Information Systems (Informationssysteme)

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A Few Words About Me

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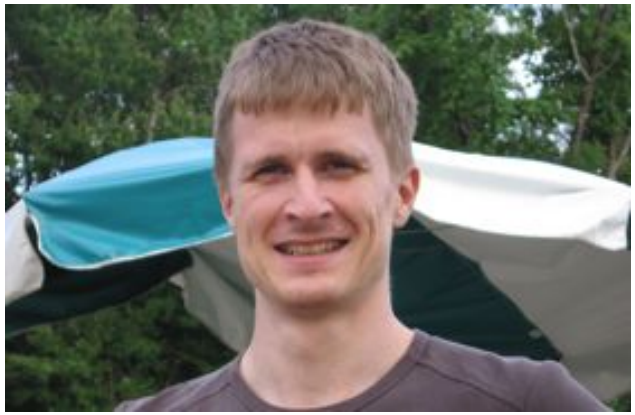


1996–2001	Diploma in Physics, U Konstanz
2001–2005	Research assistant, DBIS Group, U Konstanz
2005–2007	Research assistant, Database Group, TU München
Oct 2006	PhD in Computer Science (XML query processing)
2007–2008	Postdoc, IBM T. J. Watson Research Center, NY, USA
2008–2013	Senior Researcher, Systems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

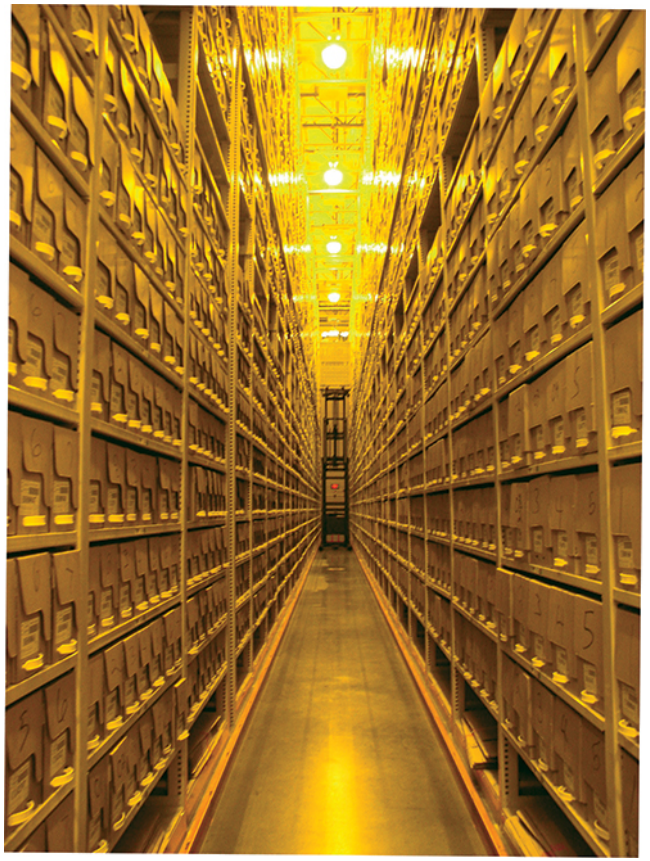
Topic: Database systems on modern computing hardware

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/ss14/infosys/`

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

Exercises:

- Organizers: **Marcel Preuß** (`marcel.preuss@cs.tu-dortmund.de`) and **Sebastian Breß** (`sebastian.bress@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: **July 30, 2014** and **October 1, 2014**.
- **no material allowed** at the exam

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/Mac)
- **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)