Artificial Intelligence — Basics & Applications

Title: An Introduction to Artificial Intelligence (AI)

Artificial Intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think, learn, and problem-solve like humans. The term encompasses a wide range of technologies and methods.

The primary subfield of AI is **Machine Learning (ML)**, which is an approach where systems are not explicitly programmed with rules. Instead, they "learn" directly from data. An ML model is trained on a dataset, and it finds patterns or makes inferences based on that data. There are three main types of machine learning:

1. **Supervised Learning:** The model is trained on a dataset where the data is already "labeled" with the correct answer. For example, a model trained on thousands of pictures of cats (labeled "cat") and dogs (labeled "dog") learns to identify new, unlabeled pictures.
2. **Unsupervised Learning:** The model is given an unlabeled dataset and must find hidden patterns or structures on its own. This is often used for "clustering," such as grouping customers into different market segments based on their purchasing behavior.
3. **Reinforcement Learning:** The model learns by trial and error in an environment. It receives "rewards" for correct actions and "penalties" for incorrect ones, with the goal of maximizing its cumulative reward. This is the method used to train AI to play complex games like Chess or Go.

Deep Learning (DL) is a more advanced subfield of machine learning. It uses complex, multi-layered "neural networks," which are inspired by the structure of the human brain. Deep learning is particularly powerful for complex pattern recognition and is the technology behind self-driving cars, advanced language translation, and generative AI models like ChatGPT.

Key Applications of AI:

- **Natural Language Processing (NLP):** Enabling computers to understand and process human language. This powers virtual assistants (Siri, Alexa), customer service chatbots, and language translation services.
- **Computer Vision:** Allowing machines to interpret and understand the visual world. This is used in facial recognition, medical image analysis (like finding tumors in X-rays), and autonomous navigation.
- **Recommender Systems:** Predicting what a user might like. This is used by Netflix to suggest movies, by Amazon to recommend products, and by Spotify to create custom playlists.

Most AI today is considered **Narrow AI (ANI)**, meaning it is designed and trained to perform a specific, narrow task. The concept of **Artificial General Intelligence (AGI)**—a machine with the ability to understand, learn, and apply intelligence across a wide range of tasks at a human level—remains a theoretical and long-term goal.