EMTM 605 - Expert Systems
Professor Lyle Ungar

Syllabus

Overall goals
Know the capabilities of current technology in knowledge-based expert systems, including intelligent agents and machine learning. Be able to recognize what problems are appropriate for expert systems, select an appropriate knowledge representation and reasoning method, and anticipate potential difficulties in developing and introducing the expert systems. This requires familiarity with the basic approaches to knowledge representation and inference such as rules, frames and search, and machine learning techniques such as ID3 and neural networks. It also requires understanding the political, technical and managerial issues involved in automating decision making.

Schedule

1. Overview; introduction to rule-based expert systems
Background, general introduction
Forward and backward chaining, conflict resolution
Uses: structured selection, configuration, diagnosis
and business rules

2. Rule-based expert systems
Uncertainty, fuzzy logic and belief nets
Expert System Shells

3. Other expert system paradigms
PIES example system (Pan and Tenenbaum)
OOPs, frames
Case-based reasoning and help desks
Recommender systems (CDNow Case Study)
Scheduling (Steelmaking example: Dorn and Slany)

4. Building expert systems
CLUES example system (Talebzadeh, Mandutianu and Winner)
Building expert systems
Discussion of shells
Knowledge Management (Wiki web case study)

5. Machine learning and data-base mining
Data Mining
Decision Trees, Neural Networks
Text Mining, Web mining

6. Current trends, projects
Current trends in AI
Presentation and discussion of projects
EMTM 605 - Administrivia

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Text

Grading
Grading will be based 90% on homework and 10% on class participation.

*Note that Homework 1 is due in class 2, Homework 2 is due in class 3, etc.*
Readings

The textbook is supplemental to the lectures. You are welcome to read it before or after the lectures or just use it as a reference when doing the homework. See the course website for supplemental material.

1. Overview; introduction to rule-based expert systems
   Chapts. 1, 2, 4, 5

2. Rule-based expert systems
   Chap. 8 (skip 8.4)

3. Frames, object-oriented programming and scheduling
   PIES: An engineer’s do-it-yourself knowledge system for interpretation of parametric test data, Pan and Tenenbaum
   A flow shop with compatibility constraints in a steelmaking plant, Dorn and Slany
   Product descriptions from APICS and MIMI
   Chap. 6

4. Building expert systems
   Coutrywide Loan-Underwriting Expert System, Talebzadeh, Mandutianu and Winner (CLUES)
   Chapts. 10-14, 16

5. Machine learning and data-base mining
   Chap. 15
   Sections 9.4, 9.6
   Chapts 21 and 22 from Pat Winston’s AI text: “Learning by building identification trees” and “Learning by training neural nets”

6. Current trends, projects
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