

LU01a - Fundamentals of Databases

Learning objectives

- I can explain in my own words what a database is.
- I can explain, using a simple diagram I have drawn myself, how a database system is structured.
- I can list at least three advantages of using a database.

Introduction

What is a database?



Stuttgart City Library is like a database: it collects, categorises and makes large amounts of knowledge accessible. Photo: Tobias Fischer, Unsplash ([Link](#))

A database is a system that stores and manages large amounts of data.

It ensures that data ...

- **is permanently** – even when the computer is switched off
- **is consistent** – a piece of information is stored in only one place and therefore cannot exist in two versions
- **can be found quickly** – even with millions of entries
- **protected** – against loss and unauthorised access

However, a database does not merely store the data itself, but also **how it is related**: in an online

shop, for example, the database knows which order belongs to which customer and which products are included in that order.

The same database can be accessed **be accessed simultaneously by several people and several programmes**. Each query receives exactly the data that is currently needed – not the entire database. The shop's website shows the customer her own orders, whilst the accounts department retrieves last month's turnover from the same database.

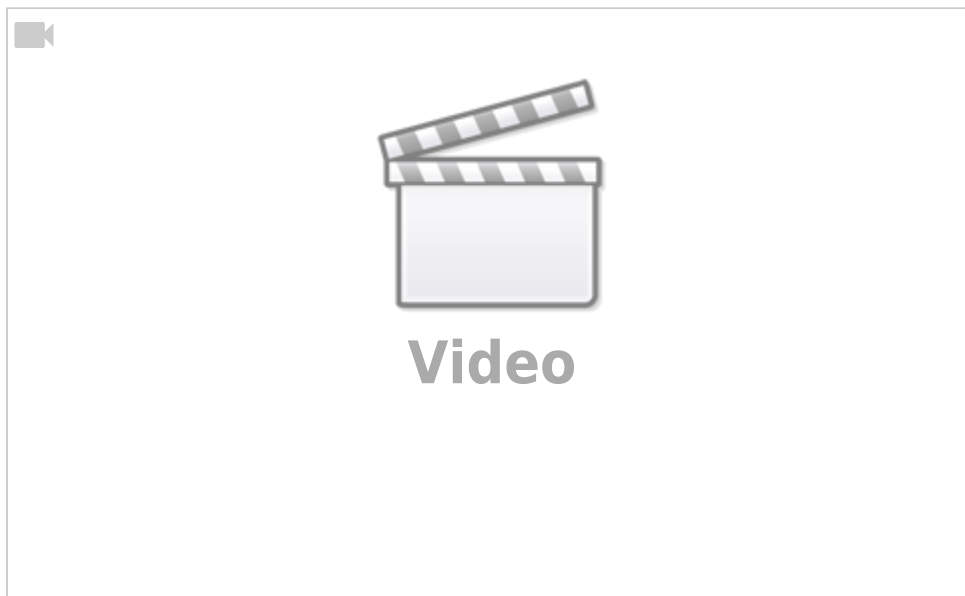
The data is stored in **tables** – similar to Excel, but with fixed rules governing which values are permitted in which column. This tabular format is standard for SQL databases, and this is precisely what we will be working with in this module.

Storing data "in the database"

Data is the plural form of *Datum*, the Latin term for 'that which is written', 'that which is given', 'value', 'fact' or 'information'. ¹⁾

A database is, in effect, **a bank for data**, and thus, in a figurative sense, a **secure repository for (valuable) information**. ²⁾

The term **database** is often used not only to refer to the actual collection of data, but also to the entire **DBMS** ³⁾ From a programmer's perspective, a database is a programme that processes queries and thus provides a service. We will look at its exact structure on the next page.



Have a look at this introductory video on the topic **(up to 3:15)** ⁴⁾

Why databases?

Why is it important to learn and understand some of the basics about databases?

Nowadays, many companies collect information about consumers and their behaviour – and analyse this data in a targeted manner. Databases form the **cornerstone** of business processes, as they store

all key information in a structured manner.

For large companies such as Google or Meta (Facebook, Instagram), data is so valuable that, in return, they can offer high-quality services (e.g. Gemini, Google Search, Gmail, Google Maps, YouTube, etc.) free of charge.

Where do I come across databases in everyday life?

You probably come into contact with a (relational) database several times a day – often without realising it. A good example is the content management system (CMS) **WordPress**, which is used on over 43% of all websites on the internet. This means that almost every second website you visit **retrieves content such as text, images or metadata (e.g. author or publication date) from a database.**

In the case of WordPress, this is usually the database management system **MySQL** – the same system that we will install locally in this course and which we will also use later to record and edit our own data.



Logo of the MySQL database management system, which we use in this course and which WordPress uses to store text, images and other data.

Other everyday examples of databases include:

- **Customer databases** (e.g. for online shops)
- **Stock management systems**
- **User account management** (e.g. for apps or web platforms)
- **Digital encyclopaedias** such as Wikipedia
- **Pokédex** (a fictional database of all known Pokémon)

¹⁾ ²⁾

Heuer, A. et al. (2020). *Databases – A Compact Course*. 1st ed., p. 28

³⁾

A DBMS – database management system – is software that stores and organises data and responds to queries about it.

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Database Tutorial for Beginners: Lucid Software

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Last update: **2026/08/19 12:07**

