FIT5186 Intelligent Systems

Week 11 Tutorial

Business Intelligence Modelling - Decision Analysis under Uncertainly

Let's try the Lecture Exercise first…

Question:

- News vendor Phyllis Pauley sells newspapers, and each day she must determine how many newspapers to order.
- Phyllis pays the company 20c for each newspaper and sells the paper for 25c each. Newspapers that are unsold by the end of the day are worthless.
- Phyllis knows that each day she can sell between 6 and 10 papers, with each possibility being equally likely.

1. Set up a payoff table for the problem.
2. Find the best order quantity for Phyllis, using (a) Maximax rule, (b) Maximin rule, and (c) Minimax Regret rule.

1.

		Papers Demanded			
Papers Ordered	6	7	8	9	10
6					
7					
8					
9					
10					

2. (a)

# Ordered	Best State of Nature	Payoff in the Best State of Nature
6		
7		
8		
9		
10		

2. (b)

# ordered	Worst State of Nature	Payoff in the Worst State of Nature
6		
7		
8		
9		
10		

2. (c) Regret matrix

	Papers Demanded				
Papers Ordered	6	7	8	9	10
6					
7					
8					
9					
10					

Exercise 1
A car dealer is offering the following three two-year leasing options:

Plan	Fixed Monthly Payment	Additional Cost Per Kilometer
I	$200	$0.095 per kilometer.
II	$300	$0.061 for the first 6000 kilometers; $0.050 thereafter.
III	$170	$0.000 for the first 6000 kilometers; $0.14 per kilometer thereafter.

Assume a customer expects to drive between 15000 to 35000 kilometers during the next two years according to the following probability distribution:

P(driving 15000 kilometers) = 0.1
P(driving 20000 kilometers) = 0.2
P(driving 25000 kilometers) = 0.2
P(driving 30000 kilometers) = 0.3
P(driving 35000 kilometers) = 0.2

a) Construct a payoff matrix for this problem.

b) What decision should be made according to the maximax decision rule? (Keep in mind that the "payoffs" here are costs, where less is better).

c) What decision should be made according to the maximin decision rule?

d) What decision should be made according to the minimax regret decision rule?

e) What decision should be made according to the EMV decision rule?

f) What decision should be made according to the EOL decision rule?

Exercise 2

The Fish House (TFH) in Norfolk, Virginia sells fresh fish and seafood. TFH receives daily shipments of farm-raised trout from a nearby supplier. Each trout costs $2.45 and is sold for $3.95. To maintain its reputation for freshness, at the end of the day TFH sells any leftover trout to a local pet food manufacturer for $1.25 each. The owner of TFH wants to determine how many trout to order each day. Historically, the daily demand for trout is:

Demand	10	11	12	13	14	15	16	17	18	19	20
Probability	0.02	0.06	0.09	0.11	0.13	0.15	0.18	0.11	0.07	0.05	0.03

a) Construct a payoff matrix for this problem.

b) What decision should be made according to the maximax decision rule?

c) What decision should be made according to the maximin decision rule?

d) What decision should be made according to the minimax regret decision rule?

e) What decision should be made according to the EMV decision rule?

f) What decision should be made according to the EOL decision rule?

g) Perform a sensitivity analysis on the EMV by varying the selling price and the purchase cost.

h) Find the expected value with perfect information and the expected value of perfect information (EVPI). Explain how this value could be interpreted.