Assignment No. 9

Title: Write a python program to design a hopefield network with stores 4 vectors.

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In [5]:
```python
import numpy as np
```

In [6]:
```python
class HopfieldNetwork:
    def __init__(self, n_neurons):
        self.n_neurons = n_neurons
        self.weights = np.zeros((n_neurons, n_neurons))

    def train(self, patterns):
        for pattern in patterns:
            self.weights += np.outer(pattern, pattern)
        np.fill_diagonal(self.weights, 0)

    def predict(self, pattern):
        energy = -0.5 * np.dot(np.dot(pattern, self.weights), pattern)
        return np.sign(np.dot(pattern, self.weights) + energy)
```

In [7]:
```python
if __name__ == '__main__':
    patterns = np.array([
        [1, 1, -1, -1],
        [-1, -1, 1, 1],
        [1, -1, 1, -1],
        [-1, 1, -1, 1]
    ])

    n_neurons = patterns.shape[1]
    network = HopfieldNetwork(n_neurons)
    network.train(patterns)

    # Test predictions for all input patterns
    for pattern in patterns:
        prediction = network.predict(pattern)
        print('Input pattern:', pattern)
        print('Predicted pattern:', prediction)
```

```
Input pattern: [ 1  1 -1 -1]
Predicted pattern: [-1. -1. -1. -1.]
Input pattern: [-1 -1  1  1]
Predicted pattern: [-1. -1. -1. -1.]
Input pattern: [ 1 -1  1 -1]
Predicted pattern: [-1. -1. -1. -1.]
Input pattern: [-1  1 -1  1]
Predicted pattern: [-1. -1. -1. -1.]
```

In [ ]:

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