



# **Addis Ababa University**

**College of Built Environment and Engineering  
Department of Artificial Intelligence**

**Assignment Title: Assignment Two(2) Project one(1) Traveling Ethiopia**

**Course: Artificial Intelligence**

**Program: Master of Science in Artificial Intelligence**

**Topic: Assignment Two(2) Project one(1) Traveling Ethiopia**

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## Traveling Ethiopia Relaxed Search Problem

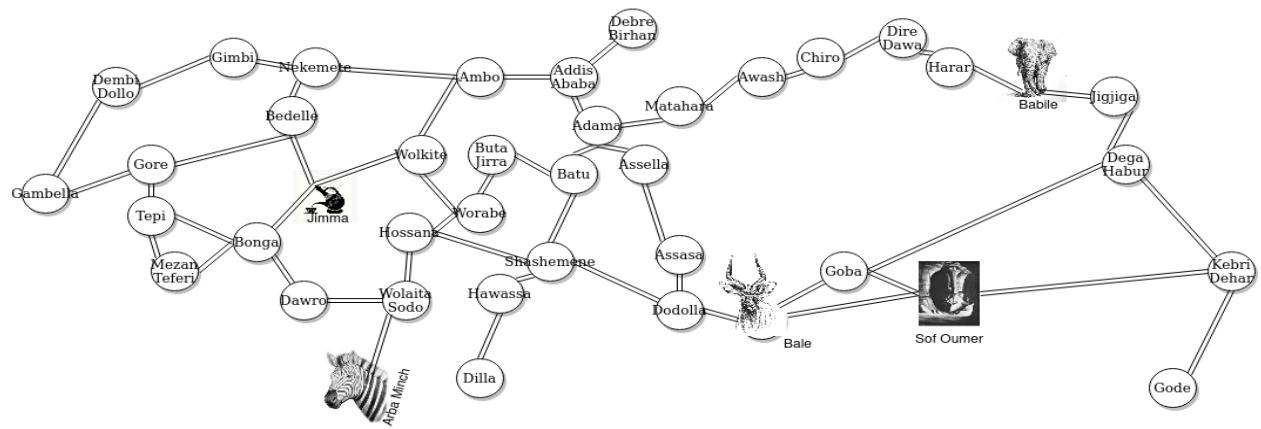


Figure 1: Traveling Ethiopia

## Questions

1. Consider Figure 1 (A generic state space graph for traveling Ethiopia search problem) to solve the following problems.

1.1 Convert Figure 1, a State space graph for traveling Ethiopia search problem, into some sort of manageable data structure such as, stack or queue.

## Converting State Space Graph → Queue (BFS)

- ❖ Go as deep as possible before backtracking
- ❖ Last discovered node is explored first

### Breadth-First Search (BFS)

- ❖ Uses a QUEUE (FIFO)
- ❖ Expands nodes level by level
- ❖ Guarantees the shortest path (fewest edges)

# BFS Search Tree

Level 0:

Addis Ababa

Level 1:

```
└── Ambo
    ├── Adama
    └── Debre Birhan
```

Level 2:

From Ambo:

```
    |   └── Nekemte
    └── Wolkite
```

From Adama:

```
    |   └── Batu
    └── Assella
        └── Metehara
```

Level 3:

From Batu:

```
    |   └── Shashemene
```

From Assella:

```
    |   └── Assasa
```

From Metehara:

```
    |   └── Awash
```

Level 4:

From Shashemene:

```
    |   └── Dodolla
```

From Awash:

```
    |   └── Chiro
```

Level 5:

From Dodolla:

```
    |   └── Bale
```

From Chiro:

```
    |   └── Dire Dawa
```

Level 6:

From Bale:

```
    |   └── Goba
```

Level 7:

From Goba:

```
    |   └── Sof Oumer  ⚪ (GOAL FOUND)
```

## BFS Solution Path

Addis Ababa → Adama → Batu → Shashemene → Dodolla → Bale → Goba → Sof Oumer

- ❖ Shortest path
- ❖ Optimal in number of steps

## Converting State Space Graph → STACK (DFS)

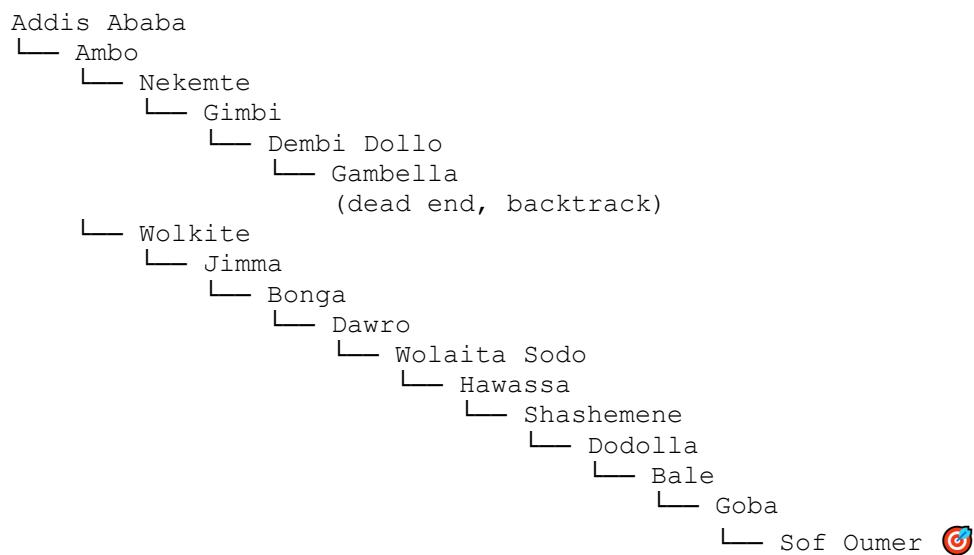
### Depth-First Search (DFS)

- ❖ Uses a STACK (LIFO)
- ❖ Goes as deep as possible first
- ❖ Does not guarantee shortest path

DFS result depends on expansion order.

Below is one valid DFS traversal following your map.

### DFS Search Tree



### DFS Solution Path

Addis Ababa → Ambo → Wolkite → Jimma → Bonga → Dawro  
→ Wolaita Sodo → Hawassa → Shashemene → Dodolla  
→ Bale → Goba → Sof Oumer

- ❖ Goal reached
- ❖ Not shortest
- ❖ Valid DFS