Database Theory
VU 181.140, WS 2019

0. General Information

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Outline

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Classes

- **Time and Place - Original Plan.**
  - Mondays, 09:00 - 11:00, Seminarraum FAV 01 B (Sem 187/2); no Monday classes in the first two weeks.
  - Tuesdays, 09:00 - 11:00, Seminarraum FAV EG B (Sem v.Neumann)
  - No classes on 28/29 October and 11/12 November
  - Quiz at the beginning of the semester: EI 5, Hochenegg HS.
  - **additional classes (if needed):** Depending on the number of participants, additional classes might be needed for the students' presentations in December (details to be announced later).
  - Course ends before the Christmas holidays

- **Problem.** Size of the Sem von Neumann
Classes (continued)

- **Time and Place - Modified Plan.**
  - Mondays, 09:00 - 11:00, Seminarraum FAV 01 B (Sem 187/2);
  - Tuesdays, 09:00 - 11:00
    FAV HS 3 Zemanek (Seminarraum Zemanek): on 15.10., 5.11., 19.11., 26.11.

- Please check the course homepage:
  https://www.dbai.tuwien.ac.at/staff/pichler/complexity
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 helpful (e.g., 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. 10 credits; passed with $\geq 5$.

- **Time and place.**
  - Thursday, 10 October, 09:00 - 11:00: EI 5, Hochenegg HS
  - Thursday, 17 October, 09:00 - 11:00: EI 5, Hochenegg HS
  - 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

- **Datalog**
  184.247 – 2.0 VU – Deduktive Datenbanken
  Mantas Simkus
Some Related Lectures

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- **Complexity Theory**
  181.142 – 2.0 VU – Komplexitätstheorie Mondays and Tuesdays,
  11:00 - 13:00
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Some Related Lectures

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- **Logic**
  see [http://www.logic.at/lvas/](http://www.logic.at/lvas/)
DB Literature

Most Important DB-Conferences

- **ACM SIGMOD:**
  - “International Conference on Management of Data”
  - 2019 in Amsterdam: https://sigmod2019.org/

- **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
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 TUWIEEN domain via IEEE Xplore Digital Library

- **EDBT and ICDT proceedings:**
  - originally Springer LNCS Series or ACM proceedings
  - free access from TUWIEEN domain via University library “eBooks” or ACM digital library
  - EDBT: open proceedings since 2014
  - ICDT: LIPIcs (open access) since 2015
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 "electronic edition' 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