Coping with NP-completeness: Introduction

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Advanced Algorithms and Complexity
**Data Structures and Algorithms**

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- Alas, this happens rarely

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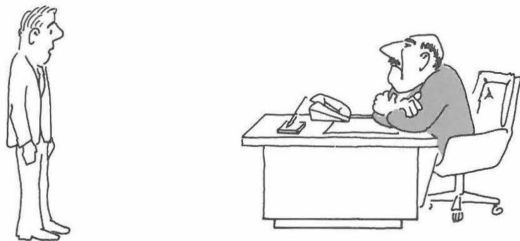
"I can't find an efficient algorithm, I guess I'm just too dumb."

Michael R. Garey and David S. Johnson.
Computers and Intractability: A Guide to the Theory of NP-Completeness. 1979.

Perhaps there is just no efficient algorithm
for your search problem.

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"I can't find an efficient algorithm, because no such algorithm is possible!"

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- Note that such a proof would resolve the **P** vs **NP** question
- Instead of showing that there is no efficient algorithm for your program, you show that it is one of the hardest search problems
- That is, you show that your problem is **NP**-complete

"I can't find an efficient algorithm, but neither can all these famous people!"

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Keep your head up!

It is just the beginning of a fascinating adventure!

Next Parts

If $\mathbf{P} \neq \mathbf{NP}$, then there is no polynomial time algorithm that finds an optimal solution to an **NP**-complete problem in all cases.

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	poly time	optimal solution	all cases
special cases	✓	✓	✗
approximation algorithms	✓	✗	✓
exact algorithms	✗	✓	✓