ARTIFICIAL INTELLIGENCE
CT 653

Lecture : 3 **Year : III**
Tutorial : 1 **Part : II**
Practical : 3/2

Course Objectives:
The main objectives of this course are:

- To provide basic knowledge of Artificial Intelligence
- To familiarize students with different search techniques
- To acquaint students with the fields related to AI and the applications of AI

1. Introduction (4 hrs)
- 1.1. Definition of Artificial Intelligence
- 1.2. Importance of Artificial Intelligence
- 1.3. AI and related fields
- 1.4. Brief history of Artificial Intelligence
- 1.5. Applications of Artificial Intelligence
- 1.6. Definition and importance of Knowledge, and learning.

2. Problem solving (4 hrs)
- 2.1. Defining problems as a state space search,
- 2.2. Problem formulation
- 2.3. Problem types, Well- defined problems, Constraint satisfaction problem,
- 2.4. Game playing, Production systems.

3. Search techniques (5 hrs)
- 3.1. Uninformed search techniques- depth first search, breadth first search, depth limit search, and search strategy comparison,
- 3.2. Informed search techniques-hill climbing, best first search, greedy search, A* search Adversarial search techniques-minimax procedure, alpha beta procedure

4. Knowledge representation, inference and reasoning (8 hrs)
- 4.1. Formal logic-connectives, truth tables, syntax, semantics, tautology, validity, well- formed-formula,
- 4.2. Propositional logic, predicate logic, FOPL, interpretation, quantification, horn clauses,
- 4.3. Rules of inference, unification, resolution refutation system (RRS), answer extraction from RRS, rule based deduction system,
- 4.4. Statistical Reasoning-Probability and Bayes' theorem and causal networks, reasoning in belief network

5. Structured knowledge representation (4 hrs)
- 5.1. Representations and Mappings,
- 5.2. Approaches to Knowledge Representation,
- 5.3. Issues in Knowledge Representation,
- 5.4. Semantic nets, frames,
- 5.5. Conceptual dependencies and scripts

6. Machine learning (6 hrs)
- 6.1. Concepts of learning,
- 6.2. Learning by analogy, Inductive learning, Explanation based learning
- 6.3. Neural networks,
- 6.4. Genetic algorithm
- 6.5. Fuzzy learning
- 6.6. Boltzmann Machines

7. Applications of AI (14 hrs)
- 7.1. Neural networks
  - 7.1.1. Network structure
  - 7.1.2. Adaline network
  - 7.1.3. Perceptron
  - 7.1.4. Multilayer Perceptron, Back Propagation
  - 7.1.5. Hopfield network
  - 7.1.6. Kohonen network
- 7.2. Expert System
  - 7.2.1. Architecture of an expert system
  - 7.2.2. Knowledge acquisition, induction
  - 7.2.3. Knowledge representation, Declarative knowledge, Procedural knowledge
  - 7.2.4. Development of expert systems
- 7.3. Natural Language Processing and Machine Vision
  - 7.3.1. Levels of analysis: Phonetic, Syntactic, Semantic, Pragmatic
  - 7.3.2. Introduction to Machine Vision

Practical:

Laboratory exercises should be conducted in either LISP or PROLOG. Laboratory exercises must cover the fundamental search techniques, simple question answering, inference and reasoning.

References:

1. E. Rich and Knight, *Artificial Intelligence*, McGraw Hill, 2009.
2. D. W. Patterson, *Artificial Intelligence and Expert Systems*, Prentice Hall, 2010.
3. P. H. Winston, *Artificial Intelligence*, Addison Wesley, 2008.
4. Stuart Russel and Peter Norvig, *Artificial Intelligence A Modern Approach*, Pearson, 2010

Evaluation Scheme:

The question will cover all the chapters of the syllabus. The evaluation scheme will be as indicated in the table below:

Unit	Hour	Marks Distribution*
1	4	7
2	4	7
3	5	9
4	8	14
5	4	7
6	6	10
7	14	26
Total	45	80

*There can be minor deviations in the numbers