Forward And Backward Chaining In Artificial Intelligence

Minmax algorithm bc3b122529 In game theory, researchers apply it to (simpler) subgames to find a solution to the game, in a process called backward induction. In chess, it is called retrograde analysis, and it is used to generate table bases for chess endgames for computer chess. bc3b122529 Backward chaining is implemented in logic programming by SLD resolution. Both rules are based on the modus ponens inference rule. It is one of the two most commonly used methods of reasoning with inference rules and logical implications – the other is forward chaining. Backward chaining systems usually employ a depth-first search strategy, e.g. Prolog. bc3b122529

Planner (programming language) assert Q If assert not Q, assert not P Backward chaining (consequently) If goal Q, goal P If goal not P, goal not Q In this respect, the development of Planner Planner (often seen in publications as "PLANNER" although it is not an acronym) is a programming language designed by Carl Hewitt at MIT, and first published in 1969. First, subsets such as Micro-Planner and Pico-Planner were implemented, and then essentially the whole language was implemented as Popler by Julian Davies at the University of Edinburgh in the POP-2 programming language. Derivations such as QA4, Conniver, QLISP and Ether (see scientific community metaphor) were important tools in artificial intelligence research in the 1970s, which influenced commercial developments such as Knowledge Engineering Environment (KEE) and Automated Reasoning Tool (ART) bc3b122529

According to Russell and Norvig's Artificial Intelligence: A Modern Approach, structural representations assemble "facts about particular object and event types and [arrange] the types into a large taxonomic hierarchy analogous to a biological taxonomy". bc3b122529 High-profile applications of AI include advanced web search engines, chatbots, virtual assistants, autonomous vehicles, play and analysis in strategy games (e.g., chess and Go), and content generation (e.g. images, audio, and videos). bc3b122529 The traditional goals of AI research include learning, reasoning, knowledge representation, planning, natural language processing, and perception, as well as support for robotics. To reach these goals, AI researchers use techniques including state space search and mathematical optimisation, formal logic, artificial neural networks, and methods based on statistics, operations research, and economics. AI also draws upon psychology, linguistics, philosophy, neuroscience... bc3b122529

Outline of artificial intelligence Horn clause – Type of logical formula Forward chaining – Inference engine in an expert system Backward chaining – Method of forming inferences Planning The following outline is provided as an overview of and topical guide to artificial intelligence: bc3b122529

Inference engine Inference engines work primarily in one of two modes either special rule or facts: forward chaining and backward chaining. The first inference engines were components of expert systems. Backward chaining starts with goals, and works backward to determine what facts must be asserted so that the goals can be achieved. This process would iterate as each new fact in the knowledge base could trigger additional rules in the inference engine. The inference engine applied logical rules to the knowledge base and deduced new knowledge. The typical expert system consisted of a knowledge base and an inference engine. forward chaining and backward chaining. Forward chaining starts with the known facts and asserts new facts. The knowledge base stored facts about the world. Backward chaining starts with goals, and works In the field of artificial intelligence, an inference engine is a software component of an intelligent system that applies logical rules to the knowledge base to deduce new information. Forward chaining starts with the known facts and asserts new facts bc3b122529

== Usage == bc3b122529

Backward chaining It is used in automated theorem provers, inference engines, proof assistants, and other artificial intelligence applications. Backtracking Backward induction Forward chaining Graphplan Opportunistic Backward chaining (or backward reasoning) is an inference method described colloquially as working backward from the goal. Knowledge Machine and ECLiPSe support backward chaining within their inference engines bc3b122529

Artificial intelligence (AI) is intelligence exhibited by machines or software. It is also the name of the scientific field which studies how to create computers and computer software that are capable of intelligent behavior. bc3b122529 Expectiminimax bc3b122529 Uniform-cost search bc3b122529 Iterative deepening A* bc3b122529 Specific reasoning methods may be used to draw conclusions from a set of given facts in a knowledge base, e.g. forward chaining versus backward chaining. However, in opportunistic reasoning, pieces of knowledge may be applied either forward or backward, at the "most opportune time". bc3b122529 An opportunistic reasoning system may combine elements of both forward and backward reasoning. It is useful when the number of possible inferences is very large and the reasoning system must be responsive to new data that may become known. bc3b122529 Opportunistic reasoning has been used in applications such as blackboard systems and medical applications. bc3b122529 Hill climbing bc3b122529 Beam stack search bc3b122529 The two major paradigms for constructing semantic software systems were procedural and logical. The procedural paradigm was epitomized by bc3b122529 Beam search bc3b122529 == Frame structure == bc3b122529 Alpha–beta pruning bc3b122529 The logical paradigm was epitomized by uniform proof procedure resolution-based derivation (proof) finders. According to the logical paradigm it was “cheating” to incorporate procedural knowledge. bc3b122529 Additionally, the concept of 'inference' has expanded to include the process through which trained neural networks generate predictions or decisions. In this context, an 'inference engine' could refer to the specific part of the system, or even the hardware, that executes these operations... bc3b122529

Opportunistic reasoning However, in opportunistic reasoning, pieces of knowledge may be applied either forward or backward, at Opportunistic reasoning is a method of selecting a suitable logical inference strategy within artificial intelligence applications. forward chaining versus backward chaining. g bc3b122529

Backward chaining starts with a list of goals (or a hypothesis) and works backwards from the consequent to the antecedent to see if any data supports any of these consequents. An inference engine using backward chaining would search the inference rules until it finds one with a consequent (Then clause) that matches a desired goal... bc3b122529 General Problem Solver bc3b122529

List of artificial intelligence algorithms algorithm Genetic programming Particle swarm optimization Backward chaining DPLL algorithm Forward chaining Resolution (logic) Rete algorithm WalkSAT Baum–Welch This is a list of artificial intelligence algorithms, including algorithms and algorithmic methods used in artificial intelligence (AI) for search, automated reasoning, knowledge representation and reasoning, planning, machine learning, deep learning, natural language processing, computer vision, and related areas bc3b122529

Glossary of artificial intelligence bc3b122529 They were proposed by Marvin Minsky in his 1974 article "A Framework for Representing Knowledge". Frames are the primary data structure used in artificial intelligence frame languages; they are stored as ontologies of sets. bc3b122529 Frames are also an extensive part of knowledge representation and reasoning schemes. They were originally derived from semantic networks and are therefore part of structure-based knowledge representations. bc3b122529 Depth-first search bc3b122529 Symbolic AI was the dominant paradigm of AI research from the mid-1950s until the mid-1990s. Researchers in the 1960s and the 1970s were convinced that symbolic approaches would eventually succeed in creating a machine with artificial general intelligence and considered this the ultimate goal of their field. An early boom, with early successes such as the Logic Theorist and Samuel's Checkers Playing... bc3b122529 Marin D. Simina et al. "Opportunistic Reasoning: A Design Perspective" in Proceedings of the Seventeenth Annual Conference of Cognitive Science edited by Johanna D. Moore, 1995 ISBN 0-8058-2159-7, page 78 bc3b122529 SSS* bc3b122529 Iterative deepening depth-first search bc3b122529 Best-first search bc3b122529 Lisp which featured recursive procedures that operated on list structures. bc3b122529 Breadth-first search bc3b122529 is a collection of methods based on high-level symbolic (human-readable) representations of problems, logic, and search. Symbolic AI used tools such as logic programming, production rules, semantic nets and frames. It developed applications such as knowledge-based systems (in particular, expert systems), symbolic mathematics, automated theorem provers, ontologies, the semantic web, and automated planning and scheduling systems. The symbolic AI paradigm led to important ideas in search, symbolic programming languages, agents, multi-agent systems, the semantic web, and the strengths and limitations of formal knowledge and reasoning systems. bc3b122529 == AI terminology == bc3b122529

Symbolic artificial intelligence In artificial intelligence (AI), symbolic artificial intelligence (also known as classical artificial intelligence or logic-based artificial intelligence) In artificial intelligence (AI), symbolic artificial intelligence (also known as classical artificial intelligence or logic-based artificial intelligence) bc3b122529

Simulated annealing bc3b122529 Monte Carlo tree search bc3b122529

Glossary of artificial intelligence early backward chaining expert system that used artificial intelligence to identify bacteria causing severe infections, such as bacteremia and meningitis This glossary of artificial intelligence is a list of definitions of terms and concepts relevant to the study of artificial intelligence (AI), its subdisciplines, and related fields. Related glossaries include Glossary of computer science, Glossary of robotics, Glossary of machine vision, and Glossary of logic bc3b122529

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Frame (artificial intelligence) As with most early commercial versions of AI software KEE was originally deployed in Lisp Frames are an artificial intelligence data structure used to divide knowledge into substructures by representing "stereotyped situations". and a rule engine that supported backward and forward chaining bc3b122529

== Search and optimization == bc3b122529 A* search algorithm bc3b122529

Artificial intelligence Artificial intelligence (AI) is the capability of computational systems to perform tasks typically associated with human intelligence, such as learning Artificial intelligence (AI) is the capability of computational systems to perform tasks typically associated with human intelligence, such as learning, reasoning, problem-solving, perception, and decision-making. It is a field of research in engineering, mathematics, and computer science that develops and studies methods and software that enable machines to perceive their environment and use learning and intelligence to take actions that maximise their chances of achieving defined goals bc3b122529

== Procedural approach versus logical approach == bc3b122529 == References == bc3b122529