CS 6200 : ADVANCED TOPICS IN ARTIFICIAL INTELLIGENCE

Semester Hours: 3.0  
Contact Hours: 3

Coordinator: TBD
Text: TBD
Author(s): TBD
Year: TBD

SPECIFIC COURSE INFORMATION

Catalog Description:

Intensive study of a major sub-field such as neural networks, expert systems, machine learning/tutoring, natural language processing, pattern recognition, robotics, or others.

Course Type: ELECTIVE

SPECIFIC COURSE GOALS

- TBD

LIST OF TOPICS COVERED

- Introduction
  - Definitions
    - AI, Expert System, Rule-Based Expert System (RBES)
  - How an RBES works
  - Brief history of RBES
  - Applications of RBES
- Foundation of RBES: Rule-Based Production Systems (RBPS)
  - Production system formalisms
  - Operational principles of RBPS
  - Evaluation of RBPS
    - Advantages
    - Disadvantages
- Inference Engines (Automated RBPS)
  - Search
• Chaining
• Conflict resolution
• Success and failure
• Development of RBES using CLIPS (NASA’s RBES tool)
  o Tutorial on CLIPS
  o Preconditions
  o Stages
    ▪ Problem selection
    ▪ Knowledge acquisition: elicitation and induction
    ▪ Knowledge representation: facts and rules
    ▪ Design of the human interface
    ▪ Design of the production system
    ▪ Design of the explanation system
    ▪ Iterative prototyping
    ▪ Verification: consistency and completeness
    ▪ Validation
    ▪ Application
  o Problems and pitfalls
• Fuzzy Logic
  o Representation of uncertainty
    ▪ Abstraction as a solution
    ▪ Bayesian logic as a solution
    ▪ Certainty factors as a solution
    ▪ Fuzzy logic as a solution
  o Tutorials on fuzzy logic
    ▪ Classical Set Theory (Cantor)
    ▪ Multi-Valued Logic (Lukasiewics)
      • Relationships: complement, containment, intersection, union
      • Formal definitions
      • Membership graphs: S, Z, and Pi
      • Linguistic Variables, Values, and Modifiers (Hedges)
• Development of RBES Using Fuzzy CLIPS
  o Tutorial on Fuzzy CLIPS (an extension of CLIPS)
  o Design considerations
    ▪ Preconditions for a “Fuzzy” solution
    ▪ Methods of representing uncertainty in Fuzzy CLIPS
  o Major application areas for fuzzy expert systems
  o Advantages of Fuzzy Inference Control
• Case Studies of Successfully Deployed Expert Systems
  o MACSYMA
  o MYCIN
  o XCON
• PROSPECTOR

  • Evaluation of Expert Systems
    o Ethical issues in expert systems
    o Benefits of expert systems compared to human experts
    o Limitations of expert systems