Assignment 2

Course Code : CAP 446
Course Title : Data Warehousing and Mining
Section : D2112
Roll No. : RD2112A103
Reg. No. : 12111670

Name : Jayshri Lal Pandit

(1.) Given that :-

Transaction ID	Products			
1.	Milk	Egg	Bread	Butter
2.	Milk	Butter	Egg	Ketchup
3.	Bread	Butter	Ketchup	
4.	Milk	Bread	Butter	
5.	Bread	Butter	Cookies	
6.	Milk	Bread	Butter	Cookies
7.	Milk	Cookies		
8.	Milk	Bread	Butter	
9.	Bread	Butter	Egg	Cookies
10.	Milk	Butter	Bread	
11.	Milk	Bread	Butter	
12.	Milk	Bread	Cookies	Ketchup

Min Support = 30 % , Confidence = 60 %

We have to generate Rules using Apriori Algorithm :-

Step 1: We need to create a frequent Items , frequency and their Support. We can eliminate those item which does not support given minimum support. Support can be calculated by using given below Formula :-

$$\text{Support} = \frac{\text{Frequency of data Items}}{\text{Total Transaction}}$$

2.

Items	Frequency	Support	
Milk	9	9/12 = 75 %	✓
Egg	3	3/12 = 25 %	X
Bread	10	10/12 = 83.34 %	✓
Butter	10	10/12 = 83.34 %	✓
Ketchup	3	3/12 = 25 %	X
Cookies	5	5/12 = 41.67 %	✓

Here, Eliminate 'Egg' and 'ketchup'.

Step 2: By using above table we need ~~can~~ to create 2 itemsets, frequency and their support. Here also we can eliminate those itemsets which does not support given minimum support.

Itemsets	Frequency	support	
{Milk, Bread}	7	7/12 = 58.34 %	✓
{Milk, Butter}	7	7/12 = 58.34 %	✓
{Milk, Cookies}	3	3/12 = 25 %	X
{Bread, Butter}	9	9/12 = 75 %	✓
{Bread, Cookies}	4	4/12 = 33.34 %	✓
{Butter, Cookies}	3	3/12 = 25 %	X

Here, Eliminate '{Milk, Cookies} and {Butter, Cookies}

Step 3:- Again By using above table we need to create 3 itemsets, frequency and their support. Here also

we can eliminate those itemsets which does not support given minimum support.

3 Itemsets	Frequency	Support	
{Milk, Bread, Butter}	6	6/12 = 50 %	✓
{Milk, Bread, Cookies}	2	2/12 = 16.67 %	X
{Milk, Butter, Cookies}	1	1/12 = 8.34 %	X
{Bread, Butter, Cookies}	3	3/12 = 25 %	X

Here, only one Itemset which support given minimum support. So, we can start create Rule generation by using formula given :-

$$\boxed{\text{Confidence}(A \rightarrow B) = \frac{\text{Support}(A \cup B)}{\text{Support}(A)}}$$

3Itemset ⇒ {Milk, Bread, Butter}

Rule 1: Confidence [{Milk} → {Bread, Butter}]

$$= \frac{\text{supp}[\{\text{Milk}\} \cup \{\text{Bread, Butter}\}]}{\text{supp}\{\text{Milk}\}}$$

$$= \frac{6/12}{9/12} = 66.67\ \%$$

Rule 2: conf [{Bread, Butter} → {Milk}]

$$= \frac{\text{Supp}[\{\text{Bread, Butter}\} \cup \{\text{Milk}\}]}{\text{Supp}\{\text{Bread, Butter}\}}$$

P.T.O

$$= \frac{6/12}{9/12} = 66.67\%$$

Rule 3: conf [{Bread} → {Milk, Butter}]

$$= \frac{\text{Support}[\{\text{Bread}\} \cup \{\text{Milk, Butter}\}]}{\text{Support}\{\text{Bread}\}}$$

$$= \frac{6/12}{10/12} = \frac{6}{10} = 60\%$$

Rule 4: conf [{Milk, Butter} → {Bread}]

$$= \frac{\text{Supp}[\{\text{Milk, Butter}\} \cup \{\text{Bread}\}]}{\text{Supp}\{\text{Milk, Butter}\}}$$

$$= \frac{6/12}{7/12} = \frac{6}{7} = 85.71\%$$

Rule 5: conf [{Butter} → {Milk, Bread}]

$$= \frac{\text{Support}[\{\text{Butter}\} \cup \{\text{Milk, Bread}\}]}{\text{Support}\{\text{Butter}\}}$$

$$= \frac{6/12}{10/12} = \frac{6}{10} = 60\%$$

Rule 6: Conf [{Milk, Bread} → {Butter}]

$$= \frac{\text{Support}[\{\text{Milk, Bread}\} \cup \{\text{Butter}\}]}{\text{Support}[\{\text{Milk, Bread}\}]}$$

$$= \frac{6/12}{7/12} = \frac{6}{7} = 85.71\%$$

Here, In the above all Rules are follow given confidence. So, All 6 Rules are good.

(2.) Given that :-

Minimum support = 7

Transaction No.	Products
1	beer, wine, cheese
2	beer, potato chips
3	eggs, flour, butter, cheese
4	eggs, flour, butter, beer, Potato chips
5	wine, cheese
6	Potato ~~cheep~~ chips
7	eggs, flour, butter, wine, cheese
8	eggs, flour, butter, beer, Potatochips
9	wine, beer
10	beer, Potato chips
11	butter, eggs
12	beer, potato chips
13	flour, eggs
14	beer, potato chips
15	eggs, flour, butter, wine, cheese
16	beer, wine, potato chips, cheese
17	wine, cheese
18	beer, Potato chips
19	wine, cheese
20	beer, potato chips

We need to prepare FP Growth ~~the~~ tree using above products transaction.

Step 1:- We need to create frequent Items, frequency and Priority. We can eliminate those item which does not support given minimum support. Priority can be calculated on basis on frequency.

Item	Frequency	Priority	
beer	11	1	✓
Wine	8	3	✓
Cheese	8	4	✓
Potato chips	10	2	✓
eggs	7	5	✓
Flour	6	6	X
butter	6	7	X

Step 2:- We need to create ordered itemsets.

Transaction No	Odered Items
1	beer, Wine, cheese
2	beer, potato chips
3	~~eggs~~, Cheese, eggs
4	beer, Potato chips, eggs
5	Wine, Cheese
6	potato chips

7	wine, cheese, eggs
8	beer, potato chips, eggs
9	beer, wine
10	beer, potato chips
11	eggs
12	beer, potato chips
13	eggs
14	beer, potato chips
15	wine, cheese, eggs
16	beer, potato chips, wine, cheese
17	wine, cheese
18	beer, potato chips
19	wine, cheese
20	beer, potato chips

Now, we can create FP tree by using above ordered items

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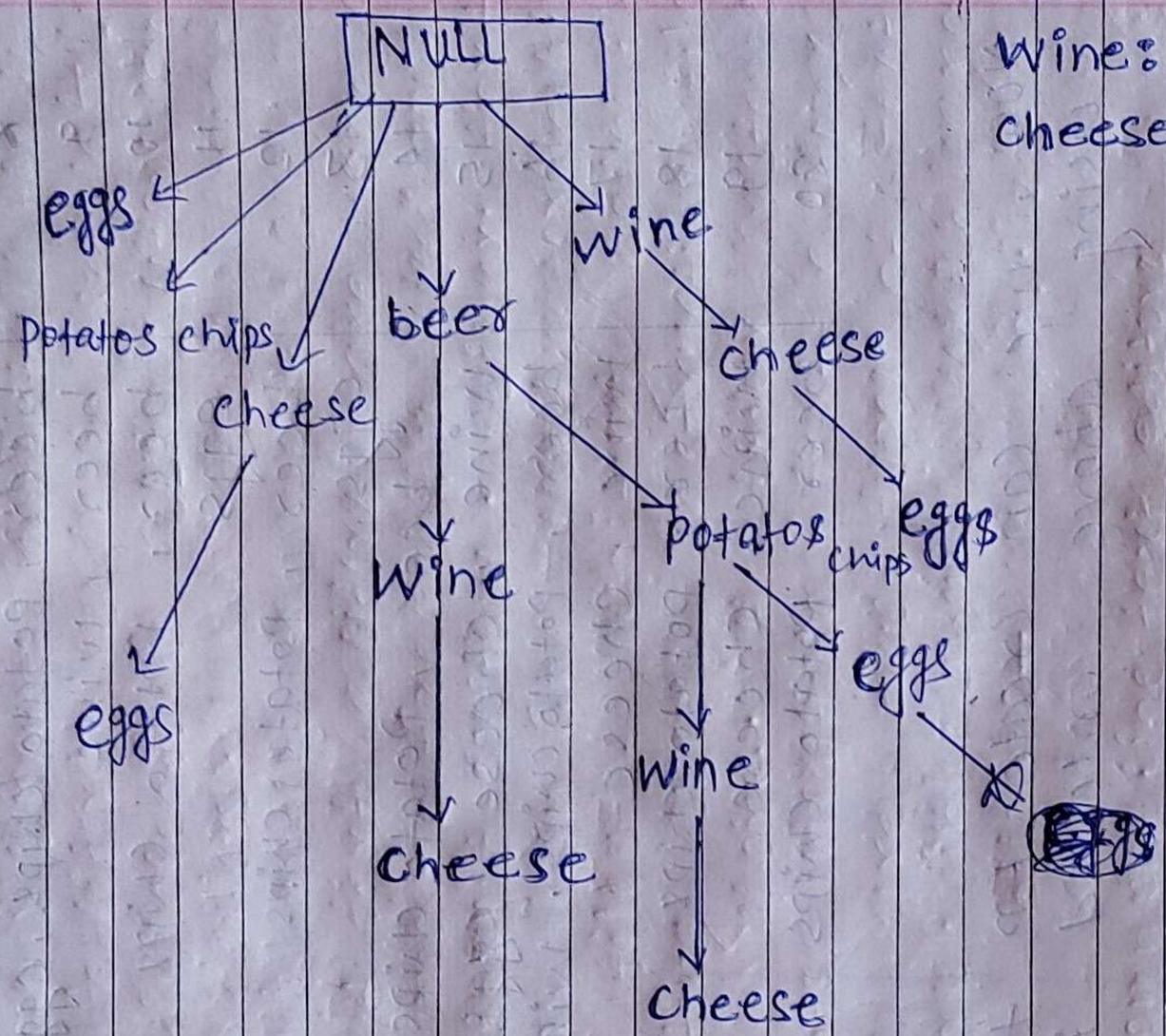

beer : ~~1 2 3 4 5 6 7 8 9 10~~ 11
Wine : ~~1~~ 2
cheese : 1

Potatos chips : ~~1 2 3 4 5 6 7 8~~ 9
cheese : 1
Eggs : 1
Eggs : ~~1 2~~ 3
Wine : ~~1 2 3~~ 4 5
cheese : ~~1 2 3 4~~ 5
Potatos chips : 1
Eggs : 1
- Eggs : ~~1~~ 2
wine : 1
cheese : 1

FP Growth Tree