jupyter Untitled4 Last Checkpoint: 1 minute ago

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Code

JupyterLab

Python 3 (ipykernel)

[1]:
```
import numpy as np
from matplotlib.pylab import randn
from math import exp
```

[2]:
```
def sigmoid(x):
    return 1 / (1 + np.exp(-x))

def sigmoidDerivative(x):
    return x * (1 - x)
```

[3]:
```
class NeuralNetwork:
    def __init__(self, layerSizes):
        self.layerSizes = layerSizes
        self.weights = []
        for i in range(1, len(layerSizes)):
            self.weights.append(np.random.randn(layerSizes[i - 1], layerSizes[i]))

    def forwardPropagation(self, inputData):
        self.activations = [inputData]
        self.zValues = []
        for i in range(len(self.layerSizes) - 1):
            z = np.dot(self.activations[i], self.weights[i])
            self.zValues.append(z)
            activation = sigmoid(z)
            self.activations.append(activation)
        return self.activations[-1]
```

```
    def backwardPropagation(self, inputData, targetOutput, learningRate):
        output = self.forwardPropagation(inputData)
        error = targetOutput - output
        delta = error * sigmoidDerivative(output)

        for i in range(len(self.layerSizes) - 2, -1, -1):
            gradient = np.dot(self.activations[i].T, delta)
            self.weights[i] += learningRate * gradient
            error = np.dot(delta, self.weights[i].T)
            delta = error * sigmoidDerivative(self.activations[i])

    def train(self, inputData, targetOutput, epochs, learningRate):
        for _ in range(epochs):
            self.backwardPropagation(inputData, targetOutput, learningRate)
        return self.forwardPropagation(inputData)
```

[4]:
```python
X = np.array([[0, 0], [0, 1], [1, 0], [1, 1]])
y = np.array([[0], [1], [1], [0]])

layerSizes = [2, 4, 1]

nn = NeuralNetwork(layerSizes)

output = nn.train(X, y, epochs=10000, learningRate=0.1)

print("Output after training:")
print(output)
```

```
Output after training:
[[0.11246119]
 [0.92341256]
 [0.92986151]
 [0.03965906]]
```