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Artificial Intelligence Search Methods & Reasoning

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ISBN 13 :	978-93-55384-10-2
ISBN 10 :	9355384106
E-ISBN 13 :	978-93-55384-10-2
Edition :	First
Pages :	96
Type of book :	Physical
Year :	2026
Language :	English
Publisher :	Khanna Publishing House
M.R.P :	Rs 148.00
Categories :	Computer Science Engineering, Book Store, Sathyabama Series, New Arrivals
Condition Type :	New
Country Origin :	India

Product Description

Artificial Intelligence Search Methods and Reasoning serves as an essential guide to the foundational principles and core algorithmic strategies that power modern intelligent systems. This book uniquely blends the basic cognitive science behind AI—exploring concepts of intelligence, memory, computation, and learning—with the practical, rigorous algorithms used for problem-solving in complex environments. Its core theme is to demystify how intelligent agents perceive, reason, and act by systematically searching for optimal solutions.

The primary purpose of this resource is to equip learners with a deep, practical understanding of both uninformed (e.g., BFS, DFS) and informed search techniques (e.g., A*, Greedy Best-First Search), adversarial search, and constraint satisfaction problems (CSPs). The text further extends into crucial domains like knowledge representation using logical agents (propositional and first-order logic) and probabilistic reasoning (Bayesian networks, Hidden Markov Models). It culminates in a detailed examination of various learning algorithms, including supervised, unsupervised, reinforcement, and ensemble methods.

The target audience for this book includes undergraduate and graduate students in Computer Science, Artificial Intelligence, and Electrical Engineering, as well as researchers and professionals seeking a robust, algorithm-focused foundation in AI theory and implementation. It offers practical value through numerous case studies, such as the N-Queens Problem, the Wumpus World, and the application of Nature-Inspired Computation like Ant Colony Optimization for the Traveling Salesman Problem. It is a vital resource for building intelligent systems capable of autonomous decision-making.

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• Foundational AI Concepts: Provides a unique introduction to the cognitive roots of AI, detailing the science behind intelligence, human memory models, and their translation into computational systems.

• Exhaustive Search Algorithms: Offers comprehensive coverage of Uninformed Search methods (BFS, DFS, IDDFS, UCS, Bidirectional Search) & advanced Informed Search strategies, including heuristics & A*.

• Logic and Reasoning: Systematically explores the role of knowledge and its representation using propositional and First-Order Logic, enabling agents to perform complex inference via Forward and Backward Chaining.

• Probabilistic Approaches: Dedicated unit on planning and reasoning under uncertainty, covering essential topics like Bayes' Rule, Bayesian Networks, Hidden Markov Models, and Kalman Filters.

• Constraint Solving & Games: Detailed breakdown of Constraint Satisfaction Problems (CSPs), including a case study on the N-Queens problem, alongside an exploration of Adversarial Search strategies for competitive environments.

• Modern Learning Paradigms: Includes extensive chapters on learning intelligence, covering Supervised, Unsupervised, and Ensemble Learning techniques (e.g., Boosting/AdaBoost), vital for contemporary AI applications.

• Real-World Case Studies: Features practical application examples like solving the Wumpus World problem and a special unit on Nature-Inspired Computation, demonstrating Ant Colony Optimization for the Traveling Salesman Problem (TSP).

• Intelligent Agent Design: Focuses on the Rational Agent approach, detailing the PEAS framework (Performance, Environment, Actuators, Sensors) and exploring agent rationality, learning, and autonomy.

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