

Quiz 3 (in-class)

- Due Nov 10 at 12:20pm
- Points 10
- Questions 1
- Available Nov 10 at 11:45am - Nov 10 at 12:28pm 43 minutes
- Time Limit 25 Minutes

Instructions

Due on Nov. 10 (Monday).

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	11 minutes	0 out of 10 *

* Some questions not yet graded

 **Correct answers are hidden.**

Score for this quiz: 0 out of 10 *

* Some questions not yet graded

Submitted Nov 10 at 11:56am

This attempt took 11 minutes.



Question 1

Not yet graded / 10 pts

Learning Objective

- Implement in-place matrix transformations using logical operations on array indices.
- Understand and apply 2D matrix manipulations, specifically 90-degree rotations.
- Gain familiarity with matrix operations using `numpy`.

Problem Description

You are given an $n \times n$ 2D matrix representing an image. Rotate the image by 90 degrees clockwise.

The rotation must be done **in-place**, meaning you are required to modify the input 2D matrix directly without using additional memory for another 2D matrix.

Input

The input is a 2D integer matrix `matrix` of size $n \times n$ as a NumPy array, where each element `matrix[i, j]` represents the pixel value at row i and column j of the image.

Output

Return the modified 2D matrix after rotating it 90 degrees clockwise.

Examples

Example 1

Input:

$$\text{matrix} = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

Output:

$$\begin{bmatrix} 7 & 4 & 1 \\ 8 & 5 & 2 \\ 9 & 6 & 3 \end{bmatrix}$$

Example 2

Input:

$$\text{matrix} = \begin{bmatrix} 5 & 1 & 9 & 11 \\ 2 & 4 & 8 & 10 \\ 13 & 3 & 6 & 7 \\ 15 & 14 & 12 & 16 \end{bmatrix}$$

Output:

$$\begin{bmatrix} 15 & 13 & 2 & 5 \\ 14 & 3 & 4 & 1 \\ 12 & 6 & 8 & 9 \\ 16 & 7 & 10 & 11 \end{bmatrix}$$

Requirements

1. The solution to this problem must be implemented using [Python and the NumPy library only](#). No other programming languages (such as C++, Java, Matlab, R, etc.) are allowed.
2. You must rotate the matrix **in-place** without allocating additional 2D arrays.
3. Import NumPy as `np` and work with `np.arrays`.
4. Please respect the honor code: [you are not allowed to use the internet, including ChatGPT or any other AI tools, to assist in the implementation of this problem](#). Otherwise, points will be deducted.
5. Do not change the framework provided to you. You may only write your solution within the comments between `# Your code for the rotate function starts here` and `# Your code for the rotate function ends here`.

Sample codes:

```
import numpy as np
```

```
class Matrix:  
    # Rotates the matrix by 90 degrees clockwise in-place  
    def rotate(self, matrix):  
        # Your code for the rotate function starts here  
        # Your code for the rotate function ends here  
        if __name__ == "__main__":  
            matrix = np.array([  
                [1, 2, 3],  
                [4, 5, 6],  
                [7, 8, 9]  
            ])  
            m = Matrix()  
            m.rotate(matrix)  
            # Output the rotated matrix  
            print(matrix)
```

Your Answer:

```
import numpy as np  
  
class Matrix:  
    # Rotates the matrix by 90 degrees clockwise in-place  
    def rotate(self, matrix):  
        n = matrix.shape[0]  
  
        for i in range(n):  
            for j in range(i + 1, n):  
                matrix[i, j], matrix[j, i] = matrix[j, i], matrix[i, j]  
  
        matrix[:, :] = matrix[:, ::-1]  
  
        return matrix  
  
    if __name__ == "__main__":  
        matrix = np.array([  
            [1, 2, 3],  
            [4, 5, 6],  
            [7, 8, 9]  
        ])  
        m = Matrix()  
        m.rotate(matrix)
```

```
# Output the rotated matrix  
print(matrix)
```

Quiz Score: 0 out of 10

* Some questions not yet graded