

Objective: Implementation and analysis of Matrix multiplication

Matrix Multiplication

The matrix multiplication can only be performed, if it satisfies this condition. Suppose two matrices are A and B, and their dimensions are A ($m \times n$) and B ($p \times q$) the resultant matrix can be found if and only if $n = p$. Then the order of the resultant matrix C will be ($m \times q$).

Algorithm:

matrixMultiply(A, B):

Assume dimension of A is ($m \times n$), dimension of B is ($p \times q$)

Begin

if n is not same as p , then exit

otherwise define C matrix as ($m \times q$)

for i in range 0 to $m - 1$, do

for j in range 0 to $q - 1$, do

for k in range 0 to p , do

$C[i, j] = C[i, j] + (A[i, k] * A[k, j])$

done

done

done

End

Code:

```
# 3x3 matrix
X = [[12, 7, 3],
      [4, 5, 6],
      [7, 8, 9]]
```

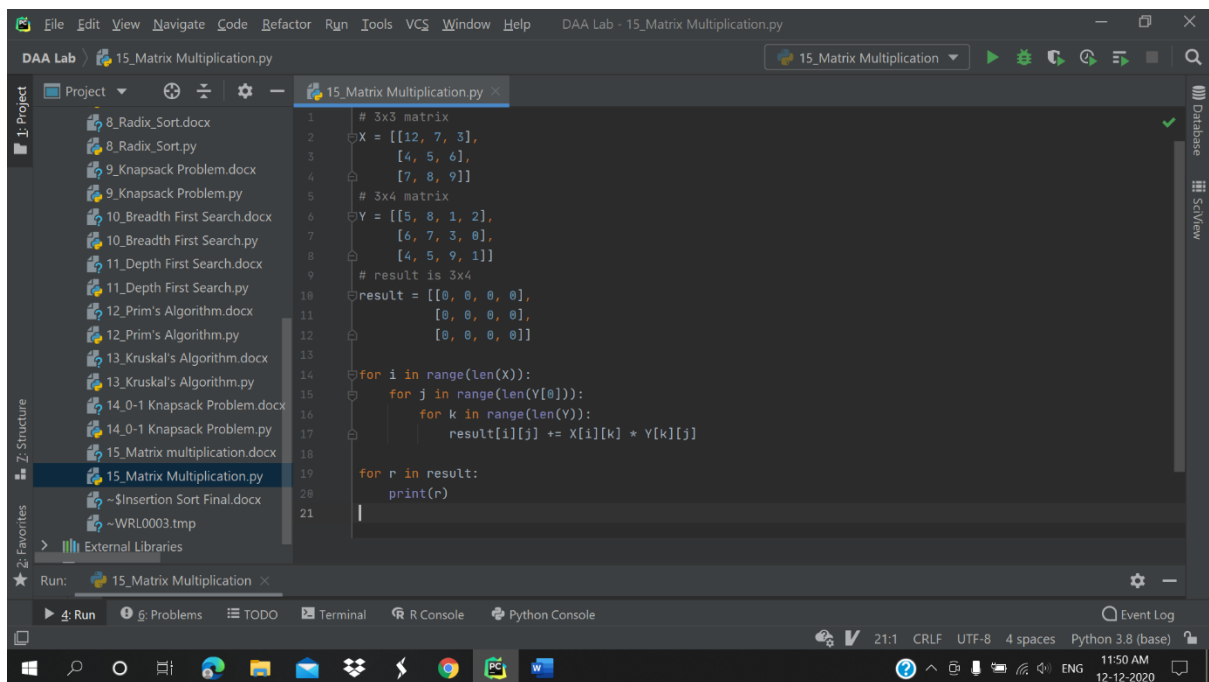
```

# 3x4 matrix
Y = [[5, 8, 1, 2],
      [6, 7, 3, 0],
      [4, 5, 9, 1]]
# result is 3x4
result = [[0, 0, 0, 0],
          [0, 0, 0, 0],
          [0, 0, 0, 0]]

for i in range(len(X)):
    for j in range(len(Y[0])):
        for k in range(len(Y)):
            result[i][j] += X[i][k] * Y[k][j]

for r in result:
    print(r)

```

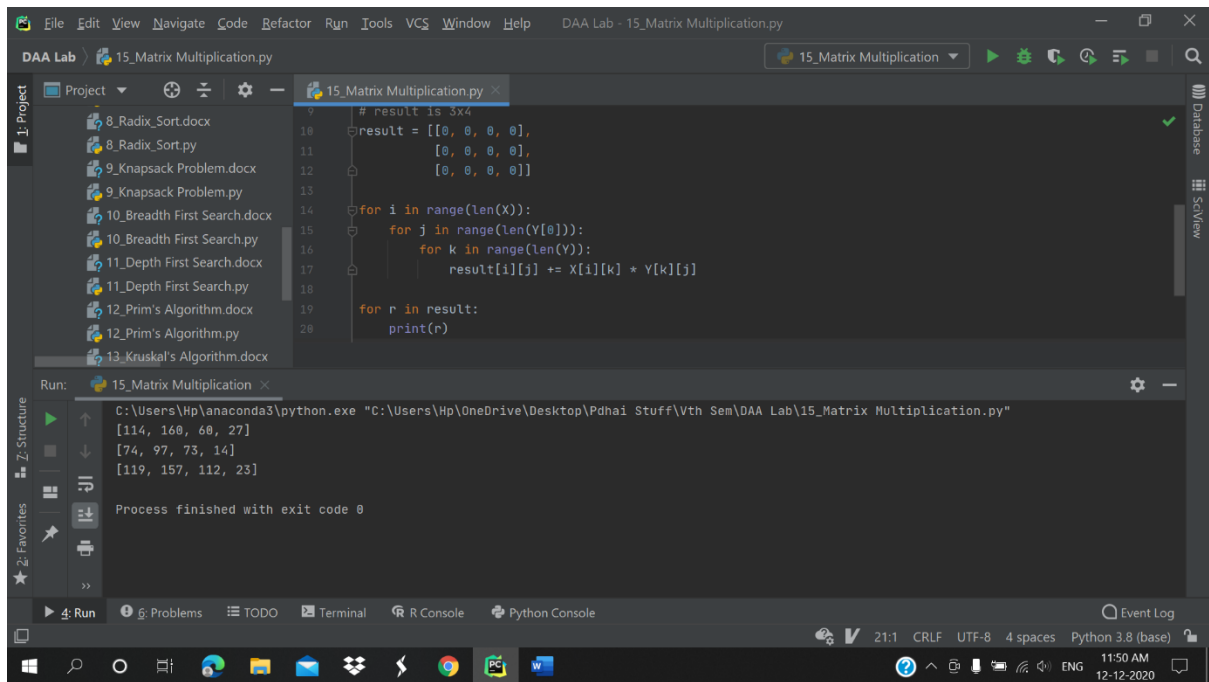


Output:

[114, 160, 60, 27]

[74, 97, 73, 14]

[119, 157, 112, 23]



The screenshot shows an IDE window titled "DAA Lab - 15_Matrix Multiplication.py". The editor displays a Python script for matrix multiplication. The script initializes a 3x4 result matrix and iterates through the rows of matrix X and columns of matrix Y to calculate the product. The output of the script is shown in the Run console.

```
# result is 3x4
result = [[0, 0, 0, 0],
          [0, 0, 0, 0],
          [0, 0, 0, 0]]

for i in range(len(X)):
    for j in range(len(Y[0])):
        for k in range(len(Y)):
            result[i][j] += X[i][k] * Y[k][j]

for r in result:
    print(r)
```

Run: 15_Matrix Multiplication

```
C:\Users\Hp\anaconda3\python.exe "C:\Users\Hp\OneDrive\Desktop\Pdhai Stuff\Vth Sem\DAA Lab\15_Matrix Multiplication.py"
[114, 160, 60, 27]
[74, 97, 73, 14]
[119, 157, 112, 23]

Process finished with exit code 0
```

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Time Complexity: The standard way of multiplying an m-by-n matrix by an n-by-p matrix has complexity $O(mnp)$.