

Stationers Confedit Service

A. P. SHAH INSHHUURE OF TECHNOLOGY

(Approved by AICTE New Bellii & Covt. of Maharuchtra, Alliliated to University of Mumbal) (Religious Jain Minority)

Subject :- ADSAA

SEM -V (I.T)

011 Knapsack

Problem Statement

We have a knapsack / bag which we have to fill with objects. If the object is represented with o which means object is absent. And if the object is represented with I which means object is present.

The knapsack problem which we solve using greedy approach is a fractional knapsack.

This (profit weight ratio)

The Oll knapsack problem solved using dynamic programming is dit has different approach.

Either the full obj is present or absent. No fraction is considered.

Example

object ob1 ob2 ob 3 weight profit 20

Knapsack capacity (M) = 12



Stationers Controls worth

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Our target is to fill the knapsack with the objects to get the maximum profit.

If We first calculate profit radio for each object.

Object obj1 ob2 ob3

profit redio. 10 6.2 7.5

Highest Plw radio is for obj1 with weight 2

2 5 051 12 Profit = 20

Next highest Plw ratio is for obj3 with weight 8

2 Free 8 $\begin{cases} ob 3 \\ 12 \end{cases}$ Profit = 20 + 60 = 80

As this is 0/1 knapsack we can not select the objects in fractional part.

But through this approach we can not achieve the optimal solution.



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To solve the Ola knapsack problem we reque apply brute-force technique I method

As per brute-force technique, of if we have nobjects as 1,2,3,4,...., h

for all the objects

1 (1-1)

For each object we have 2 options either we will put the object in the bag or we will not put the object in the bag.

2 2 2 2 2 2 choices choices choices choices

Total 2" choices

In our example we 3 objects.

So we have 2" = 23 choices = 8 choices

Out of these 8 choices I can choice will give the optimal solution.

Now how to find out the optimal solution out



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-	Subject :- ADSAA	SEM -V (I.T)
	If we go with brute force	method.
	ob1 ob2 ob3	Profit
	0 0 0	No profit
2	0 0 1	60
3	0 1 0	25
4	0 1 1	85)
5	1 0 0	20
6	1 0 1	80
7		45
8		Not possible us
		consitu of king I
		capacity of knapsack
		15 /2.
	Everala	
	Example,	
	111 3 - 1 - 5 - 2	
	weights = 2 3, 4, 6, 5 3	
	100 tot5 = 2 2,3,1,4 5	
	M = 8	
	Total 4 objects are there se = 16 possibilities	osototal we have 24
	Ving dynamic programming opposed	de
	Brute force approach is not	



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Using dynamic programming approach for 0/1

Knapsack problem:-

	, Me	∌ ₩						capacity of			
	11	0	1	2	3	4	:5	6	Knop	8	
Wi.	* 0	O	0	0	0	0	0	0	0	0	
3	1	0	0	0	2	2	2	2	2	2	
4	2	0	0	0	2	3	13	3	.5	5	
5	3	0	0	0	2	3	14	4	5	6	
6	4	0	0	0	2	3	4	4	5	6 4	
			1								

Wi proust be written in ascending order. so the sequence is 23,4,5,63

First row & first colm set to zero

Value of i are the no of objects

For value of (2,4)

max (3+ W)-

max((3+ W-W;),2)= max((3+4-4),2)= max((3+6),2)

= mox (3,2)



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For value of (2,5)

$$mox((3+W-W;),2)$$

= $max((3+(5-4)),2)$

$$= max ((3+(1)), 2)$$

check value for 1 in previous step it is 0

$$= maxe((3+0), 2)$$

$$= max (3,2)$$

For value (2,6)

$$=$$
 max $((3+(2)), 2)$

=
$$\max((3+0),2)$$

= $\max(3,2)$

$$= max (3, 2)$$

For value of (2,7)

=
$$max((3+(7-4)),2) = max((3+(8-4)),2)$$

$$= max((£3+(3)), 2)$$

=
$$max(3+2,2)$$

= $max(5,2)$

For value of (28)

$$= max((3+(4)),2)$$

$$-max((3+2), 2)$$

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Department of Information Technology

A. D. SHIVH HASHIMMIND OD THEOLIGA

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$$= max (54+(5-5),3)$$

$$=$$
 max $(4+(6-5),3)$

=
$$max (4+(1),3)$$

= $max (4+0,3)$

=
$$max((4+(2)),5)$$

= $max(4+0,5)$

$$= max (4+0, 5)$$

 $= max (4, 3)$

$$= max ((4+(8-5)), 5)$$

$$= max ((4 + (3)), 5$$

$$= max ((4+(3)), 5)$$

$$= max ((4+2), 5)$$



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```
For value of (4,6)

= max((1+(6-6)),4)

= max((1+(0)),4)

= max((1+0),4)

= max((1,4))
```

=
$$\max ((1+(7-6)), 5)$$

= $\max ((1+(1)), 5)$
= $\max ((1+0), 5)$
= $\max (1,5)$
= 5

=
$$max((1+(8-6)), 6)$$

= $max((1+(2)), 6)$
= $max((1+(6)), 6)$
= $max((1+0), 6)$
= $max(1, 6)$

$$m[i, w] = max(m[i-1, w], m[i-1])$$

 $m[i, w] = max(m[i-1, w], m[i-1, w-w[i]) + P[i])$

= 6



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Now how to decide we of we have to select the item or not. Currently pointer is pointing to last com of last row.

2; = 3 ob1, ob2, ob3, ob43

& check last colm of last row which is 6 & check last colm of 2nd last row which is 6

As both of them are same we shift the pointer to 2nd last row & we are not 2i = 2, 0, -3 selecting obta

of 2nd last 3rd last row

6 & 5

As both one not same we select item with profit weight 5 which is present in 2nd last now.

2ei = 2 - , - , 0, 13

Total Profit = 6 Profit of ob4 \$ = 4

Remaining Profit = 6-4 = 2

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For obl i.e. 2nd now last colm we have profit of 12. So we select obl

Remaining profit = 2 Profit of obl is 2

Now remaining profit = 2-2=0

2= 21,0,0,13