Neural Networks — Concept Document

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Concept Overview :

1. **Definition:** Neural Networks are computational models inspired by how neurons in the brain transmit information.
2. **Goal:** Learn complex relationships in data by adjusting internal parameters (weights & biases).
3. **Structure:** Consist of input, hidden, and output layers connected by weighted edges.
4. **Neuron Operation:** Each neuron calculates a weighted sum and passes it through an activation function (e.g., Sigmoid or ReLU).
5. **Forward Propagation:** Input data flows through layers to produce an output prediction.
6. **Loss Function:** Measures how far predictions are from true labels.
7. **Backward Propagation:** Gradients are computed and weights updated to reduce the loss.
8. **Learning Rate:** Controls how fast the model learns.
9. **Example Used:** Implemented a small 2-layer network to predict the XOR logic gate.
10. **Applications:** Used in computer vision, speech recognition, natural-language processing, and robotics.

Reflection

From this project, I learned how forward and backward propagation work together to train a neural network.
Building the XOR classifier from scratch helped me understand how weights and activation functions interact.
I also realized how sensitive training is to the learning rate and random initialization.
Overall, this exercise deepened my intuition for how neural networks “learn” from data rather than memorizing it.