PRACTICAL NO. 3

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Batch:A3

Aim: Perform Fractional Knapsack for the given scenario. Problem Definition: Suppose you are a transport dealer and want to load a truck with different types of boxes. Assume there are 50 types of boxes (Box-1 to Box-50), which weigh different and that the truck has a maximum capacity (truckSize). Each box has a profit value associated with it. It is the commission that the transporter will receive after transporting the box. You can choose any box to put on the truck as long as the number of boxes does not exceed truckSize. Tasks: A. Load the truck using different methods:

1. Minimum weight
2. Maximum profit
3. Profit/weight ratio. Compute the total profit using each method and infer the best performing method. B. Compute the time required in each method and plot the graph.

```
weight=[7, 0, 30, 22, 80, 94, 11, 81, 70, 64, 59, 18, 0, 36, 3, 8, 15, 42, 9, 0,42, 47, 52, 32,
26, 48, 55, 6, 29, 84, 2, 4, 18, 56, 7, 29, 93, 44, 71,3, 86, 66, 31, 65, 0, 79, 20, 65,
52, 13]
```

```
t=[]
```

```
Profit=[360, 83, 59, 130, 431, 67, 230, 52, 93, 125, 670, 892, 600, 38, 48, 147, 78, 256,
63, 17, 120, 164, 432, 35, 92, 110, 22, 42, 50, 323, 514, 28, 87, 73, 78, 15, 26, 78,
210, 36, 85, 189, 274, 43, 33, 10, 19, 389, 276,312 ]
```

```
def maxProfit (visited):
  max=-1;
  max_idx=0;
  for i in range(0,len(Profit)):
    if (visited[i]==0):
      if(Profit[i]>max):
        max=Profit[i];
        max_idx=i;
  return max,max_idx;
```

```
import time
start=time.perf_counter()
visited =[]
for i in range(0,len(weight)):
  visited.append(0);
w=0;
p=0;
capacity=850;
while(capacity>0):
  max,max_idx=maxProfit(visited);
  if(weight[max_idx]<capacity):
    visited[max_idx]=1;
    p+=Profit[max_idx];
    capacity-=weight[max_idx];
    print(max_idx,"\t",weight[max_idx],"\t",Profit[max_idx]);
  else:
    visited[max_idx]=(capacity-w)/weight[max_idx];
    p=p+ (Profit[max_idx]*visited[max_idx]);
    break;
print("Total Profit is ",p);
```

```
end= time.perf_counter()
timetaken=end-start
print("Time is ",timetaken)
t.append(timetaken)
```

```
    11       18      892
    10       59      670
    12       0       600
    30       2       514
    22       52      432
    4        80      431
    47       65      389
    0        7       360
    29       84      323
    49       13      312
    48       52      276
    42       31      274
    17       42      256
    6        11      230
    38       71      210
    41       66      189
    21       47      164
    15       8       147
    3        22      130
    9        64      125
    20       42      120
    Total Profit is  7076.083333333333
    Time is  0.02682792999999606
```

```
def minWeight (visited):
  min=9999;
  min_idx=-1;
  for i in range(0,len(Profit)):
    if (visited[i]==0):
      if(weight[i]<min):
        min=weight[i];
        min_idx=i;
  return min,min_idx;


start=time.perf_counter()
visited = []
for i in range (0,len(weight)):
  visited.append(0);
w = 0;
p = 0;
capacity = 850;
while(capacity > 0):
  min,min_idx = minWeight(visited);
  if(min<capacity):
      visited[min_idx]=1;
      p = p + Profit[min_idx];
      capacity = capacity - min;
      print(min_idx,"\t",weight[min_idx],"\t",Profit[min_idx]);
  else:
      visited[min_idx]= (capacity-w)/weight[min_idx];
      p = p + (Profit[min_idx]*visited[min_idx]);
      break
print("Total Profit",p);
end= time.perf_counter()
timetaken=end-start
print("Time is ",timetaken)
t.append(timetaken)
```

```
    1        0       83
    12       0       600
    19       0       17
    44       0       33
    30       2       514
    14       3       48
    39       3       36
    31       4       28
    27       6       42
    0        7       360
    34       7       78
    15       8       147
    18       9       63
    6        11      230
    49       13      312
    16       15      78
    11       18      892
    32       18      87
    46       20      19
    3        22      130
    24       26      92
```

```
28       29      50
35       29      15
2        30      59
42       31      274
23       32      35
13       36      38
17       42      256
20       42      120
37       44      78
21       47      164
25       48      110
22       52      432
48       52      276
26       55      22
33       56      73
Total Profit 6265.745762711865
Time is  0.023191224999990823
```

```
def max_ratio(visited):
    max = -1;
    max_idx=0;
    for i in range(0,len(Profit)):
      if(visited[i]==0):
        if(weight[i]==0):
          temp = Profit[i]/1;
        else:
          temp = Profit[i]/weight[i];
        if(temp>max):
          max = temp;
          max_idx=i;
    return max,max_idx;


start=time.perf_counter()
visited = []
for i in range (0,len(weight)):
  visited.append(0);
w = 0;
p = 0;
capacity = 850;
while(capacity > 0):
  max,max_idx = max_ratio(visited);
  if(weight[max_idx]<capacity):
      visited[max_idx]=1;
      p = p + Profit[max_idx];
      capacity = capacity - weight[max_idx];
      print(max_idx,"\t",weight[max_idx],"\t",Profit[max_idx]);
  else:
      visited[max_idx]= (capacity-w)/weight[max_idx];
      p = p + (Profit[max_idx]*visited[max_idx]);
      break
print("Total Profit",p);
end= time.perf_counter()
timetaken=end-start
print("Time is ",timetaken)
t.append(timetaken)
```

```
12       0       600
30       2       514
1        0       83
0        7       360
11       18      892
44       0       33
49       13      312
6        11      230
15       8       147
19       0       17
14       3       48
39       3       36
10       59      670
34       7       78
42       31      274
22       52      432
18       9       63
27       6       42
31       4       28
17       42      256
47       65      389
3        22      130
4        80      431
```

```
48       52      276
16       15      78
32       18      87
29       84      323
24       26      92
21       47      164
38       71      210
41       66      189
Total Profit 7566.857142857143
Time is  0.003444099999995842
```

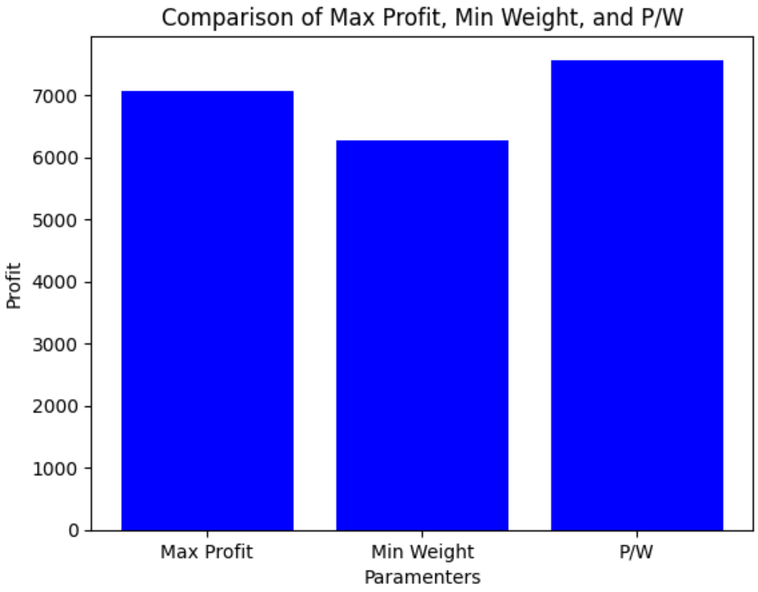
```
import matplotlib.pyplot as plt

arr1 = [7076.08, 6265.74, 7566.85]
labels = ['Max Profit', 'Min Weight', 'P/W']

plt.bar(labels, arr1, color=['blue', 'blue', 'blue'])


plt.title('Comparison of Max Profit, Min Weight, and P/W')
plt.xlabel('Paramenters')
plt.ylabel('Profit')


plt.show()
```

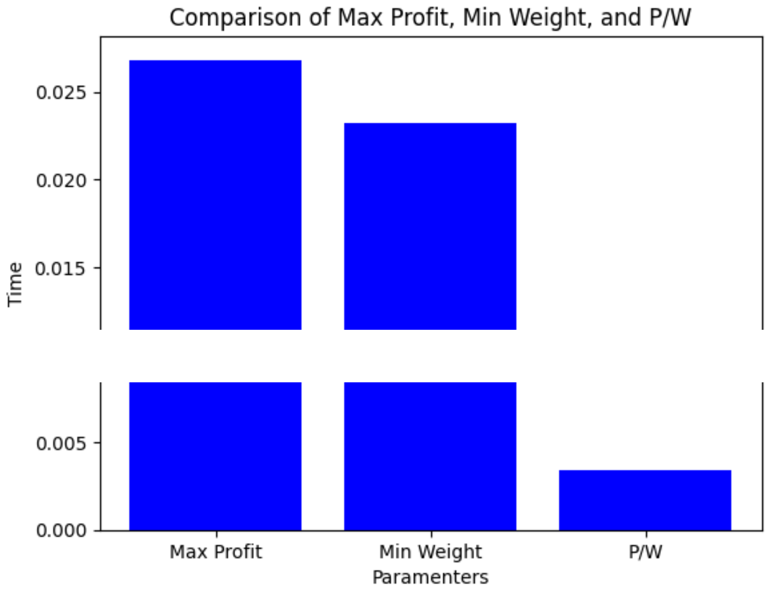


```
print("Time array is ",t)
```

```
Time array is  [0.02682792999999606, 0.023191224999990823, 0.003444099999995842]
```

```
import matplotlib.pyplot as plt
labels = ['Max Profit', 'Min Weight', 'P/W']
plt.bar(labels, t, color=['blue', 'blue', 'blue'])
plt.title('Comparison of Max Profit, Min Weight, and P/W')
plt.xlabel('Paramenters')
plt.ylabel('Time')

plt.show()
```



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