Computational Complexity

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1 Review of concepts

1. Instance, Problems, Solutions. Chess and Euler graph.
2. Notion of time and scaling. Input size. Matrix multiplication.
3. Polynomial time and tractability.
4. Robustness of **P**.
5. Main theme of computational complexity - **P** or not in **P**. Less emphasis on most efficient algorithms.

2 Algorithmic Insights

1. What makes a problem tractable?
2. Recursion.
3. Divide and Conquer.
4. Greedy.
5. Dynamic Programming.
6. Iterative Approaches (Rewriting).
7. Reductions.

3 Recursion

1. Finding the maximum in an array.
2. Searching for an element in an array.
3. The Towers of Hanoi Problem.

4 Divide and Conquer

1. The Master Theorem.
2. The Mergesort algorithm.
3. The Quicksort algorithm.
4. Modular Exponentiation.
5. Strassen's matrix multiplication.

5 Greedy

1. The minimum spanning tree problem.
2. The fractional knapsack problem.