Green University of Bangladesh

Department of Computer Science and Engineering (CSE)

Faculty of Sciences and Engineering

Semester: (Spring, Year:2025), B.Sc. in CSE (Day)

LAB REPORT NO: 02

Course Title: Artificial Intelligence Lab

Course Code: CSE 316 Section: 221-D4

Student Details

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Submission Date : 06 Mar 2025

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Lab Report Status

Marks: …… **Signature:.....**

Comments:..... **Date:.....**

1. TITLE OF THE LAB EXPERIMENT

- Write a python code to perform bfs traversal on the given graph and print the order of the nodes.

2. OBJECTIVES/AIM

- To understand and implement the Breadth-First Search (BFS) algorithm
- To explore graph traversal techniques using a queue
- To enhance problem-solving skills by working with graph data structures
- To optimize code efficiency in handling directed graphs

3. PROCEDURE

Breadth-First Search Implementation:

- Represent the graph using an adjacency list.
- Create a queue to keep track of nodes to visit.
- Use a set to store visited nodes to avoid reprocessing.
- Start from a given node, add it to the queue, and explore its neighbors level by level.
- Continue the process until all reachable nodes are visited.

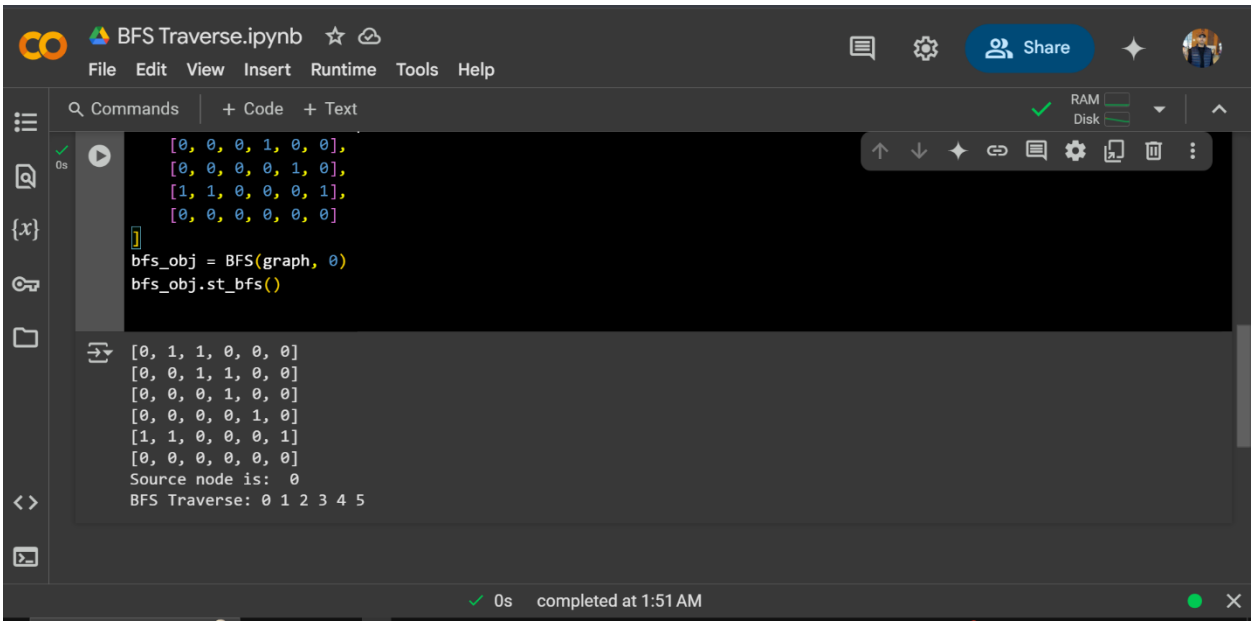
4. IMPLEMENTATION

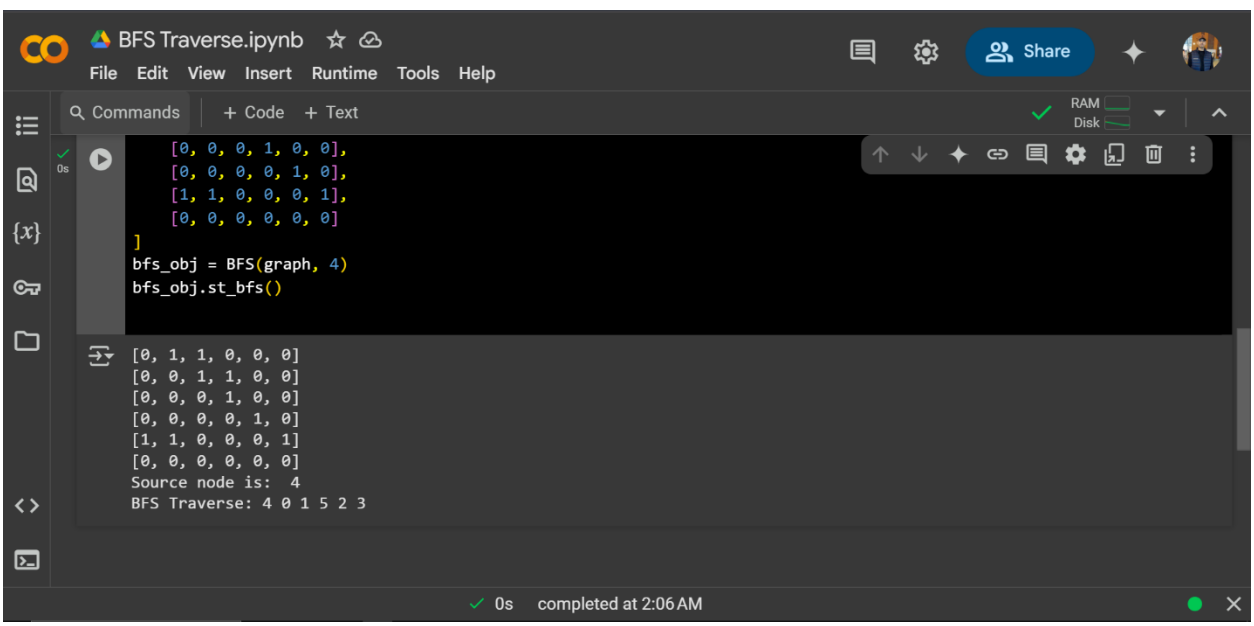
Breadth-First Search Code:

```
from collections import deque

class BFS:
    def __init__(self, graph, source):
        self.graph = graph
        self.source = source
        for row in self.graph:
            print(row)
        print("Source node is: ",self.source)

    def st_bfs(self):
        queue = deque()
        visited_node = set()

        queue.append(self.source)
        visited_node.add(self.source)
        print("BFS Traverse:", self.source, end=" ")

        while queue:
            node = queue.popleft()
            for i in range(len(self.graph[node])):
                if self.graph[node][i] == 1 and i not in visited_node:
                    queue.append(i)
                    visited_node.add(i)
                    print(i, end=" ")

graph = [
    [0, 1, 1, 0, 0, 0],
    [0, 0, 1, 1, 0, 0],
    [0, 0, 0, 1, 0, 0],
    [0, 0, 0, 0, 1, 0],
    [1, 1, 0, 0, 0, 1],
    [0, 0, 0, 0, 0, 0]
]
bfs_obj = BFS(graph, 0)
bfs_obj.st_bfs()
```

5. Test Result / Output

Breadth-First Search Output:





6. ANALYSIS AND DISCUSSION

- The BFS algorithm effectively explores the graph level by level using a queue.
- A set is used to track visited nodes, preventing infinite loops.
- The algorithm ensures that each node is processed once, making it efficient with a time complexity of O(V + E), where V is the number of vertices and E is the number of edges.
- The BFS traversal for the given graph starting from node 0 results in the sequence: `0 2 1 3 4 5`.

6. SUMMARY:

This experiment demonstrated the implementation of the Breadth-First Search (BFS) algorithm in Python. By representing a graph using an adjacency list and using a queue for traversal, we efficiently explored the nodes. This experiment helped in understanding graph traversal techniques and improving problem-solving skills in handling directed graphs in Python.