
COMPUTER ALGORITHMS

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GLOSSARY

Algorithm: Sequence of well-defined instructions the execution of which results in the solution of a specific problem. The instructions are unambiguous, and each can be performed in a finite amount of time. Furthermore, the execution of all the instructions together takes only a finite amount of time.

Approximation algorithm: Algorithm that is guaranteed to produce solutions whose value is within some prespecified amount of the value of an optimal solution.

Asymptotic analysis: Analysis of the performance of an algorithm for large problem instances. Typically, the time and space requirements are analyzed and provided as a function of parameters that reflect properties of the problem instance to be solved. Asymptotic notation (e.g., big "oh," theta, omega) is used.

Deterministic algorithm: Algorithm in which the outcome of each step is well defined and determined by the values of the variables (if any) involved in the step. For example, the value of $x + y$ is determined by the values of x and y .

Heuristic: Rule of thumb employed in an algorithm to improve its performance (time and space requirements or quality of solution produced). This rule may be very effective in certain instances and ineffective in others.

Lower bound: Defined with respect to a problem. A lower bound on the resources (time or space) needed to solve a specified problem has the property that the problem cannot be solved by any algorithm that uses less resource than the lower bound.

Nondeterministic algorithm: Algorithm that may contain some steps whose outcome is determined by selecting from a set of permissible outcomes. There are no rules determining how the selection is to be made. Rather, such an algorithm terminates in one of two modes: success and failure. It is required that, whenever possible, the selection of the outcomes of individual steps be done in such a way that the algorithm terminates successfully.

NP-Complete problem: Decision problem (one for which the solution is "yes" or "no") that has the following property. The decision problem can be solved in polynomial deterministic time iff all decision problems that can be solved in nondeterministic polynomial time are also solvable in deterministic polynomial time.

NP-Hard problem: Problem for which the following is true. If this problem can be solved in polynomial deterministic time, then all decision problems that can be solved in nondeterministic polynomial time are also solvable in deterministic polynomial time.

Performance: Amount of resources (i.e., amount of computer time and memory) required by an algorithm. If the algorithm does not guarantee optimal solutions, the term *performance* is also used to include some measure of the quality of the solutions produced.

Probabilistically good algorithm: Algorithm that does not guarantee optimal solutions but generally does provide them.

