Database Theory
VU 181.140, SS 2017

0. General Information

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Outline

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Classes

- **Language.** This lecture will probably be held in English.

- **Time.**
  - Tuesdays, 9:00 – 11:00: 7, 14, 28 March, 4, 25 April, 2 May
  - Thursdays, 10:00 – 12:00: 16, 30 March, 6, 27 April, 4 May
  - in June: students' presentations, details to be announced later.

- **Place.**
  - Classes on Tuesdays will be held in the Seminarraum 188/2 (Favoritenstraße 9-11, 4th floor).
  - Classes on Thursdays will be held in the Seminarraum von Neumann (Favoritenstraße 9-11, ground floor).
  - The quiz at the beginning of the semester will be in the main building, HS 11 Paul Ludwik.
Prerequisites and Admission

- **Prerequisites.**
  - This course is designed for *master’s students*.
  - It is highly recommended to attend this course *after* the course *Formale Methoden der Informatik (185.291)*.

- **Knowledge and skills required.**
  - basic knowledge of databases (cf. VU Datenmodellierung)
  - basic knowledge in mathematical logic
  - introduction to complexity theory
  - in particular, the central concept of “problem reduction”

- **Admission.**
  - primarily for *master’s students!*
  - positive assessment in a quiz is required
  - each student has at most two attempts
Quiz

■ Goal.
  - ensure that students have the required knowledge and skills
  - basic knowledge in mathematical logic and complexity theory;
  - in particular, the central concept of “problem reduction”.

■ Organization.
  - Student’s card required!!
  - closed book (no material allowed)
  - Being able to solve all questions of the exercise sheet of block 1 (complexity theory part) of the course “Formale Methoden der Informatik” clearly suffices for the quiz.
  - max. 20 points; passed with $\geq 10$.

■ Time and place.
  - Thursday, 9 March 2017, 16:00 - 18:00: HS 11 Paul Ludwik
  - Thursday, 16 March 2017, 16:00 - 18:00: HS 11 Paul Ludwik
  - 60 min actual working time
Communication

■ (during, after) classes

■ Course Homepage:
  http://www.dbai.tuwien.ac.at/staff/pichler/dbt

■ TISS: please check your mail address in TISS
Course Overview (Tentative Plan)

Fundamental aspects of (relational) query languages

- Relational algebra vs. relational calculus vs. SQL
- Introduction to datalog
- Codd’s Theorem: relational algebra vs. First-Order logic
- Trakhtenbrot’s Theorem: some undecidability results
- Complexity of Query Evaluation
- (Acyclic) Conjunctive Queries
- Inexpressibility Results (Ehrenfeucht-Fraïssé Games, Locality)
- Beyond relational data
# Assessment

## Components

1. **Individual work on 1 article from database theory research**
   - Details (e.g. assignment of articles) to be provided later
   - Short written report of this article (2–3 pages)
   - Oral presentation (ca. 20 min, depends on number of participants)
   - Sufficient to get mark 3 (or worse)

2. **Oral exam**
   - positive assessment of report & presentation required
   - exam not compulsory, but required for marks 1 and 2

3. **Quiz**
   - will be taken into account in case of intermediate marks
Assessment of Report & Presentation

Criteria of a good report & presentation

- reasonable effort (30 - 40 hours)
- basic understanding of the article
- honestly identify parts which you did not understand (give a justification: which prerequisites were missing?)
- relate the article to the contents of the course
- quickly check important background articles
- (presentation) being able to answer questions (in particular, those relating the article to the course)
ECTS Breakdown

3 ECTS corresponds to 75h of work for “standard students” fulfilling the prerequisites (i.e., VU Formale Methoden der Informatik - 185.291).

10 classes (including preparation): 25h
research article (report, presentation): 35h
preparation for oral exam: 15h

in total: 75h
Some Related Lectures

- **Complexity Theory**
  181.142 – 2.0 VU – Komplexitätstheorie (in the summer term)
  Reinhard Pichler

- **Datalog**
  184.247 – 2.0 VU – Deduktive Datenbanken (in the winter term)
  Mantas Simkus

- **Special topics in database theory (e.g. decompositions)**
  184.776 – 2.0 VU – Advanced Topics in Foundations of Databases and Artificial Intelligence (in the summer term)
  Georg Gottlob
DB Literature

Most Important DB-Conferences

- ACM SIGMOD:
  - "International Conference on Management of Data"

- VLDB:
  - "International Conference on Very Large Data Bases"
  - 2017 in Munich, Germany: http://www.vldb.org/2017/

- ICDE:
  - "IEEE International Conference on Data Engineering"

- EDBT:
  - "International Conference on Extending Database Technology"
  - 2017 in Venice, Italy: http://edbticdt2017.unive.it/
Most Important DB Theory Conferences

- **ACM PODS:**
  - “Symposium on Principles of Database Systems”
  - always in conjunction with SIGMOD

- **ICDT:**
  - “International Conference on Database Theory”
  - since 2009 in conjunction with EDBT
Most Important DB-Journals

- ACM TODS:
  - “ACM Transactions on Database Systems”
  - free access from TUWIEN domain via ACM digital library

- VLDB Journal
  - free access from TUWIEN domain via University library

- IEEE TKDE:
  - “IEEE Transactions on Knowledge and Data Engineering”
  - free access from TUWIEN domain via IEEE Xplore
Access To Articles

Access from the TUWIEN domain is free to (almost) all major conferences and journals.

- **SIGMOD and PODS proceedings**
  - free access from TUWIEN domain via ACM digital library
  - [http://portal.acm.org/dl.cfm](http://portal.acm.org/dl.cfm) → “Proceedings” → {SIGMOD, PODS}

- **VLDB proceedings:**
  - free access from anywhere
Access To Articles (continued)

- ICDE proceedings
  - free access from TUWIEN domain via IEEE Xplore Digital Library

- EDBT and ICDT proceedings:
  - since 2008: ACM proceedings
    ⇒ free access from TUWIEN domain via ACM digital library
  - formerly: proceedings in Springer LNCS Series
    ⇒ free access from TUWIEN domain via University library
    → “Lecture Notes in Computer Science” → search via volume
    (e.g., ICDT 2007 has volume 4353 of LNCS)
Comfortable Search & Access via DBLP

- DBLP “Computer Science Bibliography”
- contains information on (almost) all relevant publications
- Overview: http://www.informatik.uni-trier.de/~ley/db
- Google-search, e.g., “DBLP <author>” or “DBLP <conference>”
- access to the article by clicking on the article-icon
- free access from TUWIEN-domain as described above (e.g., ACM digital library, Springer Verlag, etc.)
Alternative Search Methods

- Citeseer, e.g., Google-search: “citeseer <title of article>”
- http://scholar.google.com (keyword search)
- Authors’ Homepages