ROHAN SAXENA 2015A7TS0017P
NAVEEN VENKAT 2015A7PS0078P

Problem 1: Implement a dynamic pricing scheme

Data Preprocessing and Selection:

From the given transactions data, the following parts are selected: the hour of transaction, the student segment, and the ID number of the item bought. The hour of transaction is calculated based on the time when ANC starts, ranging from 16 to 26. The student segment is calculated from the first 2 characters of the student's ID number. The ID number of the item bought is merely selected from the data.

Data Mining Technique:

We modelled this problem as one of mining appropriate association rules. The association rules we look for are of the form ("hour number", "student segment" ➔ "item ID"). A rule of the form (H, S ➔ N) is interpreted as follows: when a student belonging to a segment S comes to ANC at hour number H, he/she will likely buy item number N. Thus, our profit maximising strategy is that we will increase the price of item number N for student segment S at hour number H. We applied Aprori algorithm for mining such association rules.

Interpretation / Evaluation:

We applied Apriori algorithm for different combinations of minimum support and minimum confidence for such associations as explained before. When an association is observed (corresponding to a minsup and minconf), it is considered a candidate for dynamic pricing. We find all such (item, segment, hour) combinations and apply dynamic pricing on such objects. Approximate values of profits thus obtained are given in the table below. The penalties arising in all such cases were also examined. The complete data is in **P1results.txt** file.

	Minsup values								
minconf	0.08%	0.09%	0.10%	0.11%	0.12%	0.13%	0.14%	0.15%	0.16%
0%	6.27%	6.05%	5.89%	5.63%	5.44%	5.26%	5.08%	4.85%	4.67%
1%	6.27%	6.05%	5.89%	5.63%	5.44%	5.26%	5.07%	4.85%	4.67%
2%	6.11%	5.93%	5.85%	5.58%	5.42%	5.26%	5.07%	4.85%	4.67%
3%	5.39%	5.33%	5.27%	5.16%	5.06%	4.98%	4.82%	4.69%	4.59%

4%	5.02%	5.01%	4.98%	4.87%	4.83%	4.81%	4.70%	4.59%	4.49%
5%	4.72%	4.71%	4.69%	4.61%	4.58%	4.57%	4.50%	4.43%	4.37%
6%	3.93%	3.92%	3.90%	3.82%	3.80%	3.79%	3.59%	3.51%	3.41%

The penalties arising from minconf = 0% and the different minsup values corresponding to the profits given in the above table are as follows:

Minconf = 0%

Profit (%)	Penalty
6.27	105449.4
6.05	92577.6
5.89	80943.4
5.63	70645.6
5.44	59843.2
5.26	52591.0
5.08	46440.0
4.85	43453.6
4.67	38481.2

Tables for other minconf values were constructed and studied. We do not mention here due to brevity. However, the complete data corresponding to each case is in the file **P1results.txt.**

Finding an optimum solution:

The approach taken to find an optimum assignment of new prices was by observing the value of profit-penalty-ratio (Profit / Penalty). It gives an estimate of a good pricing scheme. High value would indicate a higher potential of making profits which incurring minimum penalties at that profit level. Here we only consider those assignments which yield at least **X = 5%** profit.

The highest Profit / Penalty ratio was observed when:

Minsup = 0.14 %

Minconf = 0%

And the corresponding values of:

Profit = 5.07922 % (appx.)

Penalty = 46,438.8

The new price assignments corresponding to this case are given in the **newPrices.csv** file.