Admission Requirements Master Program Data Science and Artificial Intelligence (DS&AI)

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Purpose of and reason for the admission requirements for the Master program DS&AI.

The admission requirements for the DS&AI program describe the necessary knowledge students need to successfully complete DS&AI program.

- The DS&AI program requires students to apply, combine, and research new engineering and data science methods, mathematical principles, and computer science theories for solving problems in Data Science and Artificial Intelligence.
- To ensure students can achieve these goals, any student who wants to be admitted the Master program needs to have sufficient academic knowledge and engineering and academic skills in the areas of *Computer Science*, *Data Science* and *Mathematics* from several subjects (see list of subjects and expected prior knowledge below).
- The student has to perform group work and be able to present work, in writing and orally.
- Since the program is taught in English, the level of English when entering the program needs to be sufficient.

Subject-Related Knowledge & Skills

The criterion used is:

A bachelor in Computer Science, a bachelor in Mathematics, or a bachelor in Data Science or equivalent with a specialization that satisfies the norm:

The norm is:

One or more passed courses of 5 credits (ECTS) on each one of the following subjects

- **Linear Algebra**
  - calculate with matrices and vectors
  - solve linear systems with Gauss(-Jordan) elimination
  - understand and apply rank, orthogonality, (in)dependency, eigenvalue decomposition and eigenvectors
  - implement linear algebra calculations
- **Logic and Set Theory**
  - basic concepts and techniques from set theory, propositional logic, and predicate logic
  - use them in computations
  - can provide proofs by induction and perform logical reasoning
- **Probability and Statistics**
  - introductory probability theory, knowledge of discrete and continuous random variables

    - descriptive statistics including the theory and practice of confidence intervals, hypothesis testing and estimation theory
- **Data structures and Algorithms**
    - algorithm design techniques and use of standard data structures
    - prove correctness of algorithms and reason about algorithm complexity
- **Object-Oriented Programming and Software Development**
    - write programs from scratch in imperative or object-oriented languages
    - use general algorithmic techniques (aggregation, searching, sorting, recursion)
    - apply the principles of code quality and software engineering
- **Data Modeling and Databases**
    - design data models (E-R diagrams, UML) from natural language requirements
    - querying data in relational databases based on natural language requirements
- **Machine learning/Data mining**
    - theoretical foundations of data mining and machine learning
    - apply feature selection and extraction
    - apply supervised learning (classification and regression)
    - apply unsupervised learning (clustering and matrix-factorization)
    - apply evaluation methods and understand overfitting
- **Visualization**
    - Basic principles of visualization
    - design, implement, and evaluate visualization tools
    - Implement data transformation, visualizations using visual variables and interaction principles
- **Group project work, that include the skills presenting and writing.**

Important criteria are both the study load and academic performance.

Note: Credits according to European credit transfer system (1 ECTS is 28 hours of student work/study). Credits need to be on a Bachelor level (level 6 in European Qualifications Framework).

Method of assessment (by the department admissions board):

Student applications are assessed on the transcript of academic records displaying the content of previous course subjects and project work and the obtained grade.

Score:

Sufficient/ insufficient/conditional; under the condition* that

1. the student completes a premaster (max 30 Credits)
2. the student completes the defined requirement by taking homologation courses during the DS&AI master (max 15 Credits).

*The conditional situation always depends on educational feasibility.