Final Task – 2

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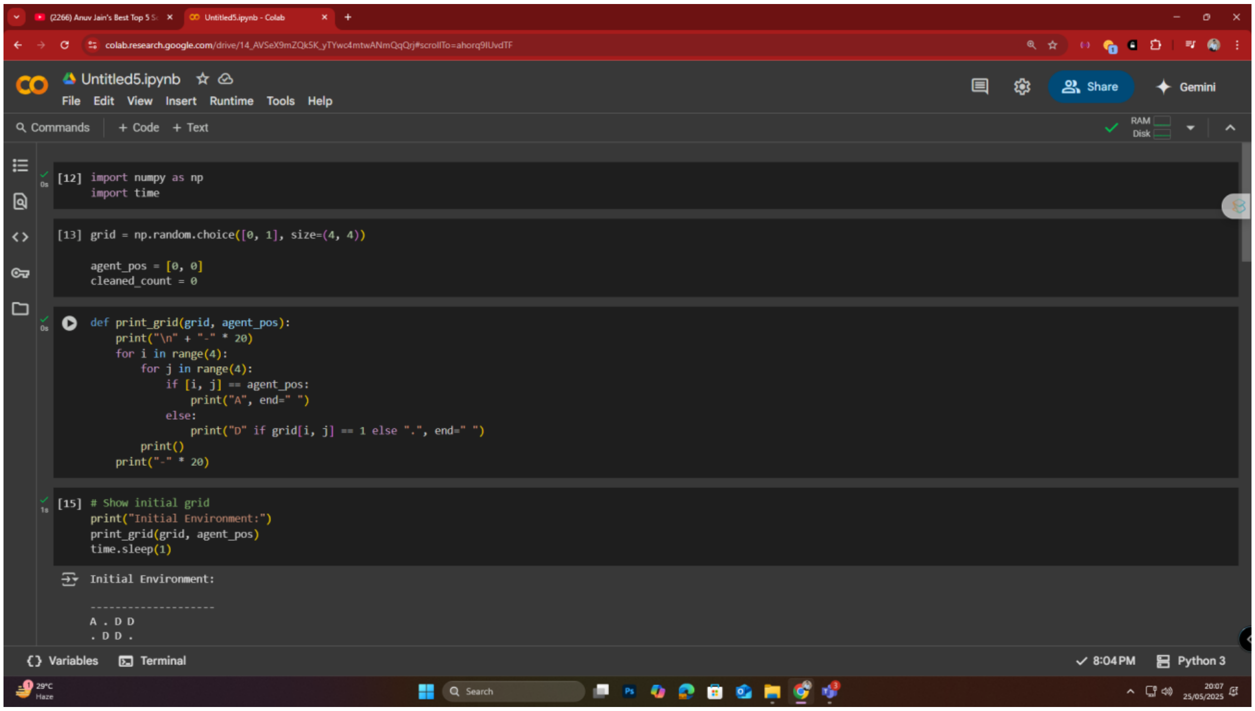
In this lab task, you have to design and implement an intelligent **Vacuum Cleaning Agent** using fundamental principles of Artificial Intelligence. The agent should operate in a simple two-dimensional environment (such as a grid-based world) where each cell can either be clean or dirty. The agent must be capable of navigating through the environment and cleaning the dirty cells efficiently. You must program the agent to perceive its current location's status (clean or dirty), decide its next action (move left, right, up, down, or clean), and execute the action accordingly. The agent should use a simple rule-based approach. Do the implementation using Python.

Code:

```
import numpy as np

import time

grid = np.random.choice([0, 1], size=(4, 4))

agent_pos = [0, 0]

cleaned_count = 0

def print_grid(grid, agent_pos):

    print("\n" + "-" * 20)

    for i in range(4):

        for j in range(4):

            if [i, j] == agent_pos:

                print("A", end=" ")

            else:

                print("D" if grid[i, j] == 1 else ".", end=" ")

        print()

    print("-" * 20)

# Show initial grid

print("Initial Environment:")
```

```
print_grid(grid, agent_pos)
time.sleep(1)
while not (agent_pos == [3, 3] and grid[3, 3] == 0):
    x, y = agent_pos
    if grid[x, y] == 1:
        grid[x, y] = 0
        cleaned_count += 1
        print(f"Cleaned cell at ({x}, {y})")
    if y < 3:
        agent_pos = [x, y + 1]
    elif x < 3:
        agent_pos = [x + 1, 0]
    else:
        agent_pos = [x, y]
    print_grid(grid, agent_pos)
    time.sleep(1)

print(f"Cleaning complete. Total cells cleaned: {cleaned_count}")
```

Code Screenshot:



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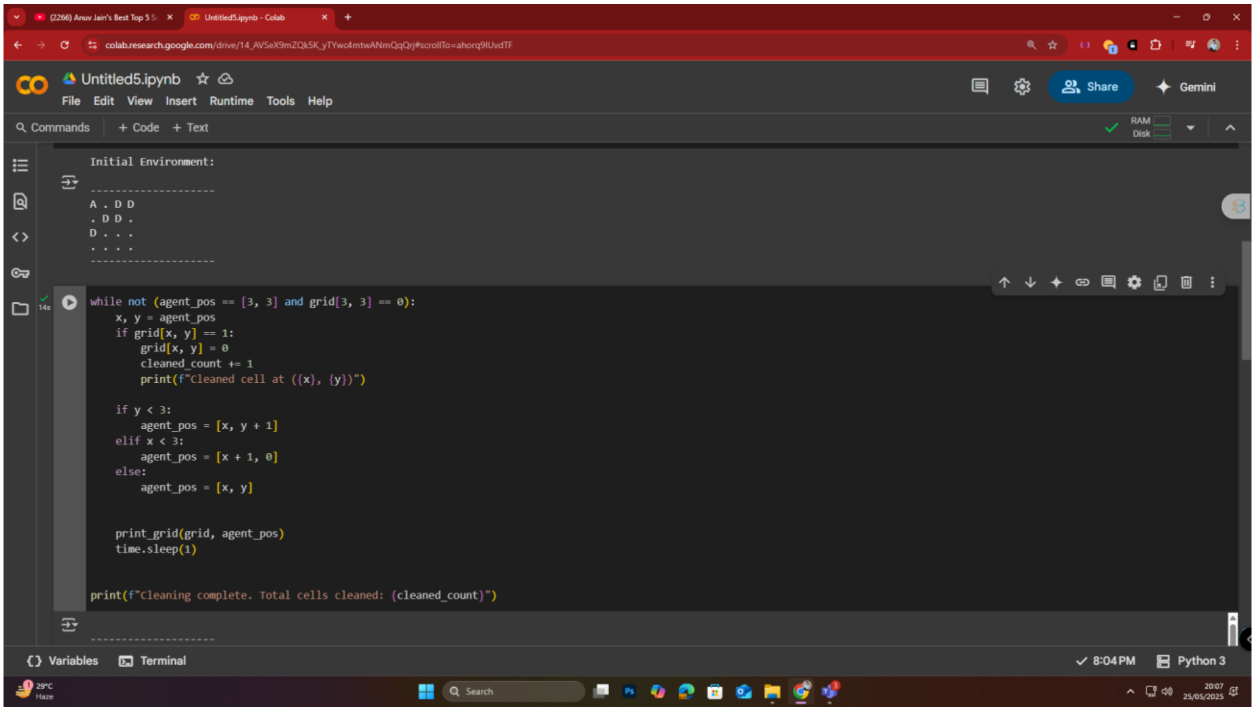
```
[12] import numpy as np
     import time
```

```
[13] grid = np.random.choice([0, 1], size=(4, 4))

     agent_pos = [0, 0]
     cleaned_count = 0
```

```
def print_grid(grid, agent_pos):
    print("\n" + "-" * 20)
    for i in range(4):
        for j in range(4):
            if [i, j] == agent_pos:
                print("A", end=" ")
            else:
                print("D" if grid[i, j] == 1 else ".", end=" ")
        print()
    print("-" * 20)
```

```
[15] # Show initial grid
     print("Initial Environment:")
     print_grid(grid, agent_pos)
     time.sleep(1)
```

```
Initial Environment:

--------------------
A . D D
. D D .
```



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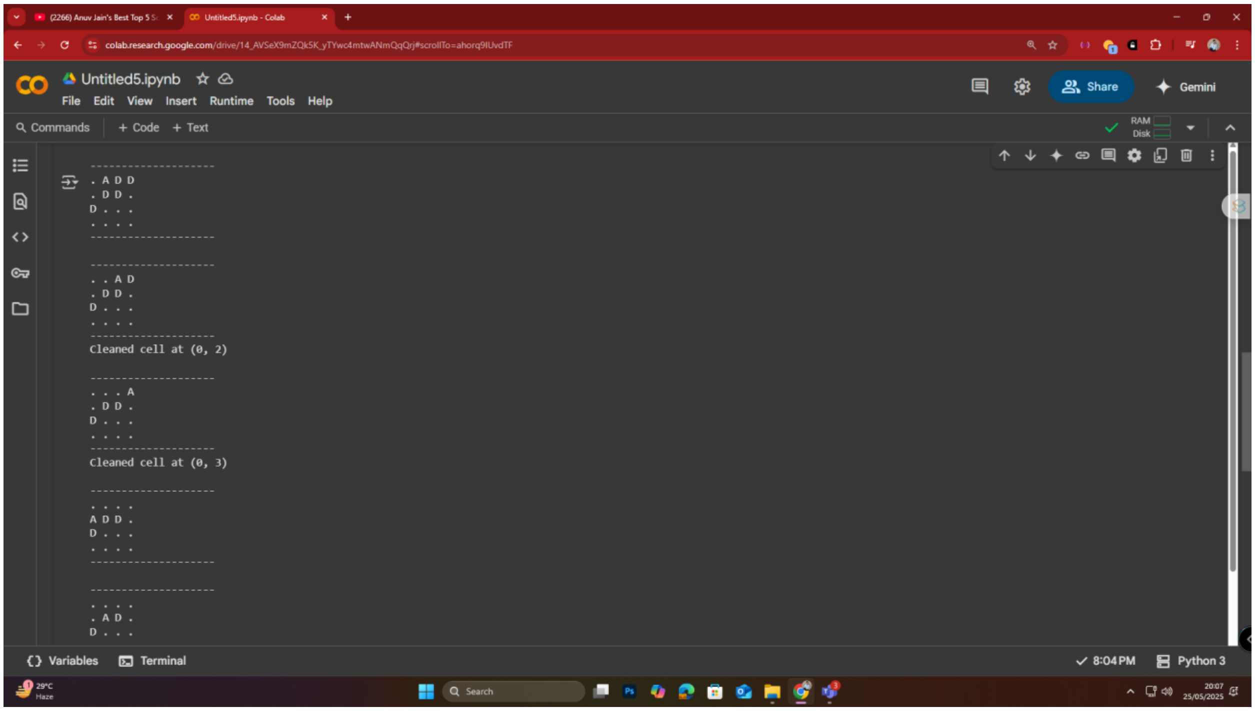
```
Initial Environment:

--------------------
A . D D
. D D .
D . . .
. . . .
--------------------
```

```
while not (agent_pos == [3, 3] and grid[3, 3] == 0):
    x, y = agent_pos
    if grid[x, y] == 1:
        grid[x, y] = 0
        cleaned_count += 1
        print(f"Cleaned cell at ({x}, {y})")

    if y < 3:
        agent_pos = [x, y + 1]
    elif x < 3:
        agent_pos = [x + 1, 0]
    else:
        agent_pos = [x, y]


    print_grid(grid, agent_pos)
    time.sleep(1)


print(f"Cleaning complete. Total cells cleaned: {cleaned_count}")
```

```
--------------------
```

Output Screenshot:



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```
--------------------
. A D D
. D D .
D . . .
. . . .
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--------------------
. . A D
. D D .
D . . .
. . . .
--------------------
Cleaned cell at (0, 2)

--------------------
. . . A
. D D .
D . . .
. . . .
--------------------
Cleaned cell at (0, 3)

--------------------
. . . .
A D D .
D . . .
. . . .
--------------------

--------------------
. . . .
. A D .
D . . .
```

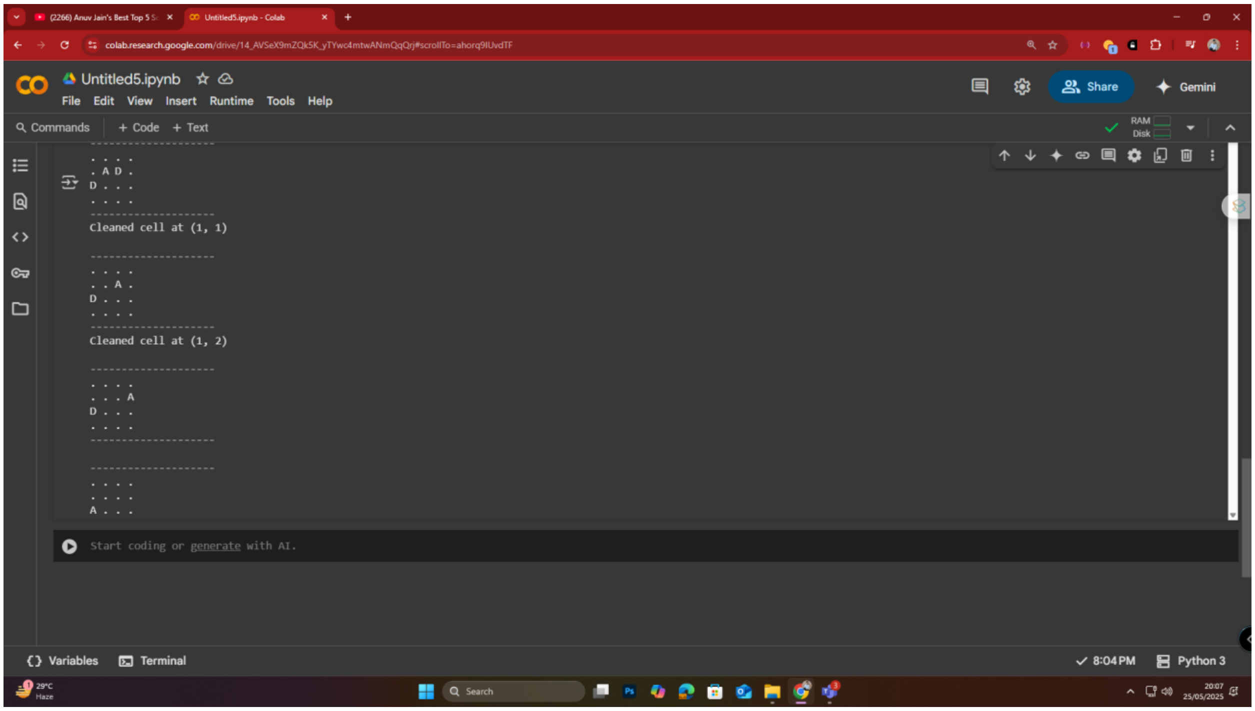

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```
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. . . .
. A D .
D . . .
. . . .
--------------------
Cleaned cell at (1, 1)

--------------------
. . . .
. . A .
D . . .
. . . .
--------------------
Cleaned cell at (1, 2)

--------------------
. . . .
. . . A
D . . .
. . . .
--------------------

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. . . .
. . . .
A . . .
```

```
Start coding or generate with AI.
```