

CSCI 404/504: Design and Analysis of Algorithms
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Why NP-completeness?

1. NP-complete problems span a wide variety of disciplines, notably, logic, operations research, electrical engineering, communication engineering and computer science.
2. There is enough indirect evidence to believe that once a problem is shown to be NP-complete, an efficient solution is extremely unlikely, and in such a case, it is best to look out for heuristics. Accordingly, the study of NP-completeness is not a theoretical curiosity; rather it is a topic of strong technical importance.
3. A large number of real-life problems are now known to be NP-complete – a depressing situation indeed! Examples include satisfiability of a Boolean formula, graph coloring, traveling salesman problem and set covering problem.
4. NP-complete problems constitute a very interesting class having several common characteristics. In particular, a polynomial-time solution to any one such problem would imply a polynomial-time solution to all other problems in this class. The converse is also true, viz., intractability of (i.e., non-existence of a polynomial-time solution to) any one NP-complete problem would imply intractability of all other problems in this class.