

## USE CASE

## PROGRAM

```
from queue import PriorityQueue
```

```
# A* Algorithm for Map Navigation
```

```
def a_star_search(graph, heuristic, start, goal):
```

```
    pq = PriorityQueue()
```

```
    pq.put((0, start))
```

```
    came_from = {start: None}
```

```
    g_cost = {start: 0}
```

```
    while not pq.empty():
```

```
        (cost, current) = pq.get()
```

```
        if current == goal:
```

```
            break
```

```
        for neighbor in graph[current]:
```

```
            new_cost = g_cost[current] + graph[current][neighbor]
```

```
            if neighbor not in g_cost or new_cost < g_cost[neighbor]:
```

```
                g_cost[neighbor] = new_cost
```

```
                f_cost = new_cost + heuristic[neighbor]
```

```
                pq.put((f_cost, neighbor))
```

```
                came_from[neighbor] = current
```

```
# Reconstruct path
```

```
path = []
```

```
node = goal
while node is not None:
    path.append(node)
    node = came_from[node]
path.reverse()
return path, g_cost[goal]
```

```
# Example Map (Graph)
```

```
graph = {
    'A': {'B': 1, 'C': 3},
    'B': {'A': 1, 'D': 3, 'E': 5},
    'C': {'A': 3, 'F': 2},
    'D': {'B': 3, 'E': 1},
    'E': {'B': 5, 'D': 1, 'F': 2},
    'F': {'C': 2, 'E': 2}
}
```

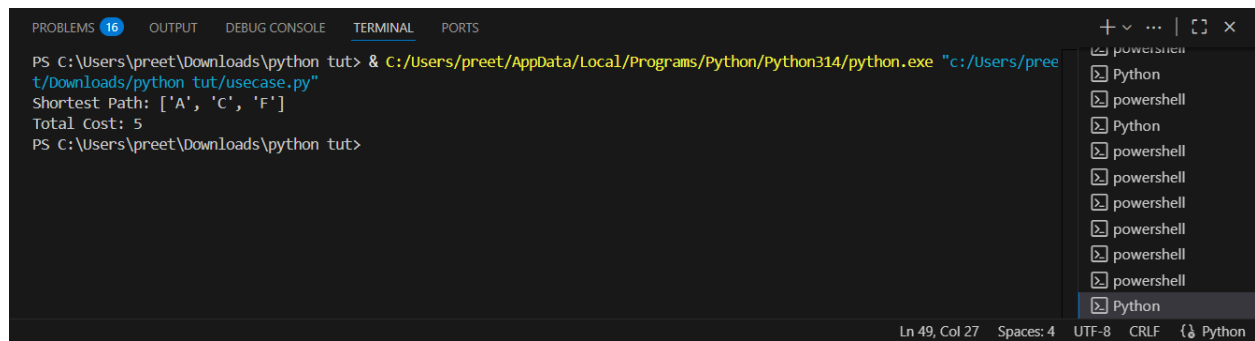
```
# Heuristic Values (estimated cost to reach goal)
```

```
heuristic = {'A': 7, 'B': 6, 'C': 4, 'D': 4, 'E': 2, 'F': 0}
```

```
# Run the A* Search
```

```
path, cost = a_star_search(graph, heuristic, 'A', 'F')
print("Shortest Path:", path)
print("Total Cost:", cost)
```

## OUTPUT



The image shows a screenshot of a Visual Studio Code terminal window. The terminal has tabs for PROBLEMS (16), OUTPUT, DEBUG CONSOLE, TERMINAL, and PORTS. The TERMINAL tab is active. The command prompt shows a PowerShell session with the following commands and output:

```
PS C:\Users\preet\Downloads\python tut> & c:/Users/preet/AppData/Local/Programs/Python/Python314/python.exe "c:/Users/preet/Downloads/python tut/usecase.py"
Shortest Path: ['A', 'C', 'F']
Total Cost: 5
PS C:\Users\preet\Downloads\python tut>
```

On the right side of the terminal, there is a dropdown menu with a search icon and a list of files. The files listed are: powershell, Python, powershell, Python, powershell, powershell, powershell, powershell, powershell, and Python. The Python file at the bottom is selected.

At the bottom of the terminal window, the status bar shows: Ln 49, Col 27, Spaces: 4, UTF-8, CRLF, and Python.