Largest Rectangular Area in Matrix GFG

Given a binary matrix representing a histogram-like structure, where each cell contains either a '1' or a '0', you need to find the maximum area of a rectangle that can be formed by considering '1's in the matrix.

Example: Consider the following binary matrix:

1 0 1 0 0

1 0 1 1 1

1 1 1 1 1

1 0 0 1 0

Output: The maximum rectangle area that can be formed using the '1's in the given matrix is 6.

1. The problem can be solved using the concept of the "Largest Rectangle in Histogram" problem.
2. For each row in the binary matrix, treat it as a histogram.
3. Calculate the maximum rectangle area for each histogram using the "Largest Rectangle in Histogram" algorithm.
4. Iterate through each row, and for each cell (i, j) with value '1', update the height of that cell by adding the value of the cell above it. If the cell has a value '0', reset the height to '0'.
5. Compute the maximum rectangle area for each histogram and update the global maximum area if a larger area is found.
6. Return the maximum area as the final answer.

Approach 1: Function to calculate the maximum rectangle area in a binary matrix

- For each row in the binary matrix:
    - Update the histogram heights for each column.
    - Compute the largest rectangle area for the histogram using the "Largest Rectangle in Histogram" algorithm.
    - Update the maximum area if a larger area is found.

Time Complexity:

- Let N be the number of rows and M be the number of columns in the matrix.

- The time complexity of the "Largest Rectangle in Histogram" algorithm is O(M), and we use it N times for each row.
- **Overall time complexity: O(N * M).**

Space Complexity:

- We use extra space to store the heights array for each row.
- **Space complexity: O(M) (for storing histogram heights).**