

Department of Computer Engineering

T.E. (Computer Sem VI) Assignment -2 Artificial Intelligence (CSC604)

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Assignment 2:

Considering the following objectives:

CSC604.1: To grasp the fundamental concepts and methods involved in creating intelligent systems.

CSC604.2: Ability to choose an appropriate problem solving method and knowledge representation technique.

CSC604.3: Ability to analyze the strength and weaknesses of AI approaches to knowledge– intensive problem solving.

CSC604.4: Ability to design models for reasoning with uncertainty as well as the use of unreliable information.

CSC604.5: Ability to design and develop AI applications in real world scenarios.

A) What are the key considerations in designing an expert system that effectively utilizes knowledge representation techniques to handle uncertainty and unreliable information, while ensuring practicality in real-world applications?

Soln: When designing an expert system that effectively utilizes knowledge representation techniques to handle uncertainty and unreliable information, while ensuring practicality in real-world applications, the following key considerations should be taken into account.

1. Knowledge Representation Technique (CSC604.2)

- a) Choose an appropriate knowledge representation technique that can handle uncertain and incomplete information, such as fuzzy logic, probabilistic reasoning, or belief networks.
- b) Evaluate the trade-offs between expressiveness, computational efficiency, and ease of knowledge acquisition for the chosen technique.

2. Uncertainty Handling (CSC604.4)

- a) Incorporate mechanisms to handle uncertainty, such as probability theory, fuzzy logic, or evidence theory (e.g., Dempster-Shafer theory).
- b) Implement methods for reasoning with uncertain or unreliable information, such as Bayesian inference, fuzzy inference systems, or belief revision techniques.

3. Knowledge Acquisition and Maintenance (CSC604.1, CSC604.3)

- a) Establish a systematic process for acquiring domain knowledge from human experts or other sources.
- b) Develop techniques for verifying and validating the acquired knowledge to ensure its consistency and accuracy.
- c) Implement mechanisms for updating and maintaining the knowledge base as new information becomes available.

4. Explanation and Justification (CSC604.3)
 - a) Incorporate methods for explaining the reasoning process and decisions made by the expert system.
 - b) Provide justifications and rationales for the system's recommendations or conclusions, especially when dealing with uncertain or conflicting information.
5. User Interface and Interaction (CSC604.5)
 - a) Design an intuitive and user-friendly interface that facilitates effective communication between the user and the expert system.
 - b) Implement mechanisms for users to provide feedback, clarifications, or additional information to refine the system's reasoning process.
6. Evaluation and Testing (CSC604.5)
 - a) Develop a rigorous evaluation plan to assess the expert system's performance, accuracy, and robustness in real-world scenarios.
 - b) Conduct extensive testing with various input scenarios, including edge cases and situations involving uncertainty or unreliable information.
7. Domain Relevance and Applicability (CSC604.5)
 - a) Ensure that the expert system is tailored to the specific domain and real-world requirements of the intended application.
 - b) Continuously gather feedback from domain experts and end-users to refine and improve the system's performance and usability.

B) Additionally, how do these considerations align with the strengths and weaknesses of various AI approaches to knowledge-intensive problem solving?

Soln: The considerations mentioned above align with the strengths and weaknesses of various AI approaches to knowledge-intensive problem solving in the following ways:

1. Rule-based Systems

Strength: Excellent for representing and reasoning with well-defined and structured knowledge.

Weakness: Difficulty in handling uncertainty, incomplete information, and exceptions to rules.

2. Case-based Reasoning

Strength: Ability to leverage past experiences and adapt solutions to new situations.

Weakness: Reliance on the availability and quality of past cases, and the ability to identify relevant similarities.

3. Fuzzy Logic

Strength: Effective in handling vague or imprecise information and modeling human reasoning processes.

Weakness: Complexity in defining and tuning membership functions and rule bases.

4. Probabilistic Reasoning (Bayesian Networks, Markov Models)

Strength: Ability to reason with uncertain and incomplete information using probability theory.

Weakness: Difficulty in acquiring and representing complex probabilistic relationships and dependencies.

5. Neural Networks and Machine Learning

Strength: Ability to learn patterns and relationships from data, making them suitable for handling uncertainty and adapting to new information.

Weakness: Lack of transparency in the reasoning process and difficulty in explaining the decisions made by the system.

1. Rubrics for the First Assignments:

Indicator	Average	Good	Excellent	Marks
Organization (2)	Readable with some missing points and structured (1)	Readable with improved points coverage and structured (1)	Very well written and fully structured	
Level of content (4)	All major topics are covered, the information is accurate (2)	Most major and some minor criteria are included. Information is accurate (3)	All major and minor criteria are covered and are accurate (4)	
Depth and breadth of discussion and representation (4)	Minor points/information maybe missing and representation is minimal (1)	Discussion focused on some points and covers them adequately (2)	Information is presented in depth and is accurate (4)	
Total				

Signature of the Teacher