A. Definition of Machine Learning

1. Historical Context and Evolution

Definition of Machine Learning:

Machine Learning (ML) is a branch of artificial intelligence (AI) that focuses on building systems that can learn from and make decisions based on data. Unlike traditional programming, where a programmer explicitly writes instructions for the system to follow, machine learning involves creating algorithms that can identify patterns within data, make predictions, or perform tasks without being explicitly programmed to do so. Essentially, machine learning enables computers to improve their performance on a task over time by learning from experience.

Historical Context and Evolution:

The concept of machine learning has roots that trace back to the early days of computing and even before, with ideas about automation and artificial intelligence appearing in the mid-20th century. Here's an outline of key milestones in the history of machine learning:

- **1950s: The Birth of AI and Early Algorithms**
    - The idea of machine learning emerged as part of the broader field of artificial intelligence. In 1950, Alan Turing, a British mathematician and computer scientist, published a paper titled "Computing Machinery and Intelligence," where he introduced the Turing Test to determine if a machine could exhibit human-like intelligence. This concept laid the groundwork for thinking about machines that could learn.
    - In 1952, Arthur Samuel, an American pioneer in the field of computer gaming and artificial intelligence, developed one of the earliest machine learning programs—a checkers-playing program. Samuel's program was one of the first to incorporate a self-learning mechanism, using a technique called "self-play" to improve its performance over time.
- **1960s-1970s: The Rise of Neural Networks**
    - In 1957, Frank Rosenblatt introduced the Perceptron, an early type of artificial neural network capable of binary classification. The perceptron was a simple algorithm inspired