

EECE 7908 Special Topic: Deductive Database Systems

Fall Semester 2003

EECE 7908 Special Topic: Deductive Database Systems. Fundamentals of deductive database systems and their applications including logic as a data model, query optimization emphasizing top-down and bottom-up evaluation of declarative rules, integrity constraint specification and evaluation, update propagation, CASE tool repositories, and deductive database machines.

Textbooks:

1. *Logic, Programming and Prolog*, U. Nilsson and J. Maluszynski, 2000. (available for free download at <http://www.ida.liu.se/~ulfni/lpp>).
2. *Deductive Databases and Their Applications*, Robert M. Colomb, Taylor and Francis, 1998, ISBN: 0-7484-0796-0.
3. Journal and conference papers will be provided throughout the semester.

References:

1. *PROLOG Programming for Artificial Intelligence*, I. Bratko, Addison-Wesley, 2001, ISBN: 0201-40375-7.1.
2. *Fundamentals of Database Systems*, R. Elmasri, and S. Navathe, Addison-Wesley, 2000, ISBN: 0-8053-1755-4.
3. *Deductive Databases and Logic Programming*, Subrata Kumar Das, Addison-Wesley, 1992, ISBN: 0-201-56897-7
4. *Principles of Database and Knowledge-Base Systems (Volumes 1 and 2)*, Jeffrey D. Ullman, Computer Science Press, 1988 and 1989, ISBN: 0-7167-8158-1 (vol 1) and ISBN: 0-7167-8162-X (vol 2).

Software:

Free SWI-PROLOG and XSB software for education and research is available for free download.

Instructor:

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Goals:

This course is designed to to prepare graduate students in computer engineering or computer science for research in applied logic programming and deductive database systems along with their applications by providing students with the foundation of research results in deductive database theory and by introducing students to the current application topics.

Prerequisites by Topic:

1. Basic concepts of relational databases including relational algebra, relational calculus, and SQL is an **essential** prerequisite for the course.
2. Some familiarity with Prolog and Expert Systems is an advantage, although **not essential** to take the course.

Topics:

1. Origins of deductive database systems and their applications.
2. Review of Basic Set Theory: Sets, Relations, and Functions.
3. Logical Inference.
4. Definite Logic Programs.
5. SL, SLD, SLDNF, SLG Resolution
6. Prolog Programming Primer.
7. Coupling Prolog and Databases.
8. Datalog.
9. Datalog and Bottom-up and Top-down Evaluation.
10. Naïve and Semi-Naïve Datalog Algorithms.
11. Magic Sets.

12. Intensional Database Simplification via Unfolding and Folding.
13. Propositional Deductive Databases.
14. Integrity Constraints.
15. Non-Monotonic Reasoning and truth maintenance in deductive database systems.
16. The XSB System including Tabelaing and Hi-Log.
17. Engineering Deductive Database Applications: GIS, CAD, and Semantic Web.

Grading:

2 Exams	40 %
Final Exam	20 %
Pop Quizzes	10%
Homework	10 %
Project	20 %