



Database Design

How can you organize lots of data to find desired information fast?

If you need to manage lots of information it is important that you understand its structure. Database design is about how to organize large amounts of information so that it is understandable by humans and can be stored in a computer in such a way that it is easy and fast to find desired information.

The course covers the fundamentals of the database field. It is about how to organize, store, and search large quantities of data in a computer.



A *database* is a collection of data that represents a part of the real world. It is usually managed by a program system called a *Database Management System*, or *DBMS*. We will study how to use a *DBMS* to *design* a database.

The first step in database design is to understand what kinds of data to store and how they are related. For this graphical diagrams of data relationships are constructed using the *Entity-Relationship model*.

In a second step the diagrams are translated into a *schema*. A schema is a description of the structure of the data expressed in terms of the building blocks, or *data model*, of the *DBMS*. The most common data model is the *relational data model* where data is regarded as tables. A relational schema describes tables and relationships between tables.



When the schema is designed, the database can be populated and searched using a *query language*, usually *SQL*.

The schema can be complemented with details about how to internally represent data in such a way that the search is fast. Efficient such *database tuning* requires understanding of the internals of the *DBMS* and the query language.

Modern databases store non-tabular data, e.g. unstructured text, images, and maps. *Object-Relational* databases provide means to store, search, and compute over such non-tabular data representations.

Prerequisites: Programming, data structures, logic (10p mathematics and 15p computer science)

Goal: The student will master the principles of database design, representation, and search using modern database management systems.