Institute of Computer Technology

B. Tech Computer Science and Engineering

Algorithm Analysis and Design

Practical 7

A thief carrying a single knapsack with limited (W = 5) capacity. The museum you stole had (n=4) artefacts that you could steal. Unfortunately, you might not be able to steal the entire artefact because of your limited knapsack capacity. Help the thief to cherry pick the artefact in order to maximise the total value (<=W) of the artefacts you stole.

First solve the given below example:

Let n = 4, W=5

(P1, P2, P3, P4) = (3,4,5,6)

(w1, w2, w3, w4) = (2,3,4,5)

App.py

```
from flask import Flask, render_template, request


app = Flask(__name__)


def dynamic_knapsack(n, W, weights, profits):
    table = [[0 for x in range(W + 1)] for x in range(n + 1)]


    for i in range(1, n + 1):
        for j in range(W + 1):
            if weights[i-1] <= j:
                table[i][j] = max(table[i-1][j], profits[i-1] + table[i-1][j - weights[i-1]])
            else:
```

```
            table[i][j] = table[i-1][j]

    max_profit = table[n][W]

    return table, max_profit

@app.route('/', methods=['GET', 'POST'])
def index():
    if request.method == 'POST':
        W = int(request.form['capacity'])
        n = int(request.form['num_items'])

        profits = list(map(int, request.form['profits'].split(',')))
        weights = list(map(int, request.form['weights'].split(',')))

        table, max_profit = dynamic_knapsack(n, W, weights, profits)

        return render_template('index.html', table=table, max_profit=max_profit,
profits=profits, weights=weights, W=W, n=n)

    return render_template('index.html')

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

index.html

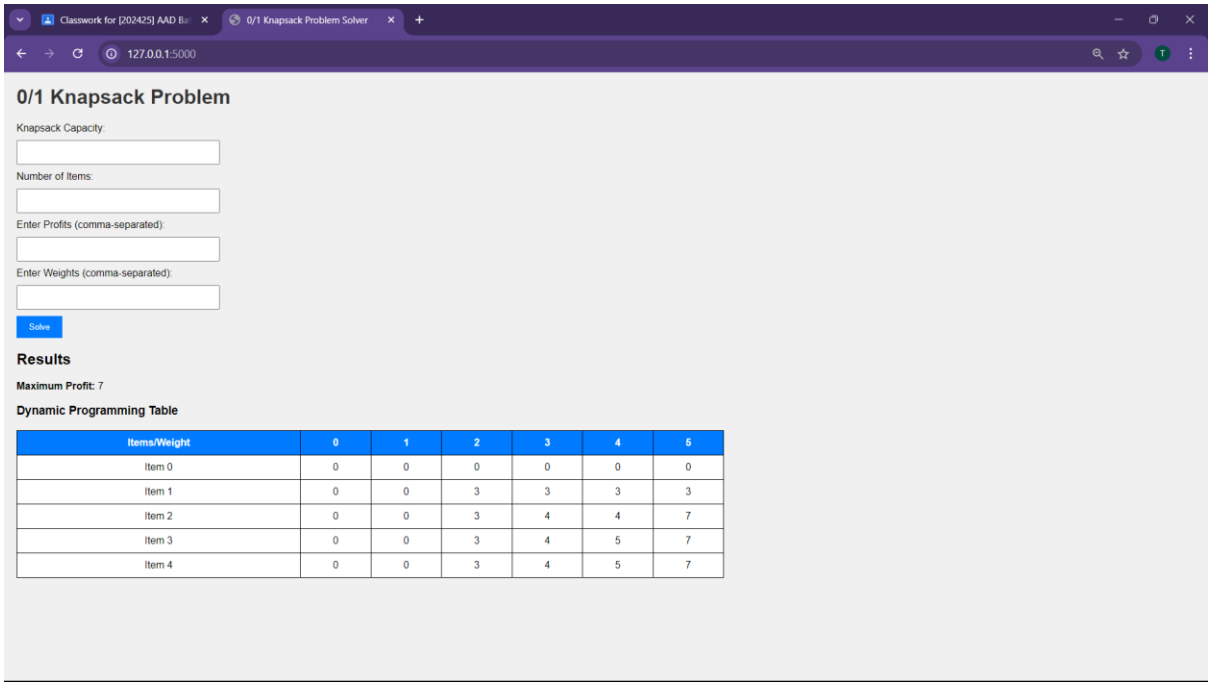
```
<!DOCTYPE html>
```

```
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>0/1 Knapsack Problem Solver</title>
    <style>
        body {
            font-family: Arial, sans-serif;
            margin: 20px;
            background-color: #f0f0f0;
        }
        h1 {
            color: #333;
        }
        form {
            margin-bottom: 20px;
        }
        input[type="text"], input[type="number"] {
            padding: 10px;
            width: 300px;
            margin: 10px 0;
        }
        input[type="submit"] {
            padding: 10px 20px;
            background-color: #007BFF;
            color: white;
            border: none;
            cursor: pointer;
        }
```

```
        table {
            border-collapse: collapse;
            width: 60%;
            margin-top: 20px;
        }
        table, th, td {
            border: 1px solid black;
            padding: 10px;
            text-align: center;
        }
        th {
            background-color: #007BFF;
            color: white;
        }
        td {
            background-color: #fff;
        }
    </style>
</head>
<body>

    <h1>0/1 Knapsack Problem</h1>

    <form method="POST">
        <label for="capacity">Knapsack Capacity:</label><br>
        <input type="number" id="capacity" name="capacity" required><br>

        <label for="num_items">Number of Items:</label><br>
        <input type="number" id="num_items" name="num_items" required><br>
```

```
    <label for="profits">Enter Profits (comma-separated):</label><br>
    <input type="text" id="profits" name="profits" required><br>

    <label for="weights">Enter Weights (comma-separated):</label><br>
    <input type="text" id="weights" name="weights" required><br>

    <input type="submit" value="Solve">
  </form>

  {% if max_profit %}
    <h2>Results</h2>
    <p><strong>Maximum Profit:</strong> {{ max_profit }}</p>

    <h3>Dynamic Programming Table</h3>
    <table>
      <thead>
        <tr>
          <th>Items/Weight</th>
          {% for i in range(W + 1) %}
          <th>{{ i }}</th>
          {% endfor %}
        </tr>
      </thead>
      <tbody>
        {% for i in range(n + 1) %}
        <tr>
          <td>Item {{ i }}</td>
          {% for j in range(W + 1) %}
```

```
                <td>{{ table[i][j] }}</td>
                {% endfor %}
            </tr>
            {% endfor %}
        </tbody>
    </table>
{% endif %}

</body>
</html>
```



Items/Weight	0	1	2	3	4	5
Item 0	0	0	0	0	0	0
Item 1	0	0	3	3	3	3
Item 2	0	0	3	4	4	7
Item 3	0	0	3	4	5	7
Item 4	0	0	3	4	5	7