DIT852 Introduction to Data Science and AI, SP1 2021

Assignment 4: Maths for data science

1. Let A be the set of students who live within 15 minutes walking distance from the university—and thus could easily walk to classes—and let B be the set of students who walk to classes. Describe the students in the set $A^C \cap B$.

2. Suppose that A is the set of third-year students at GU and B is the set of students in data science at GU; let E be the set of all GU students. Express each of the following sets in terms of set operations involving A and B and, possibly, E.
    a) The set of third-year students taking data science at GU.
    b) The set of third-year students at GU who are not taking data science.
    c) The set of GU students who either are in their third-year or are taking data science (not exclusive).

3. A retail establishment accepts either the Mastercard or VISA credit card. A total of 26% of its customers carry a Mastercard card, 63% carry a VISA card, and 12% carry both. What percentage of its customers carry a credit card that the establishment will accept?

4. Let $C(x)$ be the statement "x has a cat", let $D(x)$ be the statement "x has a dog" and $P(x)$ be the statement "x has a parrot". Express each of the following statements in terms of $C(x)$, $D(x)$, and $P(x)$, the quantifiers ∀ and ∃, and logical operators. Let the domain be the students in your class.
    a) A student in your class has a cat, a dog, and a parrot.
    b) All students in your class have a cat, a dog or a parrot.
    c) Some student in your class has a cat and a parrot, but not a dog.
    d) For each of the three animals—cat, dog, and parrot—there is a student in your class who has this animal as a pet.
    e) Negate the statements in (b) and (c); state negations as logic expressions and natural language.

5. Consider the equivalence $(p \rightarrow q) \vee (p \rightarrow r) \equiv p \rightarrow (q \vee r)$
    Using the laws given in the slides from lecture 7, and the identity $p \rightarrow q \equiv \neg p \vee q$, transform the left-hand side to the right-hand side.

Submitting work

Please upload your homework as one PDF file (a scan of handwritten notes is acceptable). Include the name of the group and the students who worked on the assignment at the beginning of the document.

Deadline: Monday 27 September 2021 at 23:59.