# Deep Learning - Detailed Overview

## History of Deep Learning

Deep learning is a subset of artificial intelligence (AI) that has evolved over several decades. Its development has been driven by advancements in neural networks, computational power, and data availability.  
  
1. Early Concepts (1940s – 1960s)  
- 1943: McCulloch and Pitts introduced the first artificial neuron model.  
- 1950s: Alan Turing proposed the Turing Test. Frank Rosenblatt developed the Perceptron.  
- 1969: Minsky and Papert proved that single-layer perceptrons couldn't solve non-linear problems.  
  
2. Revival of Neural Networks (1980s – 1990s)  
- 1986: Backpropagation algorithm reintroduced by Geoffrey Hinton, enabling multi-layer networks.  
- 1989: LeNet-5 by Yann LeCun for handwritten digit recognition.  
  
3. Growth and Setbacks (1990s – 2000s)  
- Introduction of LSTM networks by Hochreiter and Schmidhuber in 1997.  
- Shift to support vector machines and decision trees due to computational limits.  
  
4. Deep Learning Revolution (2010s – Present)  
- 2012: AlexNet won the ImageNet Challenge.  
- 2014: Generative Adversarial Networks (GANs) introduced.  
- 2015: AlphaGo by DeepMind defeated human champions.  
- 2020s: GPT-3 by OpenAI showcased the power of deep learning in NLP.

## Why Deep Learning is Used

Deep learning is used because it excels in recognizing complex patterns in data without human intervention.  
  
- Ability to Handle Complex Data: Image, speech, and autonomous systems.  
- Automatic Feature Extraction: No manual feature engineering required.  
- High Accuracy: Outperforms traditional machine learning models.  
- Scalability: Improves performance with more data.  
- Eliminates Human Bias: Data-driven decision making.  
- Advances in Computing Power: Powered by GPUs and cloud computing.

## Difference Between AI, ML, and DL

1. Artificial Intelligence (AI): Broad concept of machines mimicking human intelligence.  
2. Machine Learning (ML): Subset of AI that learns patterns from data.  
3. Deep Learning (DL): Subset of ML that uses neural networks with multiple layers.  
  
| Feature | AI | ML | DL |  
|---------------|------------------|----------------|----------------|  
| Definition | Mimics human intelligence | Learns patterns from data | Uses neural networks |  
| Data Dependency | Low | Moderate | High |  
| Complexity | Simple to Complex | Moderate | Very Complex |  
| Use Cases | Chatbots, Robotics | Fraud Detection, Recommendations | Image Recognition, Self-Driving Cars |