# Information Systems (Informationssysteme)

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# A Few Words About Me

**Jens Teubner**
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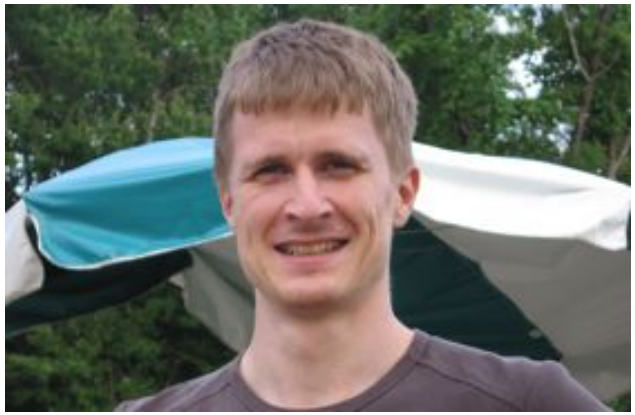


| | |
|---|---|
| 1996–2001 | Diploma in Physics, U Konstanz |
| 2001–2005 | Research assistant, DBIS Group, U Konstanz |
| 2005–2007 | Research assistant, Database Group, TU München |
| Oct 2006 | PhD in Computer Science (XML query processing) |
| 2007–2008 | Postdoc, IBM T. J. Watson Research Center, NY, USA |
| 2008–2013 | Senior Researcher, Systems Group, ETH Zurich |
| since 4/2013 | Full Professor, DBIS Group, TU Dortmund University |

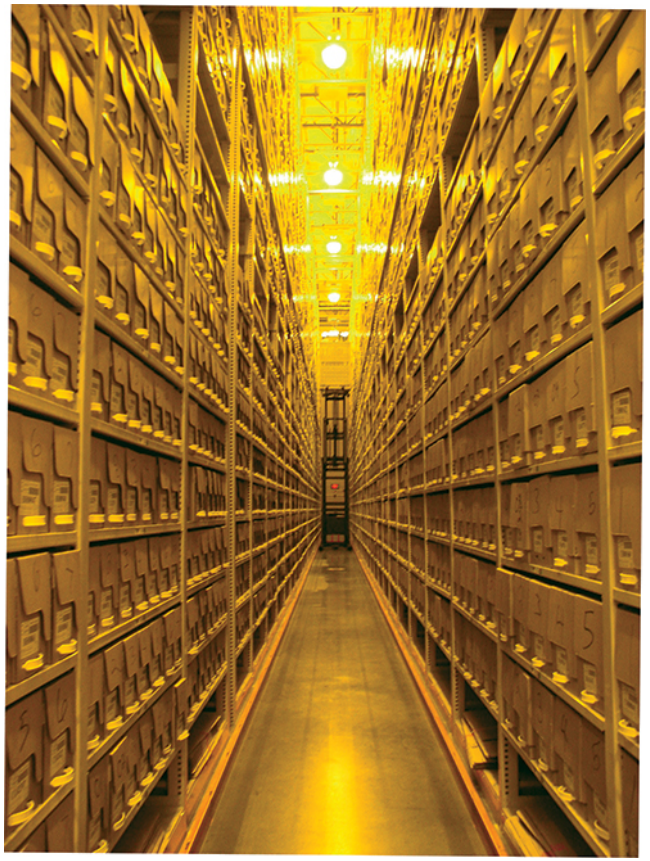
Topic: Database systems on modern computing hardware

# The Information Age

**Example:** Library of Congress (`http://www.loc.gov/`)

In 2011:

- **151.8 million items** held
  - 34.5 million books
  - 66.6 million manuscripts
  - recordings, maps, sheet music, ...
- **22,000 items** received **per day**
  ($\approx$ 10,000 are added to collection)
- 1.7 million on-site visitors
- website: 73.4 million visits,
  512 million page views



# The Information Age

**Example:** Google

- over **searches** per day
- response time: 1/4 **second**
- **20–30 % of web content is new** every time Google crawls it
- **of video uploaded** to YouTube **every minute**

Imagine an engineer being paged at 4am, because there are only a few **petabytes** of storage space left.

Google Zurich location

# Foundations of Database Systems

In this course you'll learn how to

**model**, **store**, and **process** data

data in an efficient and scalable manner.

We'll look at

- good ways to **model** your data from an application perspective,
- the role of **database systems**,
- how you **access** and **query** them,
- how **multiple users** can access a database at the same time,
- how a database can guarantee **consistency** and **durability**, and
- what a database does to **find** your data quickly.

# Course Organization

Lecture:

- Wednesdays, 8–10h, Room HS 6, Hörsaalgebäude **II**
- Course website: `http://dbis.cs.tu-dortmund.de/cms/en/teaching/ss16/infosys/`

  Please visit this website **regularly**. We will frequently post new information during the semester.

Exercises:

- Organizer: **Marcel Preuß** (`marcel.preuss@cs.tu-dortmund.de`)
- Register via **AsSESS** to one of the exercise groups.
- Exercises start **next week**.

# Surviving the Exam

There will be a **written exam** (60 min) at the end of the semester.

- dates: **August 16, 2017**; 2nd date: **September 19, 2017**
- **material allowed:** one sheet of A4 paper, **handwritten**

Best preparation for the exam? Do the exercises!

- Do exercises **before** they are discussed in the group.

"I don't understand this one thing. I need help!"

- Don't hesitate to ask me or your TA.
- Speak up during the lecture!

# Material

I will post all **lecture slides** on the course web site.[1]

Good **text books**:

- A. Kemper and A. Eickler. *Datenbanksysteme*. Oldenbourg-Verlag.
- R. Ramakrishnan and J. Gehrke. *Database Management Systems*. McGraw-Hill.
- R. Elmasri and S. B. Navathe. *Fundamentals of Database Systems*. Prentice Hall. (in German: *Grundlagen von Datenbanksystemen*. Pearson Studium.)
- A. Heuer, K.-U. Sattler, and G. Saake. *Datenbanken: Konzepte und Sprachen*. mitp.

. . . and many more (this is a standard course, taught world-wide).

[1] Except parts that I mark with ✎ on the slide.

# Experiment with a Database!

I **strongly** recommend you exercise the material of this course on a **real database system**.

**Examples:**

- **Oracle** (`http://www.oracle.com/us/products/database/`)
  - → Used in the exercises for this course.
  - → More details in the exercise groups.
- **IBM DB2** (`http://www.db2express.com/`)
  - → Full-featured, industry-strength database
  - → Available **for free** (Win/Linux)
- **PostgreSQL** (`http://www.postgresql.org/`)
  - → Very powerful and feature-rich **open source** database

# Course Outline

1. Overview of database systems
2. Database design (3-tier architecture, ER diagrams)
3. The relational model (relational algebra, relational calculus)
4. SQL (Structured Query Language)
5. Normal forms
6. Transaction management (ACID properties, serializability)
7. Crash recovery (ARIES/write-ahead logging)
8. Semi-structured data (XML)
9. Database implementation (memory hierarchy, B-trees)