Subject: Data Mining and Warehousing **SAP ID: 60004220253 – Devansh Mehta**

Experiment 09

Aim: Write a program to implement HITS algorithm.

Code:

```
import numpy as np

def hits_algorithm(adjacency_matrix, max_iter=100, tol=1e-6):

    num_nodes = adjacency_matrix.shape[0]
    hub_scores = np.ones(num_nodes)
    authority_scores = np.ones(num_nodes)

    for _ in range(max_iter):
        new_authority_scores = np.dot(adjacency_matrix.T, hub_scores)
        new_authority_scores /= np.linalg.norm(new_authority_scores, 2)

        new_hub_scores = np.dot(adjacency_matrix, new_authority_scores)
        new_hub_scores /= np.linalg.norm(new_hub_scores, 2)

        if np.linalg.norm(new_authority_scores - authority_scores, 2) < tol and \
           np.linalg.norm(new_hub_scores - hub_scores, 2) < tol:
            break

        authority_scores = new_authority_scores
        hub_scores = new_hub_scores

    return hub_scores, authority_scores

adjacency_matrix = np.array([
    [0, 1, 1, 0],
    [1, 0, 1, 1],
    [0, 1, 0, 1],
    [0, 0, 1, 0]
])

hub_scores, authority_scores = hits_algorithm(adjacency_matrix)

print("Hub Scores:", hub_scores)
print("Authority Scores:", authority_scores)
```

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Output:

```
Hub Scores: [0.50495964 0.6845599  0.42308206 0.31208185]
Authority Scores: [0.31208138 0.42308266 0.68455999 0.5049593 ]
```