TDT4300 Datawarehouse and datamining

Association analysis
Assignment 2

Group: 99

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Submission date: February 17, 2021

1. Apriori Algorithm

TID	Items
T1	H, B, K
T2	H, B
T3	H, C, I
T4	C, I
T5	I, K
T6	H, C, I, U

Task a)

Show thoroughly the steps on how the frequent itemsets are generated:

Item	Support count
B	2
C	3
H	4
I	4
K	2
U	1

Itemset	Support count
{B,C}	0
{B,H}	2
{B,I}	0
{B,K}	1
{C,H}	2
{C,I}	3
{C,K}	0
{H,I}	2
{H,K}	1
{I,K}	1

Itemset	Support count
{B,H,C}	0
{B,H,I}	0
{B,C,I}	0
{C,H, I}	2

Frequent itemsets: {C,H, I}, {H,I}, {C,I}, {C,H}, {B,H}, {K}, {I}, {H}, {C}, {B}

(b)

We first find all 2^k-2 candidates from {H,C,I}:

HC->I HI->C CI->H C->HI H->CI I->HC

Then we calculate the confidence for all of them, and since all candidates include {H,C, I} we use the support count of 2 as the numerator from the confidence formula:

C({A} → {B}) = $\frac{\sigma(\{A\} \cup \{B\})}{\sigma(\{A\})}$ where σ is the support count

Candidate (→)		Support	Confidence	Accepted (threshold 0.6)
HC	I	2	1	Yes
HI	C	2	1	Yes
CI	H	3	0.66	Yes
C	HI	3	0.66	Yes
H	CI	4	0.5	No
I	HC	4	0.5	No

This gives us the following 4 association rules:

1. {H, C} → {I}
2. {H, I} → {C}
3. {C, I} → {H}
4. {C} → {H, I}

2. FP-Growth Algorithm

We find all the 1 itemset supports counts and sort descending. Then we remove the infrequent items marked in gray.

Item	Support count
B	7
D	7
E	7
F	3
A	1
C	1
G	1
H	1
I	1
J	1

Then we sort the items for each transaction in descending order of support without the infrequent items

TID	items
T1	b, e
T2	b, d
T3	b, d, e, f
T4	d, e
T5	d, e
T6	b, d
T7	b, d, e, f
T8	b, d, e, f
T9	b, e

From this table of sorted transactions, we generate a frequent pattern tree:

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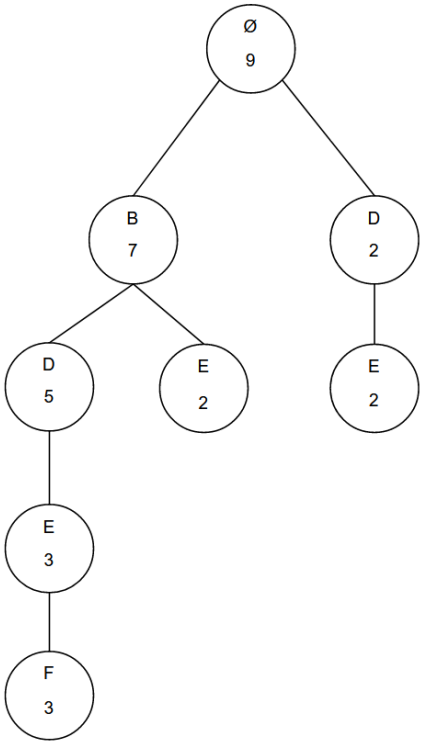
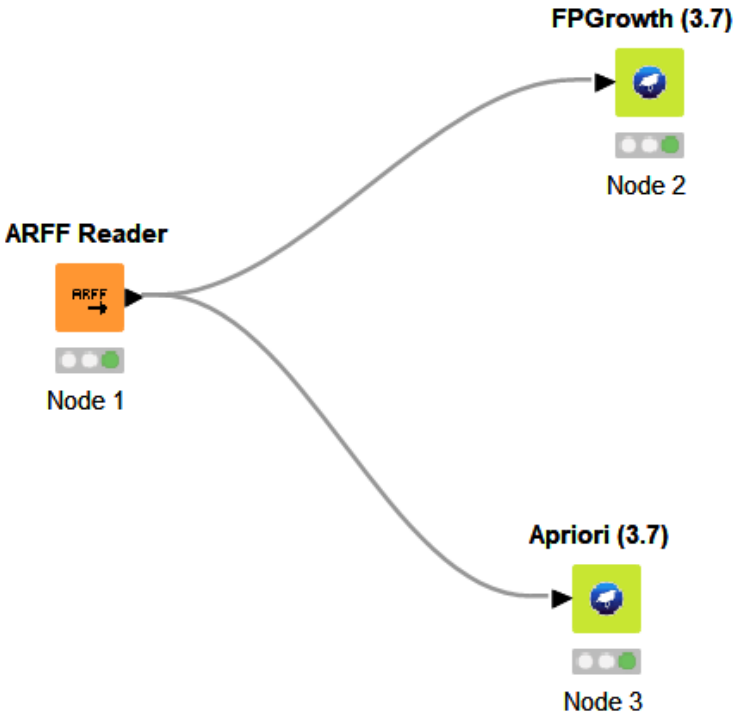


Minimum support count is 2

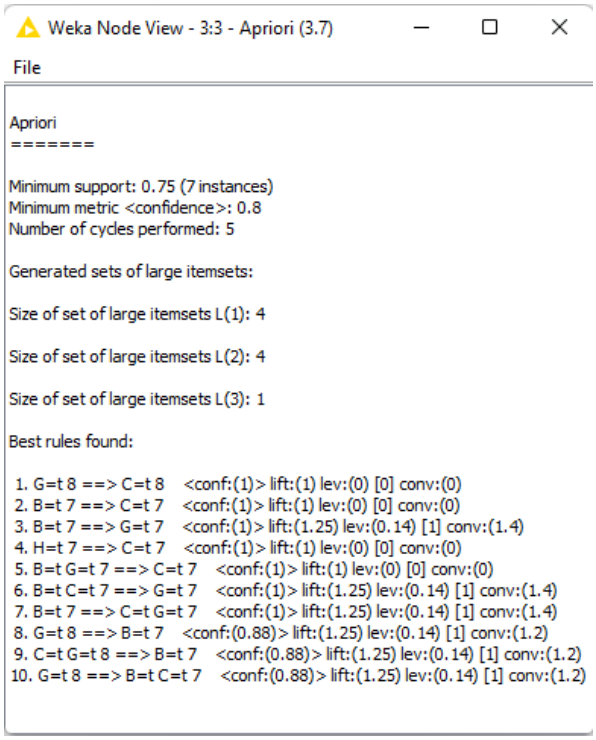
Items	Conditional pattern base	Conditional FP tree	Frequent Patterns
F	BDE:3	BDE:3	{FB}:3,{FD}:3,{FE}:3, {FBD}:3, {FBE}:3, {FDE}:3, {FBDE}:3
E	D:2, B:2, BD:3	B:5, BD:3. D:2	{ED}:2, {EB}:5, {ED}:3, {EBD}:3
D	B:5	B:5	{DB}:5
B	-	-	-

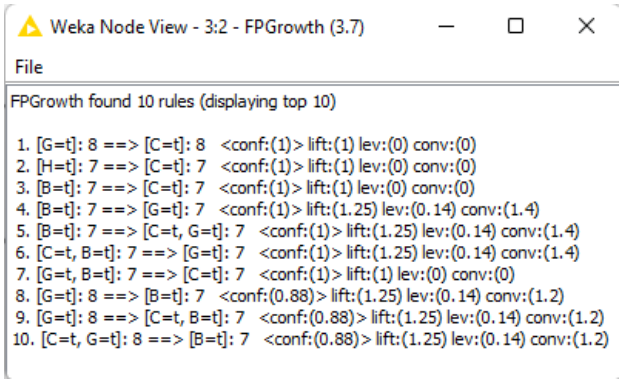
3. KNIME

I added an ARFF reader and fed its output to the FPGrowth and Apriori Nodes as shown in the following KNIME Workflow



Screenshot of the KNIME workflow





Output from the Apriori and FPGrowth nodes

4. Compact Representation of Frequent Itemsets

Closed Frequent Itemsets	Support count
{b}	10
{d}	13
{a, d}	11
{b, d}	7
{b, e}	8
{d, e}	6
{a, b, e}	7
{a, c, d}	6
{b, d, e}	4
{a, c, d, e}	5

Using Algorithm 6.4:

For K = 4:

{a, c, d, e}: support = 5

For K = 3

Find all subsets from {a, c, d, e} and add closed frequent itemsets of length 3:

itemset	Max of itemset	Support count
{a,b,e}		7
{a,c,d}		6
{a,c,e}	{a,c,d,e}:5	5
{a,d,e}	{a,c,d,e}:5	5
{b,d,e}		4
{c,d,e}	{a,c,d,e}:5	5

For K = 2

itemset	Max of itemsets	Support count
{a,c}	{a,c,e}:5,{a,c,d}:6	6
{a,b}	{a,b,e}:7	7
{a,d}		11
{a,e}	{a,b,e}:7, {a,c,e}:5, {a,d,e}:5	7
{b,d}		7
{b,e}		8
{c,d}	{a,c,d}:6, {c,d,e}:5	6
{c,e}	{a,c,e}:5, {c,d,e}:5	5
{d,e}		6

For K=1

itemset	Max of itemsets	Support count
{a}	{a,c}:6, {a,b}:7, {a,d}:11,	11
{b}		10
{c}	{a,c}:6, {c,d}:6, {c,e}:5	6
{d}		13
{e}	{c,e}:5, {a,e}:7, {b,e}:8, {d,e}:6	8

All the listed itemsets are frequent itemsets