



# Introduction to databases

Relevance and background



# What does this course cover?

- Overview of [relational] databases and DBMSs
- SQL language for
  - retrieving data
  - updating data
  - inserting data
  - deleting data
  - creating databases and tables
- Managing integrity using constraints
- Programmatically connecting to and using a database using Java
- Testing integrity and acceptance of [bad] data
- Basic database administration

# What is a database (system)?

- Organised and persistent collection of data
- We use a Database management system (DBMS) to access the data

What can we do with a DBMS?

- Retrieve data in a structured way
- Insert new data and delete old data
- Update existing data
- Create new tables (schemas) for future data

# Why do we need a database?

- We don't want to manage data and persist ourselves
- A database does the job faster, better and more securely
- We want to separate code from data
- We might want centralised data for a distributed system
- We might want data integrity
- We might want transactions (commit and rollback)
- A database offers a standardised interface to the data, e.g. SQL

Note: Sometimes we use the word "database" to refer to a database management system

# What would a database look like?

Imagine we have a collection of books which we'd like to build an application around. The application should accept new books, be able to search books and delete books.

A simple database could have a table for books:

```
+-----+
|Author      |Title      |ISBN      |Publisher  |
+-----+
|John Smith  |Life       |0-0-0-0-0-1|Bonnier   |
|James Woody |Love       |0-0-0-0-0-2|Bonnier   |
|Joan Carmen |Guns       |0-0-0-0-0-3|Bonnier   |
|Johnanna Boyd|Code      |0-0-0-0-0-4|Bonnier   |
|Eva Peron   |Cars       |0-0-0-0-0-5|Books R us|
+-----+
```

# The books database

Having the table books in a database allows us to search for books, update books, delete books or insert new books.

This can be done in a standardised way using the SQL query language.

Our application can talk to the database using SQL over an API.

The data about books are now independent of our application.

The database knows nothing about who or what is talking to it.

We can thus easily switch from i.e. a command line interface to some other client for our application.

# We need to learn some SQL for our database

Next lecture we'll look at SQL for retrieving data ("selecting data").

Teaser:

What do you think this SQL statement would retrieve?

```
SELECT author, title FROM books  
  
WHERE publisher = 'Bonnier';
```

# Terms and concepts

Database - A set of tables for storing data in an organised way

Database Management System (DBMS) - A set of computer programs that controls the creation, maintenance and usage of the database

SQL/Structured Query Language - A Language for Working with a DBMS

Table - A set of related data in a database

Note: Sometimes we say “database” for short when we actually talk about a database management system