!	Spam
URGENT: Your bank account has been compromised. Click this link to secure your funds!	Spam
Limited-time offer! Buy one, get three FREE! Act now before it's too late!	Spam
You've been selected for an exclusive weight loss program! Lose 10kg in 7 days!	Spam
Hi John, let's schedule a meeting for next Monday to discuss the project update.	Not Spam
Your Daraz order #12345 has been shipped and will arrive by Friday.	Not Spam
Reminder: Your doctor's appointment is scheduled for tomorrow at 3 PM.	Not Spam
Thank you for your payment! Your invoice for January 2025 is attached.	Not Spam

2. We train an ML model to recognize patterns
3. The model makes predictions based on what it has learned.

   How Model React after trained?:

I miss you call me	**Not Spam**
Refer this app and you will win $100,000	**Spam**

Improvement Over Time – With more data, the model refines its predictions and improves accuracy.

Key Difference

Traditional Programming (if-else)	Machine Learning
Manually define rules	Learns rules from data
Hard to handle complex cases	Adapts to new patterns
Requires updates for new spam words	Continuously improves from new emails