Exercise Sheet for the Lecture
Intelligent Learning and Information Systems

Winter Term 2023/24

1 - Association Rules I

solutions are due **electronically** via eCampus in **PDF** format by **November 8**, 2023, until **14:00** o'clock; **(strict!)**

solutions will be discussed: **November 8**, 2023 from **16:00**

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1. Number of Association Rules [10 points]

Show that the number of all association rules over d items is $3^d - 2^{d+1} + 1$ (see, also, slide 22 of Lecture 2023-10-18).

2. The Apriori Algorithm [10 points]

A database has the following five transactions:

TID	items bought
1	M, O, N, K, E, Y
2	D, O, N, K, E, Y
3	M, A, K, E
4	M, U, C, K, Y
5	C, O, K, E

List all frequent itemsets with frequency threshold $t = 3$ (or equivalently, with a minimum support of 0.6) by the Apriori algorithm. Give the details of your computation.

3. Correctness and Irredundancy of Apriori [20 points]

Prove that the Apriori algorithm correctly and irredundantly generates all frequent itemsets. (First claim on slide 14 of Lecture 2023-10-25.)

4. Complexity of Apriori [10 points]

Prove that the Apriori algorithm generates the set of frequent itemsets in incremental polynomial time. (Second claim on slide 14 of Lecture 2023-10-25.)

5. Rule Generation [10 points]

For the transaction database given in Task 2 above list all association rules with a minimum support of 0.6 and minimum confidence of 0.8. Use the algorithm given on Slides 17–18 of Lecture 2023-10-25.