

Formal Concept Analysis

Exercise Sheet 9, Winter Semester 2015/16

Exercise 1 (association rules)

We regard the context of transactions of a supermarket. Determine

(a) the *support* and the *confidence* for the association rules

- $\{\text{tv magazine}\} \rightarrow \{\text{beer}\}$,
- $\{\text{chips}\} \rightarrow \{\text{tv magazine, beer}\}$ and
- $\{\text{tv magazine, beer}\} \rightarrow \{\text{chips}\}$

(b) as well as at least two further association rules with a minimal support of 25% and a minimal confidence of 66%.

	apples (a)	beer (b)	chips (c)	tv magazine (d)	toothpaste (e)
t_1	×	×	×		
t_2			×	×	
t_3		×	×	×	
t_4	×	×			×
t_5			×		×
t_6		×	×	×	
t_7	×	×			
t_8			×	×	

Solution:

1. Support and Confidence of association rules:

Association rule	Support	Confidence
$\{\text{tv magazine}\} \rightarrow \{\text{beer}\}$	25%	50%
$\{\text{chips}\} \rightarrow \{\text{tv magazine, beer}\}$	25%	33.33%
$\{\text{tv magazine, beer}\} \rightarrow \{\text{chips}\}$	25%	100%

Association rule	Support	Confidence
$\{\text{apples}\} \rightarrow \{\text{beer}\}$	37.5%	100%
$\{\text{chips}\} \rightarrow \{\text{tv magazine}\}$	50%	66.67%
$\{\text{tv magazine}\} \rightarrow \{\text{chips}\}$	50%	100%

Exercise 2 (computing the stem base with NEXT CLOSURE)

Determine the stem base for this context using the NEXT CLOSURE algorithm. Use the following table as help:

	Mobil (1)	Telefon (2)	Fax (3)	Fax m. N.-Adapter (4)
Sinus 44 (a)		×		
Nokia 6110 (b)	×	×		
T-Fax 301 (c)			×	×
T-Fax 360 PC (d)			×	

A	i	A + i	L(A + i)	A <_i L(A+i)?	(L(A + i))''	L	intents

Solution:

A	i	$A + i$	$\mathcal{L}(A + i)$	$A <_i \mathcal{L}(A + i)?$	$(\mathcal{L}(A + i))''$	\mathcal{L}	Intents
\emptyset	4	$\{4\}$	$\{4\}$	\times	$\{3, 4\}$	\emptyset	\emptyset
$\{4\}$	3	$\{3\}$	$\{3\}$	\times	$\{3\}$	$\{4\} \rightarrow \{3\}$	$\{3\}$
$\{3\}$	4	$\{3, 4\}$	$\{3, 4\}$	\times	$\{3, 4\}$		$\{3, 4\}$
$\{3, 4\}$	2	$\{2\}$	$\{2\}$	\times	$\{2\}$		$\{2\}$
$\{2\}$	4	$\{2, 4\}$	$\{2, 3, 4\}$				
	3	$\{2, 3\}$	$\{2, 3\}$	\times	$\{1, 2, 3, 4\}$	$\{2, 3\} \rightarrow \{1, 4\}$	
$\{2, 3\}$	4	$\{2, 3, 4\}$	$\{1, 2, 3, 4\}$				
	1	$\{1\}$	$\{1\}$	\times	$\{1, 2\}$	$\{1\} \rightarrow \{2\}$	
$\{1\}$	4	$\{1, 4\}$	$\{1, 2, 3, 4\}$				
	3	$\{1, 3\}$	$\{1, 2, 3, 4\}$				
	2	$\{1, 2\}$	$\{1, 2\}$	\times			$\{1, 2\}$
$\{1, 2\}$	4	$\{1, 2, 4\}$	$\{1, 2, 3, 4\}$				
	3	$\{1, 2, 3\}$	$\{1, 2, 3, 4\}$				$\{1, 2, 3, 4\}$