Database Theory
VU 181.140, SS 2016

0. General Information

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Outline

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1. Classes

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

- **Place.**
  - Classes will be held in the **Seminarraum 188/2** (Favoritenstraße 9-11, 4th floor).
  - The quiz at the beginning of the semester will be in the main building, **HS 11 Paul Ludwik**.

- **Time.**
  - Throughout the term: **Tuesdays, 9:00 – 11:00**.
  - **additional classes (if needed):** Depending on the number of participants, additional classes might be needed for the students’ presentations in June (details to be announced later).
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, 3 March 2016, 16:00 - 18:00: HS 11 Paul Ludwik
  - Thursday, 10 March 2016, 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

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<tr>
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<th>Individual work on 1 article from database theory research</th>
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<tr>
<td>1</td>
<td>- Details (e.g. assignment of articles) to be provided later</td>
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<td>- Short written report of this article (2–3 pages)</td>
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<td>- Oral presentation (ca. 20 min, depends on number of participants)</td>
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<td>- Sufficient to get mark 3 (or worse)</td>
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<th>Oral exam</th>
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<td>2</td>
<td>- positive assessment of report &amp; presentation required</td>
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<td>- exam not compulsory, but required for marks 1 and 2</td>
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<th>Quiz</th>
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<td>- will be taken into account in case of intermediate marks</td>
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## 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
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- **Datalog**
  184.247 – 2.0 VU – Deduktive Datenbanken (in the winter term)
  Stefan Woltran
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- **Logic**
  see http://www.logic.at/lvas/
Most Important DB-Conferences

- **ACM SIGMOD:**
  - “International Conference on Management of Data”

- **VLDB:**
  - “International Conference on Very Large Data Bases”

- **ICDE:**
  - “IEEE International Conference on Data Engineering”

- **EDBT:**
  - “International Conference on Extending Database Technology”
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
  - 2016 in Bordeaux, France: http://edbticdt2016.labri.fr/
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 → “Proceedings” → {SIGMOD, PODS}

- VLDB proceedings:
  - Free access from anywhere
  - http://www.vldb.org/ → “VLDB Conferences”
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
  - [http://www.ub.tuwien.ac.at/](http://www.ub.tuwien.ac.at/) → “eBooks” → “Springer Reihen” → “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: via “EE”-field (electronic edition)
- 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