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Roll no: 19

Subject : Software Lab 2 (ANN)

Lab Assignment Group B- 4

Problem Statement :

Write a python program to design a Hopfield Network which stores 4 vectors.

Code:

```
import numpy as np
patterns = np.array([
    [1, 0, 1, 0],
    [0, 1, 0, 1],
    [1, 1, 1, 1],
    [0, 0, 0, 0]
])
num_neurons = len(patterns[0])
weights = np.zeros((num_neurons, num_neurons))
for pattern in patterns:
    weights += np.outer(pattern, pattern)
for i in range(num_neurons):
    weights[i, i] = 0
def retrieve_pattern(input_pattern):
    output_pattern = np.zeros(num_neurons)
```

```
  for _ in range(num_neurons):
        output_pattern = np.sign(np.dot(weights, input_pattern))
        input_pattern = output_pattern
    return output_pattern
for i in range(len(patterns)):
    input_pattern = patterns[i]
    output_pattern = retrieve_pattern(input_pattern)
    print(f"Input pattern {i}: {input_pattern}")
    print(f"Retrieved pattern {i}: {output_pattern}")
    print()
```

Output:

```
Input pattern 0: [1 0 1 0]
Retrieved pattern 0: [1. 1. 1. 1.]

Input pattern 1: [0 1 0 1]
Retrieved pattern 1: [1. 1. 1. 1.]

Input pattern 2: [1 1 1 1]
Retrieved pattern 2: [1. 1. 1. 1.]

Input pattern 3: [0 0 0 0]
Retrieved pattern 3: [0. 0. 0. 0.]
```