Machine Learning (ML) is a subset of Artificial Intelligence (AI) that enables computers to learn from data and improve their performance on a task over time without being explicitly programmed. Instead of relying on predefined rules or algorithms, machine learning models are trained on large datasets and use statistical methods to find patterns and make predictions or decisions.

Key Concepts in Machine Learning:

1. **Training Data**:
    - ML models are trained using historical data, which contains examples (input-output pairs). The model learns the relationship between inputs (features) and outputs (labels or targets) from this data.
2. **Types of Machine Learning**:
    - **Supervised Learning**: The model is trained on a labeled dataset where the correct output is known (e.g., predicting house prices based on past sales data).
    - **Unsupervised Learning**: The model works with unlabeled data and tries to find patterns or groupings (e.g., clustering customers by purchasing behavior).
    - **Reinforcement Learning**: The model learns through trial and error, receiving feedback through rewards or penalties (e.g., training a robot to navigate through a maze).
3. **Features**:
    - Features are the variables or characteristics in the data that the model uses to make predictions (e.g., age, income, and education level in a dataset about predicting credit scores).
4. **Model**:
    - A mathematical representation of the problem that is created based on the training data. The model "learns" the relationship between input data and the target output.
5. **Algorithm**:
    - The set of rules or procedures the model uses to adjust itself based on the data. Common algorithms include decision trees, neural networks, and support vector machines (SVM).
6. **Overfitting vs. Underfitting**:
    - **Overfitting**: When a model is too closely fit to the training data and doesn't generalize well to new data.
    - **Underfitting**: When a model is too simple to capture the underlying trends in the data, leading to poor performance on both training and new data.
7. **Evaluation**:
    - After training, the model's performance is evaluated on unseen test data to check its accuracy and ability to generalize.

Applications of Machine Learning:

- **Healthcare**: Predicting disease outbreaks, diagnosing medical conditions, and personalized treatment plans.
- **Finance**: Fraud detection, stock price prediction, and algorithmic trading.
- **Retail**: Product recommendations, inventory management, and customer segmentation.
- **Self-driving Cars**: Learning to recognize obstacles, pedestrians, and traffic patterns.
- **Natural Language Processing (NLP)**: Understanding and generating human language (e.g., chatbots, language translation).

Machine learning is integral to many AI applications and is a rapidly growing field with a wide range of real-world uses.