The University of Texas at Arlington

DESIGN & ANALYSIS OF ALGORITHMS – CSE 5311

Project Report -2

Created By:

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DAA – Project 2

Introduction:

This report contains the output and analysis based on our implementation of LCS algorithm which compares two strings and finds the longest common substring in them.

Sites Referred:

- Lectures Slides
- https://www.geeksforgeeks.org/longest-common-subsequence-dp-4/?ref=lbp
- https://www.geeksforgeeks.org/printing-longest-common-subsequence/
- https://www.programiz.com/dsa/longest-common-subsequence
- Introduction to Algorithms (Third Edition) – Page 394

Time Complexity of the Algorithm:

Algorithm	Best	Average	Worst
LCS_DP_CB	Ω(n*m)	θ(n*m)	O(n*m)

Results of LCS_DP_CB.py:

X = "Diagonal" Y = "Dragon"

```
-----------------------------------
  |     1  2  3  4  5  6
  |  Y  D  r  a  g  o  n
-----------------------------------
 X |  0  0  0  0  0  0  0
1 D |  0 \1 <1 <1 <1 <1 <1
2 i |  0 ^1 ^1 ^1 ^1 ^1 ^1
3 a |  0 ^1 ^1 \2 <2 <2 <2
4 g |  0 ^1 ^1 ^2 \3 <3 <3
5 o |  0 ^1 ^1 ^2 ^3 \4 <4
6 n |  0 ^1 ^1 ^2 ^3 ^4 \5
7 a |  0 ^1 ^1 \2 ^3 ^4 ^5
8 l |  0 ^1 ^1 ^2 ^3 ^4 ^5
-----------------------------------
```

Length of the Longest Common Subsequence is: 5

The Longest Common Subsequence of "Diagonal" and "Dragon" is "Dagon"

X = "NOAH" Y = "BOAT"

```
   |     1  2  3  4
   |  Y  B  O  A  T
---------------------------
 X |  0  0  0  0  0
1 N |  0 ^0 ^0 ^0 ^0
2 O |  0 ^0 \1 <1 <1
3 A |  0 ^0 ^1 \2 <2
4 H |  0 ^0 ^1 ^2 ^2
---------------------------
```

Length of the Longest Common Subsequence is: 2

The Longest Common Subsequence of "NOAH" and "BOAT" is "OA"

X = "FARAH" Y = "FaaaRAh"

```
---------------------------------------
   |     1  2  3  4  5  6  7
   |  Y  F  a  a  a  R  A  h
---------------------------------------
 X |  0  0  0  0  0  0  0  0
1 F |  0 \1 <1 <1 <1 <1 <1 <1
2 A |  0 ^1 ^1 ^1 ^1 ^1 \2 <2
3 R |  0 ^1 ^1 ^1 ^1 \2 ^2 ^2
4 A |  0 ^1 ^1 ^1 ^1 ^2 \3 <3
5 H |  0 ^1 ^1 ^1 ^1 ^2 ^3 ^3
```

Length of the Longest Common Subsequence is: 3

The Longest Common Subsequence of "FARAH" and "FaaaRAh" is "FRA"

X = "PARAMETER" Y = "MeTeR"

| 1 2 3 4 5

| Y M e T e R

X | 0 0 0 0 0 0

1 P | 0 ^0 ^0 ^0 ^0 ^0

2 A | 0 ^0 ^0 ^0 ^0 ^0

3 R | 0 ^0 ^0 ^0 ^0 \1

4 A | 0 ^0 ^0 ^0 ^0 ^1

5 M | 0 \1 <1 <1 <1 ^1

6 E | 0 ^1 ^1 ^1 ^1 ^1

7 T | 0 ^1 ^1 \2 <2 <2

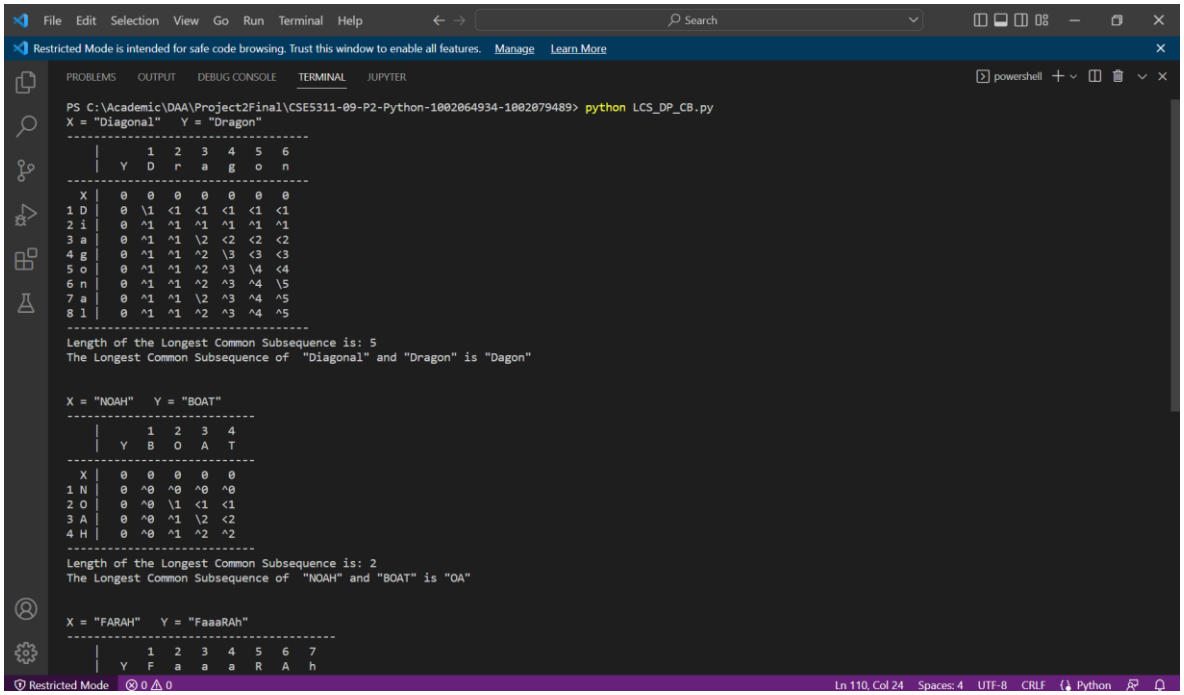
8 E | 0 ^1 ^1 ^2 ^2 ^2

9 R | 0 ^1 ^1 ^2 ^2 \3

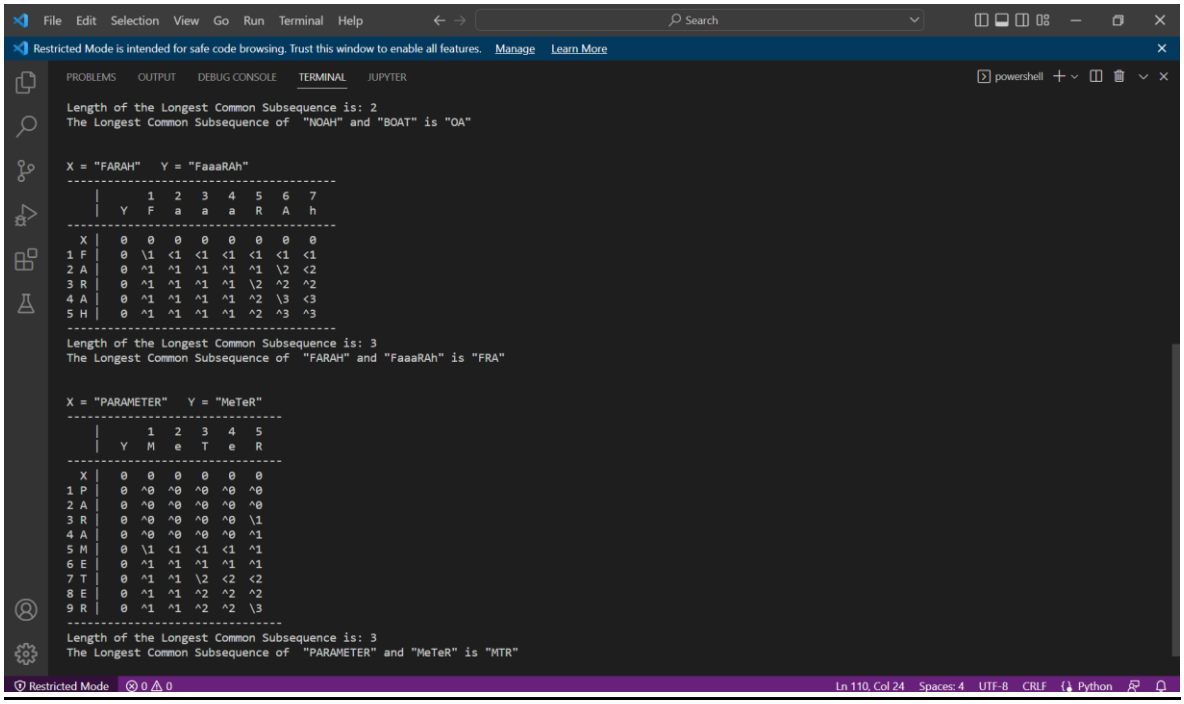
Length of the Longest Common Subsequence is: 3

The Longest Common Subsequence of "PARAMETER" and "MeTeR" is "MTR"

Output:



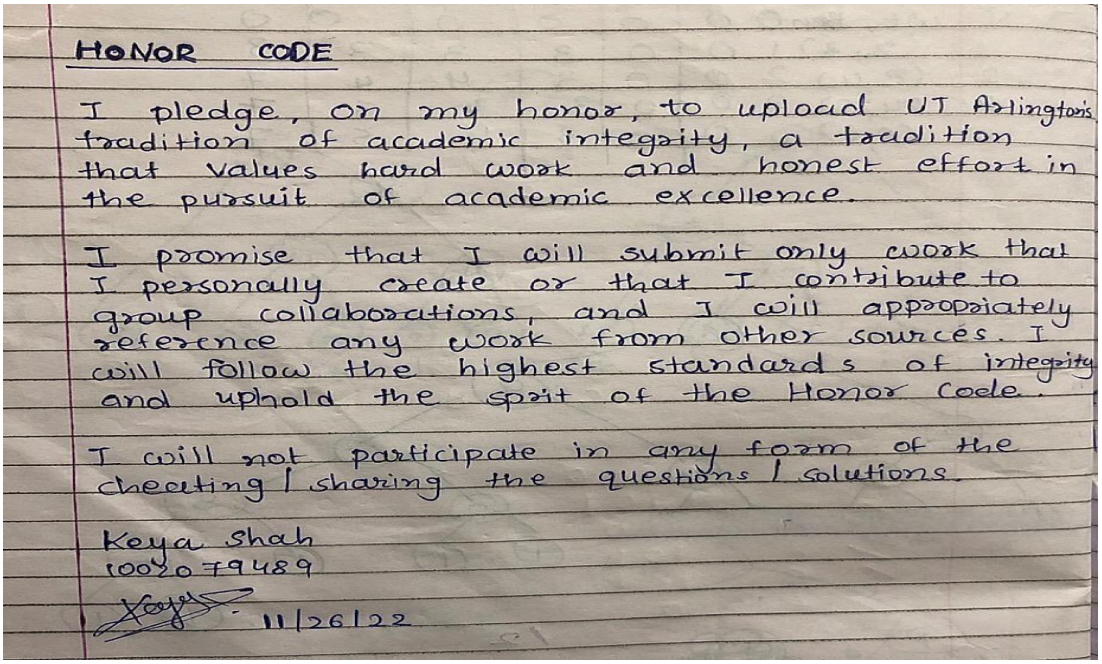
```
File  Edit  Selection  View  Go  Run  Terminal  Help                                  Search
Restricted Mode is intended for safe code browsing. Trust this window to enable all features.  Manage  Learn More
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  JUPYTER                                   powershell

PS C:\Academic\DAA\Project2Final\CSE5311-09-P2-Python-1002064934-1002079489> python LCS_DP_CB.py
X = "Diagonal"   Y = "Dragon"
-----------------------------------
    |     1   2   3   4   5   6
    |   Y   D   r   a   g   o   n
-----------------------------------
  X |   0   0   0   0   0   0   0
1 D |   0  \1  <1  <1  <1  <1  <1
2 i |   0  ^1  ^1  ^1  ^1  ^1  ^1
3 a |   0  ^1  ^1  \2  <2  <2  <2
4 g |   0  ^1  ^1  ^2  \3  <3  <3
5 o |   0  ^1  ^1  ^2  ^3  \4  <4
6 n |   0  ^1  ^1  ^2  ^3  ^4  \5
7 a |   0  ^1  ^1  \2  ^3  ^4  ^5
8 l |   0  ^1  ^1  ^2  ^3  ^4  ^5
-----------------------------------
Length of the Longest Common Subsequence is: 5
The Longest Common Subsequence of  "Diagonal" and "Dragon" is "Dagon"


X = "NOAH"   Y = "BOAT"
---------------------------
    |     1   2   3   4
    |   Y   B   O   A   T
---------------------------
  X |   0   0   0   0   0
1 N |   0  ^0  ^0  ^0  ^0
2 O |   0  ^0  \1  <1  <1
3 A |   0  ^0  ^1  \2  <2
4 H |   0  ^0  ^1  ^2  ^2
---------------------------
Length of the Longest Common Subsequence is: 2
The Longest Common Subsequence of  "NOAH" and "BOAT" is "OA"


X = "FARAH"   Y = "FaaaRAh"
-----------------------------------------
    |     1   2   3   4   5   6   7
    |   Y   F   a   a   a   R   A   h
Restricted Mode  0 0  Ln 110, Col 24  Spaces: 4  UTF-8  CRLF  Python
```



```
File  Edit  Selection  View  Go  Run  Terminal  Help                                  Search
Restricted Mode is intended for safe code browsing. Trust this window to enable all features.  Manage  Learn More
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  JUPYTER                                   powershell

Length of the Longest Common Subsequence is: 2
The Longest Common Subsequence of  "NOAH" and "BOAT" is "OA"


X = "FARAH"   Y = "FaaaRAh"
-----------------------------------------
    |     1   2   3   4   5   6   7
    |   Y   F   a   a   a   R   A   h
-----------------------------------------
  X |   0   0   0   0   0   0   0   0
1 F |   0  \1  <1  <1  <1  <1  <1  <1
2 A |   0  ^1  ^1  ^1  ^1  ^1  \2  <2
3 R |   0  ^1  ^1  ^1  ^1  \2  ^2  ^2
4 A |   0  ^1  ^1  ^1  ^1  ^2  \3  <3
5 H |   0  ^1  ^1  ^1  ^1  ^2  ^3  ^3
-----------------------------------------
Length of the Longest Common Subsequence is: 3
The Longest Common Subsequence of  "FARAH" and "FaaaRAh" is "FRA"


X = "PARAMETER"   Y = "MeTeR"
--------------------------------
    |     1   2   3   4   5
    |   Y   M   e   T   e   R
--------------------------------
  X |   0   0   0   0   0   0
1 P |   0  ^0  ^0  ^0  ^0  ^0
2 A |   0  ^0  ^0  ^0  ^0  ^0
3 R |   0  ^0  ^0  ^0  ^0  \1
4 A |   0  ^0  ^0  ^0  ^0  ^1
5 M |   0  \1  <1  <1  <1  ^1
6 E |   0  ^1  ^1  ^1  ^1  ^1
7 T |   0  ^1  ^1  \2  <2  <2
8 E |   0  ^1  ^1  ^2  ^2  ^2
9 R |   0  ^1  ^1  ^2  ^2  \3
--------------------------------
Length of the Longest Common Subsequence is: 3
The Longest Common Subsequence of  "PARAMETER" and "MeTeR" is "MTR"
Restricted Mode  0 0  Ln 110, Col 24  Spaces: 4  UTF-8  CRLF  Python
```

Honor Code:

(a) Keya Kalpeshbhai Shah



HONOR CODE

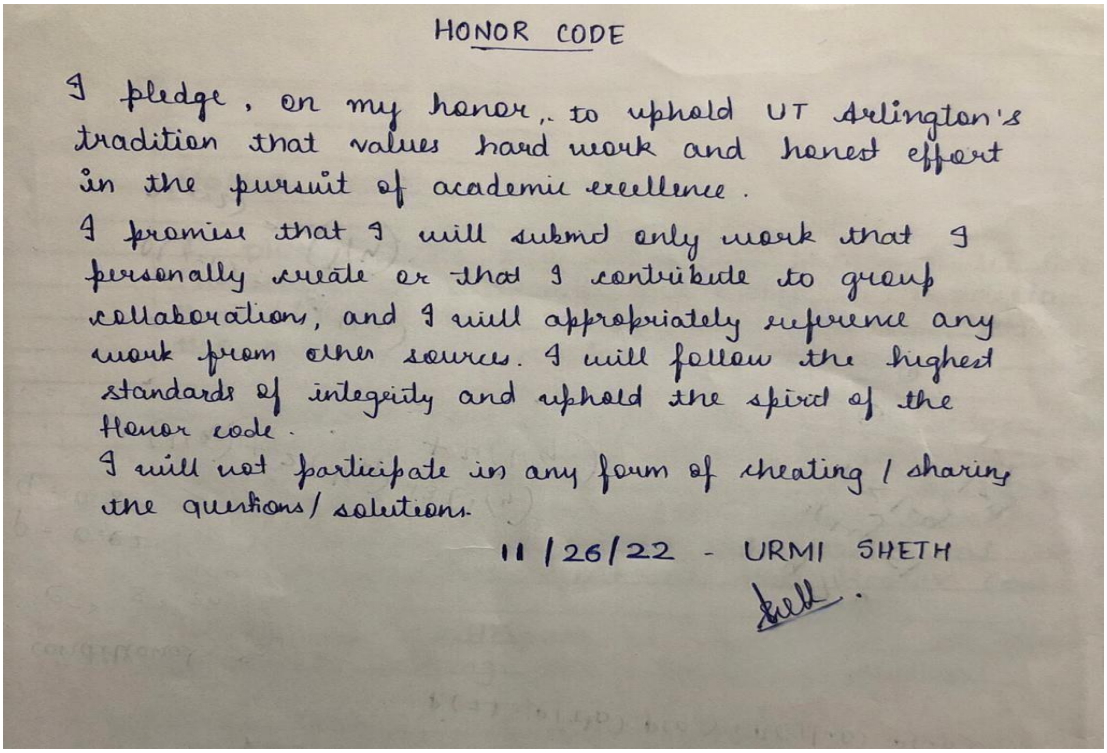
I pledge, on my honor, to uplaod UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.

I promise that I will submit only work that I personally create or that I contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spit of the Honor Code.

I will not participate in any form of the cheating / sharing the questions / solutions.

Keya Shah
1002079489
11/26/22

(b) Urmi Manish Sheth



HONOR CODE

I pledge, on my honor, to uphold UT Arlington's tradition that values hard work and honest effort in the pursuit of academic excellence.

I promise that I will submit only work that I personally create or that I contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor code.

I will not participate in any form of cheating / sharing the questions / solutions.

11/26/22 - URMI SHETH