Topics :

- Analysis of Algorithms
- Searching and Sorting
- Greedy Algorithms
- Dynamic Programming
- Pattern Searching
- Other String Algorithms
- Backtracking
- Divide and Conquer
- Geometric Algorithms
- Mathematical Algorithms
- Bit Algorithms
- Graph Algorithms
- Randomized Algorithms
- Quizzes on Algorithms
- Misc

Analysis of Algorithms:

- Asymptotic Analysis
- Worst, Average and Best Cases
- Asymptotic Notations
- Analysis of Loops
- Solving Recurrences
- Amortized Analysis
- What does 'Space Complexity' mean?
- NP-Completeness Introduction
- A Time Complexity Question
- Time Complexity of building a heap
- Time Complexity where loop variable is incremented by 1, 2, 3, 4 ..
- Time Complexity of Loop with Powers
- Performance of loops (A caching question)

Quiz on Analysis of Algorithms

Quiz on Recurrences

Searching and Sorting:

- Binary Search
- Selection Sort
- Bubble Sort
- Insertion Sort
- Merge Sort
- Heap Sort
- QuickSort
- Radix Sort
- Counting Sort
- Bucket Sort
- ShellSort
- Interpolation search vs Binary search
- Stability in sorting algorithms
- When does the worst case of Quicksort occur?
- Lower bound for comparison based sorting algorithms
- Which sorting algorithm makes minimum number of memory writes?
- Find the Minimum length Unsorted Subarray, sorting which makes the complete array sorted
- Merge Sort for Linked Lists
- Sort a nearly sorted (or K sorted) array
- Iterative Quick Sort
- QuickSort on Singly Linked List
- QuickSort on Doubly Linked List
- Find k closest elements to a given value
- Sort n numbers in range from 0 to n^2 – 1 in linear time
- A Problem in Many Binary Search Implementations
- Search in an almost sorted array
- Sort an array in wave form
- Why is Binary Search preferred over Ternary Search?
- K'th Smallest/Largest Element in Unsorted Array
- K'th Smallest/Largest Element in Unsorted Array in Expected Linear Time
- K'th Smallest/Largest Element in Unsorted Array in Worst Case Linear Time
- Find the closest pair from two sorted arrays
- Find common elements in three sorted arrays
- Given a sorted array and a number x, find the pair in array whose sum is closest to x
- Count 1's in a sorted binary array
- Binary Insertion Sort
- Insertion Sort for Singly Linked List
- Why Quick Sort preferred for Arrays and Merge Sort for Linked Lists?
- Merge Sort for Doubly Linked List

Quiz on Sorting

Quiz on Searching

Greedy Algorithms:

- Activity Selection Problem
- Kruskal's Minimum Spanning Tree Algorithm
- Huffman Coding
- Efficient Huffman Coding for Sorted Input
- Prim's Minimum Spanning Tree Algorithm
- Prim's MST for Adjacency List Representation
- Dijkstra's Shortest Path Algorithm
- Dijkstra's Algorithm for Adjacency List Representation
- Job Sequencing Problem
- Quiz on Greedy Algorithms
- Greedy Algorithm to find Minimum number of Coins
- K Centers Problem

Dynamic Programming:

- Overlapping Subproblems Property
- Optimal Substructure Property
- Longest Increasing Subsequence
- Longest Common Subsequence
- Edit Distance
- Min Cost Path
- Coin Change
- Matrix Chain Multiplication
- Binomial Coefficient
- 0-1 Knapsack Problem
- Egg Dropping Puzzle
- Longest Palindromic Subsequence
- Cutting a Rod
- Maximum Sum Increasing Subsequence
- Longest Bitonic Subsequence
- Floyd Warshall Algorithm
- Palindrome Partitioning
- Partition problem
- Word Wrap Problem
- Maximum Length Chain of Pairs
- Variations of LIS
- Box Stacking Problem
- Program for Fibonacci numbers
- Minimum number of jumps to reach end
- Maximum size square sub-matrix with all 1s
- Ugly Numbers
- Largest Sum Contiguous Subarray
- Longest Palindromic Substring
- Bellman–Ford Algorithm for Shortest Paths
- Optimal Binary Search Tree
- Largest Independent Set Problem

- Subset Sum Problem
- Maximum sum rectangle in a 2D matrix
- Count number of binary strings without consecutive 1?s
- Boolean Parenthesization Problem
- Count ways to reach the n'th stair
- Minimum Cost Polygon Triangulation
- Mobile Numeric Keypad Problem
- Count of n digit numbers whose sum of digits equals to given sum
- Minimum Initial Points to Reach Destination
- Total number of non-decreasing numbers with n digits
- Find length of the longest consecutive path from a given starting character
- Tiling Problem
- Minimum number of squares whose sum equals to given number n
- Find minimum number of coins that make a given value
- Collect maximum points in a grid using two traversals
- Shortest Common Supersequence
- Compute sum of digits in all numbers from 1 to n
- Count possible ways to construct buildings
- Maximum profit by buying and selling a share at most twice
- How to print maximum number of A's using given four keys
- Find the minimum cost to reach destination using a train
- Vertex Cover Problem | Set 2 (Dynamic Programming Solution for Tree)
- Count number of ways to reach a given score in a game
- Weighted Job Scheduling
- Longest Even Length Substring such that Sum of First and Second Half is same
- Minimum Cost Polygon Triangulation

See Dynamic Programming Tag for more problems, Quiz on Dynamic Programming

Pattern Searching:

- Naive Pattern Searching
- KMP Algorithm
- Rabin-Karp Algorithm
- A Naive Pattern Searching Question
- Finite Automata
- Efficient Construction of Finite Automata
- Boyer Moore Algorithm – Bad Character Heuristic
- Suffix Array
- Anagram Substring Search (Or Search for all permutations)
- Pattern Searching using a Trie of all Suffixes

Other String Algorithms:

- Manacher's Algorithm – Linear Time Longest Palindromic Substring – Part 1, Part 2, Part 3, Part 4
- Longest Even Length Substring such that Sum of First and Second Half is same
- Print all possible strings that can be made by placing spaces

Backtracking:

- Print all permutations of a given string
- The Knight's tour problem
- Rat in a Maze
- N Queen Problem
- Subset Sum
- m Coloring Problem
- Hamiltonian Cycle
- Sudoku
- Tug of War
- Solving Cryptarithmetic Puzzles

Divide and Conquer:

- Introduction
- Write your own pow(x, n) to calculate x*n
- Median of two sorted arrays
- Count Inversions
- Closest Pair of Points
- Strassen's Matrix Multiplication

See this for more, Quiz on Divide and Conquer

Geometric Algorithms:

- Closest Pair of Points | O(nlogn) Implementation
- How to check if two given line segments intersect?
- How to check if a given point lies inside or outside a polygon?
- Convex Hull | Set 1 (Jarvis's Algorithm or Wrapping)
- Convex Hull | Set 2 (Graham Scan)
- Given n line segments, find if any two segments intersect
- Check whether a given point lies inside a triangle or not
- How to check if given four points form a square

Mathematical Algorithms:

- Write an Efficient Method to Check if a Number is Multiple of 3
- Efficient way to multiply with 7
- Write a C program to print all permutations of a given string
- Lucky Numbers
- Write a program to add two numbers in base 14
- Babylonian method for square root
- Multiply two integers without using multiplication, division and bitwise operators, and no loops
- Print all combinations of points that can compose a given number
- Write you own Power without using multiplication(*) and division(/) operators
- Program for Fibonacci numbers
- Average of a stream of numbers

- Count numbers that don't contain 3
- MagicSquare
- Sieve of Eratosthenes
- Find day of the week for a given date
- DFA based division
- Generate integer from 1 to 7 with equal probability
- Given a number, find the next smallest palindrome
- Make a fair coin from a biased coin
- Check divisibility by 7
- Find the largest multiple of 3
- Lexicographic rank of a string
- Print all permutations in sorted (lexicographic) order
- Shuffle a given array
- Space and time efficient Binomial Coefficient
- Reservoir Sampling
- Pascal's Triangle
- Select a random number from stream, with O(1) space
- Find the largest multiple of 2, 3 and 5
- Efficient program to calculate e^x
- Measure one litre using two vessels and infinite water supply
- Efficient program to print all prime factors of a given number
- Print all possible combinations of r elements in a given array of size n
- Random number generator in arbitrary probability distribution fashion
- How to check if a given number is Fibonacci number?
- Russian Peasant Multiplication
- Count all possible groups of size 2 or 3 that have sum as multiple of 3
- Tower of Hanoi
- Horner's Method for Polynomial Evaluation
- Count trailing zeroes in factorial of a number
- Program for nth Catalan Number
- Generate one of 3 numbers according to given probabilities
- Find Excel column name from a given column number
- Find next greater number with same set of digits
- Count Possible Decodings of a given Digit Sequence
- Calculate the angle between hour hand and minute hand
- Count number of binary strings without consecutive 1?s
- Find the smallest number whose digits multiply to a given number n
- Draw a circle without floating point arithmetic
- How to check if an instance of 8 puzzle is solvable?
- Birthday Paradox
- Multiply two polynomials
- Count Distinct Non-Negative Integer Pairs (x, y) that Satisfy the Inequality x*x + y*y < n
- Count ways to reach the n'th stair
- Replace all '0' with '5' in an input Integer
- Program to add two polynomials
- Print first k digits of 1/n where n is a positive integer

- Given a number as a string, find the number of contiguous subsequences which recursively add up to 9

Bit Algorithms:

- Find the element that appears once
- Detect opposite signs
- Set bits in all numbers from 1 to n
- Swap bits
- Add two numbers
- Smallest of three
- A Boolean Array Puzzle
- Set bits in an (big) array
- Next higher number with same number of set bits
- Optimization Technique (Modulus)
- Add 1 to a number
- Multiply with 3.5
- Turn off the rightmost set bit
- Check for Power of 4
- Absolute value (abs) without branching
- Modulus division by a power-of-2-number
- Minimum or Maximum of two integers
- Rotate bits
- Find the two non-repeating elements in an array
- Number Occurring Odd Number of Times
- Check for Integer Overflow
- Little and Big Endian
- Reverse Bits of a Number
- Count set bits in an integer
- Number of bits to be flipped to convert A to B
- Next Power of 2
- Check if a Number is Multiple of 3
- Find parity
- Multiply with 7
- Find whether a no is power of two
- Position of rightmost set bit
- Binary representation of a given number
- Swap all odd and even bits
- Find position of the only set bit
- Karatsuba algorithm for fast multiplication
- How to swap two numbers without using a temporary variable?
- Check if a number is multiple of 9 using bitwise operators
- Swap two nibbles in a byte
- How to turn off a particular bit in a number?
- Check if binary representation of a number is palindrome

Quiz on Bit Algorithms

Graph Algorithms:

Introduction, DFS and BFS:

- Graph and its representations
- Breadth First Traversal for a Graph
- Depth First Traversal for a Graph
- Applications of Depth First Search
- Detect Cycle in a Directed Graph
- Detect Cycle in a an Undirected Graph
- Detect cycle in an undirected graph
- Longest Path in a Directed Acyclic Graph
- Topological Sorting
- Check whether a given graph is Bipartite or not
- Snake and Ladder Problem
- Biconnected Components
- Check if a given graph is tree or not

Minimum Spanning Tree:

- Prim's Minimum Spanning Tree (MST))
- Applications of Minimum Spanning Tree Problem
- Prim's MST for Adjacency List Representation
- Kruskal's Minimum Spanning Tree Algorithm
- Boruvka's algorithm for Minimum Spanning Tree

Shortest Paths:

- Dijkstra's shortest path algorithm
- Dijkstra's Algorithm for Adjacency List Representation
- Bellman–Ford Algorithm
- Floyd Warshall Algorithm
- Johnson's algorithm for All-pairs shortest paths
- Shortest Path in Directed Acyclic Graph
- Some interesting shortest path questions
- Shortest path with exactly k edges in a directed and weighted graph

Connectivity:

- Find if there is a path between two vertices in a directed graph
- Connectivity in a directed graph
- Articulation Points (or Cut Vertices) in a Graph
- Biconnected graph
- Bridges in a graph
- Eulerian path and circuit
- Fleury's Algorithm for printing Eulerian Path or Circuit
- Strongly Connected Components
- Transitive closure of a graph

- Find the number of islands
- Count all possible walks from a source to a destination with exactly k edges
- Euler Circuit in a Directed Graph
- Biconnected Components
- Tarjan's Algorithm to find Strongly Connected Components

Hard Problems:

- Graph Coloring (Introduction and Applications)
- Greedy Algorithm for Graph Coloring
- Travelling Salesman Problem (Naive and Dynamic Programming)
- Travelling Salesman Problem (Approximate using MST)
- Hamiltonian Cycle
- Vertex Cover Problem (Introduction and Approximate Algorithm)
- K Centers Problem (Greedy Approximate Algorithm)

Maximum Flow:

- Ford-Fulkerson Algorithm for Maximum Flow Problem
- Find maximum number of edge disjoint paths between two vertices
- Find minimum s-t cut in a flow network
- Maximum Bipartite Matching
- Channel Assignment Problem

Misc:

- Find if the strings can be chained to form a circle
- Given a sorted dictionary of an alien language, find order of characters
- Karger's algorithm for Minimum Cut
- Karger's algorithm for Minimum Cut | Set 2 (Analysis and Applications)
- Hopcroft–Karp Algorithm for Maximum Matching | Set 1 (Introduction)
- Hopcroft–Karp Algorithm for Maximum Matching | Set 2 (Implementation)
- Length of shortest chain to reach a target word
- Find same contacts in a list of contacts

Quiz on Graph
Quiz on Graph Traversals
Quiz on Graph Shortest Paths
Quiz on Graph Minimum Spanning Tree

Randomized Algorithms:

- Linearity of Expectation
- Expected Number of Trials until Success
- Randomized Algorithms | (Introduction and Analysis)
- Randomized Algorithms | Set 2 (Classification and Applications)
- Karger's algorithm for Minimum Cut
- K'th Smallest/Largest Element in Unsorted Array | Set 2 (Expected Linear Time)

- Reservoir Sampling
- Shuffle a given array
- Select a Random Node from a Singly Linked List

Quizzes on Algorithms:

- Analysis of Algorithms
- Sorting
- Divide and Conquer
- Greedy Algorithms
- Dynamic Programming
- Backtracking
- Misc
- NP Complete
- Searching
- Analysis of Algorithms (Recurrences)
- Recursion
- Bit Algorithms
- Graph Traversals
- Graph Shortest Paths
- Graph Minimum Spanning Tree

Misc:

- Commonly Asked Algorithm Interview Questions | Set 1
- Given a matrix of ‘O’ and ‘X’, find the largest subsquare surrounded by ‘X’
- Nuts & Bolts Problem (Lock & Key problem)
- Flood fill Algorithm – how to implement fill() in paint?
- Given n appointments, find all conflicting appointments
- Check a given sentence for a given set of simple grammer rules
- Find Index of 0 to be replaced with 1 to get longest continuous sequence of 1s in a binary array
- How to check if two given sets are disjoint?
- Minimum Number of Platforms Required for a Railway/Bus Station
- Length of the largest subarray with contiguous elements | Set 1
- Length of the largest subarray with contiguous elements | Set 2
- Print all increasing sequences of length k from first n natural numbers
- Given two strings, find if first string is a subsequence of second
- Snake and Ladder Problem
- Write a function that returns 2 for input 1 and returns 1 for 2
- Connect n ropes with minimum cost
- Find the number of valid parentheses expressions of given length
- Longest Monotonically Increasing Subsequence Size (N log N): Simple implementation
- Generate all binary permutations such that there are more 1’s than 0’s at every point in all permutations
- Lexicographically minimum string rotation
- Construct an array from its pair-sum array

- Program to evaluate simple expressions
- Check if characters of a given string can be rearranged to form a palindrome
- Print all pairs of anagrams in a given array of strings

Please see Data Structures and Advanced Data Structures for Graph, Binary Tree, BST and Linked List based algorithms.

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