01 - DeepLearning Introduction

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Deep Learning

- Deep learning is a subset of machine learning that involves training artificial neural networks to learn from data.
- It is inspired by the structure and function of the human brain.

Neural Networks

- Neural networks are mathematical models composed of layers.
- Different kind of layers: Fully Connected, Convolution, LSTMs, ...
- The input layer receives encoded data, such as images, text, or sound, and the output layer produces a "prediction" based on the input data.

Applications

- Deep learning is particularly effective in tasks such as:
  - Image recognition
  - Speech recognition
  - Natural language processing
  - Closed environment games
- Traditional machine learning approaches struggle in these tasks due to the complexity and variability of the input data.

Training

- Training a deep neural network involves feeding it with large amounts of labeled data.
- The network adjusts its weights and biases to minimize the error between its predictions and the true labels.
- This process is typically done through a technique called backpropagation which uses the chain rule of calculus to compute the gradients of the error with respect to the network parameters.

Training Approaches

- Two main approaches to training deep neural networks: supervised and unsupervised learning.
  - Supervised learning: network learns from labeled data by minimizing the difference between its predictions and true labels.
  - Unsupervised learning: network discovers patterns in unlabeled data by minimizing reconstruction error or maximizing probability of the data given the model.
- Other approaches: semi-supervised learning and reinforcement learning.