STOCHASTIC DYNAMIC PROGRAMMING

By: Andres Pachón Arias

STOCHASTIC DYNAMIC PROGRAMMING

Deterministic dynamic programming : given a state and a decision, both the immediate payoff and next state .are known

Stochastic Dynamic Programming: immediate payoff .and next state are known as a probability function

The basic ideas of determiningstages ,states, decisions , andrecursive formulas still hold :they simply take on a slightly different form

EXAMPLE

Consider a supermarket chain that has purchased 6 gallons of milk from a local dairy .The chain must allocate the 6 gallons to its three stores .If a store sells a gallon of milk, then the chain receives revenue of $2 .Any unsold milk is worth just $.50 .Unfortunately, the demand for milk is uncertain, and is given in the following table

Store	Demand	Probability
	1	.60
1	2	.00
	3	.40
	1	.5
2	2	.1
	3	.4
	1	.4
3	2	.3
	3	.3

Goal of the chain is to maximize the expected revenue from these 6 gallons

Difference : the revenue is not known for certain

Hint

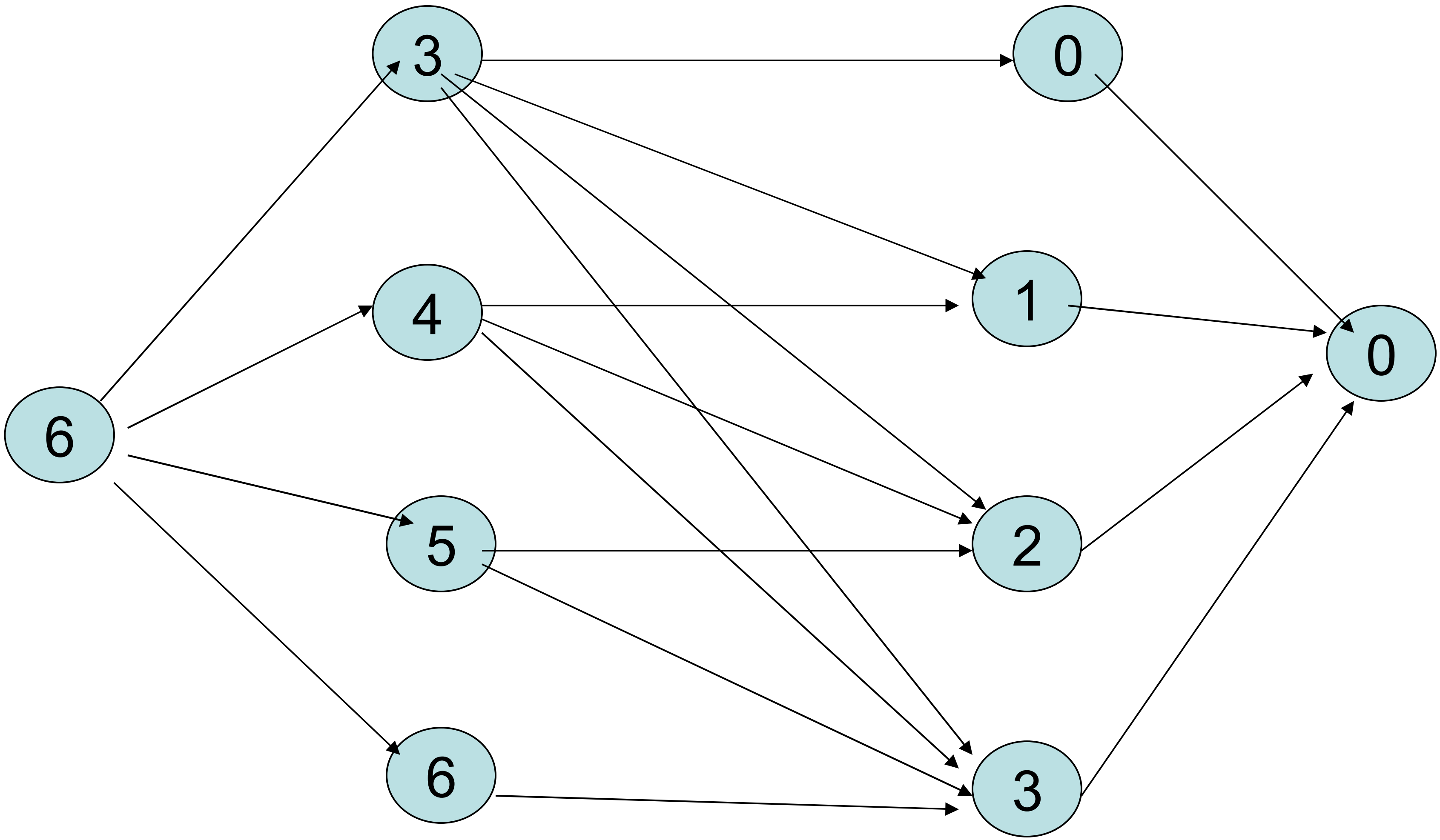
Determine an expected revenue for each allocation of milk to a store

Store	Demand	Probability
1	1	.60
	2	.00
	3	.40
2	1	.5
	2	.1
	3	.4
3	1	.4
	2	.3
	3	.3

Store	Allocation	Value
1	1	2
	2	3.1
	3	4.2
2	1	2
	2	3.25
	3	4.35
3	1	2
	2	.3.4
	3	4.35

Stages: One for each store

States: Number of allocated gallons of milk



If we let the last table be represented by $r_i(k)$ (the value of giving *k* gallons to store *i)* , then the recursive :formulas are

$$f_3(x) = r_3(x)$$

$$f_i(x) = \max_{k \le x} \{ r_i(k) + f_{i+1}(x - k) \}$$

We could use a memorization table with the maximum expected revenue at stage i in state x = f_i((x

THE END