Database Theory
VU 181.140, WS 2020

0. General Information

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Outline

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Classes

- **Language.** This lecture will probably be held in English.
- **Time.** Throughout the term: **Fridays, 09:15 – 11:00.**
- **Place.**
  - All classes will be online via Zoom
    see TISS and/or TUWEL for the Zoom link
  - Also the quiz at the beginning of the semester will be via Zoom
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.**
  - 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 $\geq 5$.

- **Date and Time.**
  - Tuesday, 6 October, 09:00 - 11:00
  - Tuesday, 13 October, 09:00 - 11:00
  - 60 min actual working time
Organization of the Quiz (continued)

- the quiz will be remote
- make sure that you are alone in a room
- join the Zoom meeting
- the camera and microphone have to be switched on during the test
- you will receive the questions as PDF file
- print the file
- enter the solutions on the printout
- at the end: scan your solutions (or take pictures of sufficiently high quality) and upload the scan to TUWEL (in case of problems, send the scan via email to pichler@dbai.tuwien.ac.at).
Communication

- (during, after) classes
- Course Homepage: http://www.dbai.tuwien.ac.at/staff/pichler/dbt
- TISS: please check your mail address in TISS
- TUWEL (probably)
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

Total: 75h
## 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”
  - 2020 in Dallas: [https://www.utdallas.edu/icde/](https://www.utdallas.edu/icde/)

- **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 TUWIEN domain via IEEE Xplore Digital Library

- **EDBT and ICDT proceedings:**
  - originally Springer LNCS Series or ACM proceedings
  - free access from TUWIEN 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: “citedeer <title of article>”
- http://scholar.google.com (keyword search)
- Authors’ Homepages