

Lesson 3: Activation Functions and Their Importance

What are Activation Functions?

Activation functions introduce non-linearity into neural networks, enabling them to learn complex relationships in the data.

Types of Activation Functions:

- Sigmoid: Maps input values between 0 and 1, useful for binary classification.
- ReLU (Rectified Linear Unit): Introduces non-linearity by outputting 0 for negative inputs and the input itself for positive inputs.
- Softmax: Converts logits (raw outputs of the network) into probability distributions, used primarily in multi-class classification.

Code Example: Comparing Activation Functions

```
python
import numpy as np
import matplotlib.pyplot as plt

# Define activation functions
def sigmoid(x):
    return 1 / (1 + np.exp(-x))

def relu(x):
    return np.maximum(0, x)

def softmax(x):
    exp_x = np.exp(x - np.max(x))
    return exp_x / exp_x.sum()

# Generate data for plotting
x = np.linspace(-10, 10, 100)

# Plot activation functions
plt.plot(x, sigmoid(x), label='Sigmoid')
plt.plot(x, relu(x), label='ReLU')
plt.legend()
plt.show()
'''
```

Key Topics to Explore:

- Choosing the Right Activation Function: Depending on the task (e.g., binary classification, multi-class classification), different activation functions may be preferred.
- Exploring Advanced Functions: Learn about more advanced functions like Leaky ReLU, Tanh, and ELU (Exponential Linear Units).