Institute of Computer Technology

B. Tech Computer Science and Engineering

Sub: Algorithm Analysis and Design

Practical 8

A subsequence is a sequence that can be derived from another sequence by deleting some elements without changing the order of the remaining elements. Longest common subsequence (LCS) of 2 sequences is a subsequence, with maximal length, which is common to both the sequences.

Given two sequences of integers, P = <M, N, O, M> and Q = <M, L, N, O, M>, find any one longest common subsequence.

In case multiple solutions exist, print any of them. It is guaranteed that at least one non-empty common subsequence will exist.

App.py

```
from flask import Flask, render_template, request


app = Flask(__name__)


def lcs(X, Y):
    m = len(X)
    n = len(Y)


    L = [[0] * (n+1) for i in range(m+1)]
```

```
    for i in range(m+1):
        for j in range(n+1):
            if i == 0 or j == 0:
                L[i][j] = 0
            elif X[i-1] == Y[j-1]:
                L[i][j] = L[i-1][j-1] + 1
            else:
                L[i][j] = max(L[i-1][j], L[i][j-1])

    index = L[m][n]
    lcs_seq = [''] * (index+1)
    lcs_seq[index] = ''

    i = m
    j = n
    while i > 0 and j > 0:
        if X[i-1] == Y[j-1]:
            lcs_seq[index-1] = X[i-1]
            i -= 1
            j -= 1
            index -= 1
        elif L[i-1][j] > L[i][j-1]:
            i -= 1
        else:
            j -= 1

    return lcs_seq, L
@app.route('/', methods=['GET', 'POST'])
def index():
```

```
    if request.method == 'POST':
        seq1 = request.form['seq1']
        seq2 = request.form['seq2']

        seq1 = [x.strip() for x in seq1.split(',')]
        seq2 = [x.strip() for x in seq2.split(',')]

        result, matrix = lcs(seq1, seq2)

        return render_template('index.html', result=result, seq1=seq1, seq2=seq2,
matrix=matrix)

    return render_template('index.html', result=None)

if __name__ == '__main__':
    app.run(debug=True)
```

Index.html

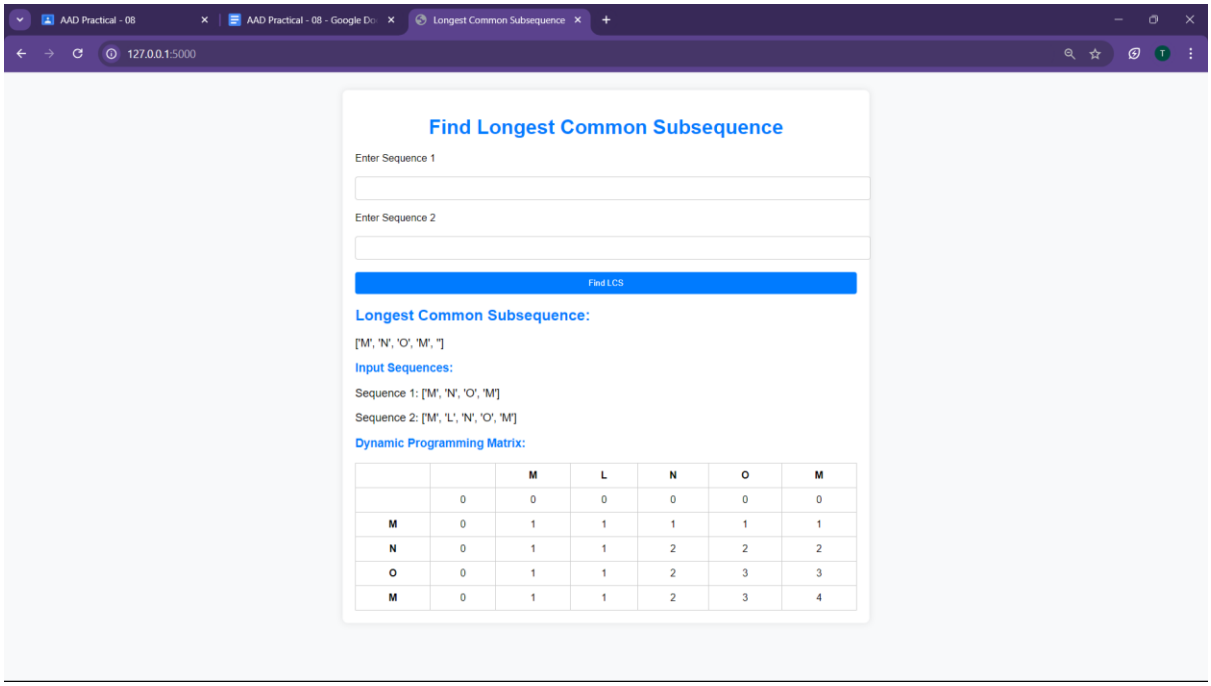
```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Longest Common Subsequence</title>
    <style>
        body {
            font-family: Arial, sans-serif;
            background-color: #f8f9fa;
            padding: 20px;
```

```
}
.container {
    max-width: 800px;
    margin: 0 auto;
    background: white;
    padding: 20px;
    border-radius: 8px;
    box-shadow: 0 0 10px rgba(0, 0, 0, 0.1);
}
h1 {
    text-align: center;
    color: #007bff;
}
label, button {
    display: block;
    width: 100%;
    margin: 10px 0;
}
input[type="text"] {
    width: 100%;
    padding: 10px;
    margin: 10px 0;
    border: 1px solid #ccc;
    border-radius: 4px;
}
button {
    padding: 10px;
    background-color: #007bff;
    color: white;
```

```
            border: none;
            border-radius: 4px;
            cursor: pointer;
        }
        button:hover {
            background-color: #0056b3;
        }
        p {
            font-size: 18px;
        }
        h2, h3 {
            color: #007bff;
        }
        table {
            width: 100%;
            border-collapse: collapse;
            margin-top: 20px;
        }
        table, th, td {
            border: 1px solid #ccc;
        }
        th, td {
            padding: 10px;
            text-align: center;
        }
    </style>
</head>
<body>
    <div class="container">
```

```
<h1>Find Longest Common Subsequence</h1>
<form method="POST">
  <label for="seq1">Enter Sequence 1 </label>
  <input type="text" id="seq1" name="seq1" required>

  <label for="seq2">Enter Sequence 2 </label>
  <input type="text" id="seq2" name="seq2" required>

  <button type="submit">Find LCS</button>
</form>

{% if result %}
<h2>Longest Common Subsequence:</h2>
<p>{{ result }}</p>

<h3>Input Sequences:</h3>
<p>Sequence 1: {{ seq1 }}</p>
<p>Sequence 2: {{ seq2 }}</p>

<h3>Dynamic Programming Matrix:</h3>
<table>
  <thead>
    <tr>
      <th></th>
      <th></th>
      {% for el in seq2 %}
      <th>{{ el }}</th>
      {% endfor %}
    </tr>
```

```
        </thead>
        <tbody>
          <tr>
            <th></th>
            <td>0</td>
            {% for _ in seq2 %}
            <td>0</td>
            {% endfor %}
          </tr>
          {% for i in range(seq1|length) %}
          <tr>
            <th>{{ seq1[i] }}</th>
            <td>0</td>
            {% for j in range(seq2|length) %}
            <td>{{ matrix[i+1][j+1] }}</td>
            {% endfor %}
          </tr>
          {% endfor %}
        </tbody>
      </table>
      {% endif %}
    </div>
</body>
</html>
```



		M	L	N	O	M
	0	0	0	0	0	0
M	0	1	1	1	1	1
N	0	1	1	2	2	2
O	0	1	1	2	3	3
M	0	1	1	2	3	4