

DSA Tutorial Data Structures Algorithms Array Strings Linked List Stack Queue Tree Graph

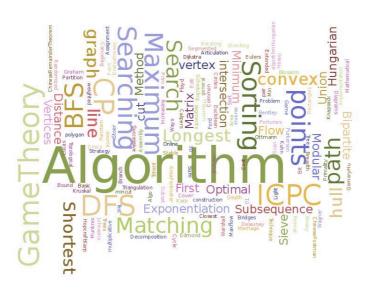
Top 10 Algorithms and Data Structures for Competitive Programming

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In this post, we will discuss Important top 10 algorithms and data structures for competitive coding.

Topics:

- 1. Graph algorithms
- 2. Dynamic programming
- 3. Searching and Sorting:
- 4. Number theory and Other Mathematical
- 5. Geometrical and Network Flow Algorithms
- 6. Data Structures



The links below cover most important algorithms and data structure topics:

Graph Algorithms

- 1. Breadth First Search (BFS)
- 2. Depth First Search (DFS)
- 3. Shortest Path from source to all vertices **Dijkstra**
- 4. Shortest Path from every vertex to every other vertex **Floyd Warshall**
- 5. Minimum Spanning tree **Prim**

- 6. Minimum Spanning tree **Kruskal**
- 7. Topological Sort
- 8. Johnson's algorithm
- 9. Articulation Points (or Cut Vertices) in a Graph
- 10. Bridges in a graph

All Graph Algorithms

Dynamic Programming

- 1. Longest Common Subsequence
- 2. Longest Increasing Subsequence
- 3. Edit Distance
- 4. Minimum Partition
- 5. Ways to Cover a Distance
- 6. Longest Path In Matrix
- 7. Subset Sum Problem
- 8. Optimal Strategy for a Game
- 9. <u>0-1 Knapsack Problem</u>
- 10. Assembly Line Scheduling

All DP Algorithms

Searching And Sorting

- 1. Binary Search
- 2. Quick Sort
- 3. Merge Sort
- 4. Order Statistics
- 5. KMP algorithm
- 6. Rabin karp
- 7. Z's algorithm
- 8. Aho Corasick String Matching
- 9. Counting Sort
- 10. Manacher's algorithm: Part 1, Part 2 and Part 3

All Articles on Searching, Sorting and Pattern Searching.

Number theory and Other Mathematical

Prime Numbers and Prime Factorization

- 1. Primality Test | Set 1 (Introduction and School Method)
- 2. Primality Test | Set 2 (Fermat Method)
- 3. Primality Test | Set 3 (Miller-Rabin)
- 4. Sieve of Eratosthenes
- 5. <u>Segmented Sieve</u>
- 6. Wilson's Theorem
- 7. Prime Factorization
- 8. Pollard's rho algorithm

Modulo Arithmetic Algorithms

- 1. Basic and Extended Euclidean algorithms
- 2. Euler's Totient Function
- 3. Modular Exponentiation
- 4. Modular Multiplicative Inverse
- 5. Chinese remainder theorem Introduction
- 6. Chinese remainder theorem and Modulo Inverse Implementation
- 7. nCr%m and this.

Miscellaneous:

- 1. Counting Inversions
- 2. Counting Inversions using BIT
- 3. logarithmic exponentiation
- 4. Square root of an integer
- 5. <u>Heavy light Decomposition</u>, this and this
- 6. Matrix Rank
- 7. Gaussian Elimination to Solve Linear Equations
- 8. Hungarian algorithm
- 9. Link cut
- 10. Mo's algorithm and this
- 11. Factorial of a large number in C++
- 12. Factorial of a large number in Java+
- 13. Russian Peasant Multiplication
- 14. Catalan Number

All Articles on Mathematical Algorithms

Geometrical and Network Flow Algorithms

1. Convex Hull

- 2. Graham Scan
- 3. Line Intersection
- 4. Interval Tree
- 5. Matrix Exponentiation and this
- 6. Maxflow Ford Furkerson Algo and Edmond Karp Implementation
- 7. Min cut
- 8. Stable Marriage Problem
- 9. Hopcroft-Karp Algorithm for Maximum Matching
- 10. Dinic's algo and e-maxx

All Articles on Geometric Algorithms

Data Structures

- 1. Binary Indexed Tree or Fenwick tree
- 2. Segment Tree (RMQ, Range Sum and Lazy Propagation)
- 3. K-D tree (See insert, minimum and delete)
- 4. <u>Union Find Disjoint Set</u> (<u>Cycle Detection</u> and <u>By Rank and Path</u> <u>Compression</u>)
- 5. Tries
- 6. Suffix array (this, this and this)
- 7. <u>Sparse table</u>
- 8. Suffix automata
- 9. Suffix automata II
- 10. LCA and RMQ

All Articles on Advanced Data Structures.

How to Begin?

Please see <u>How to begin with Competitive Programming?</u>

How to Practice?

Please see https://practice.geeksforgeeks.org/

What are top algorithms in Interview Questions?

Top 10 algorithms in Interview Questions

How to prepare for ACM – ICPC?

How to prepare for ACM – ICPC?

This is an initial draft. We will soon be adding more links and algorithms to this post.