

Introduction to Formal Concept Analysis

Exercise Sheet 7, Winter Semester 2017/18

Exercise 1 (frequent concept intents and closure systems)

Definition (frequent concept intent). Let $\mathbb{K} = (G, M, I)$ be a formal context.

(a) The support of a set $B \subseteq M$ of attributes in \mathbb{K} is given by

$$\text{supp}(B) := \frac{|B'|}{|G|}.$$

(b) For a given minimal support minsupp the set of frequent concept intents is given by

$$\{B \subseteq M \mid \exists A \subseteq G : (A, B) \in \mathfrak{B}(G, M, I) \wedge \text{supp}(B) \geq \text{minsupp}\}.$$

Show that the set of frequent concept intents together with the set M forms a closure system.

Exercise 2 (support)

Show the validity of the properties of the support function that are employed by the TITANIC algorithm:

Let (G, M, I) be a formal context $X, Y \subseteq M$. Then it holds:

- 1) $X \subseteq Y \implies \text{supp}(X) \geq \text{supp}(Y)$
- 2) $X'' = Y'' \implies \text{supp}(X) = \text{supp}(Y)$
- 3) $X \subseteq Y \wedge \text{supp}(X) = \text{supp}(Y) \implies X'' = Y''$

Exercise 3 (computing concept intents with TITANIC)

The following context contains transactions in a supermarket. Compute the closure system of all concept intents using the TITANIC algorithm. (hint: use the table structure from the example computation in the lecture slides)

	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			×	×	