

tutorialspoint

www.tutorialspoint.com





About this Tutorial

An Algorithm is a sequence of steps to solve a problem. Design and Analysis of Algorithm is very important for designing algorithm to solve different types of problems in the branch of computer science and information technology.

This tutorial introduces the fundamental concepts of Designing Strategies, Complexity analysis of Algorithms, followed by problems on Graph Theory and Sorting methods. This tutorial also includes the basic concepts on Complexity theory.

Audience

This tutorial has been designed for students pursuing a degree in any computer science, engineering, and/or information technology related fields. It attempts to help students to grasp the essential concepts involved in algorithm design.

Prerequisites

The readers should have basic knowledge of programming and mathematics. The readers should know data structure very well. Moreover, it is preferred if the readers have basic understanding of Formal Language and Automata Theory.

Copyright & Disclaimer

© Copyright 2017 by Tutorials Point (I) Pvt. Ltd.

All the content and graphics published in this e-book are the property of Tutorials Point (I) Pvt. Ltd. The user of this e-book is prohibited to reuse, retain, copy, distribute or republish any contents or a part of contents of this e-book in any manner without written consent of the publisher.

We strive to update the contents of our website and tutorials as timely and as precisely as possible, however, the contents may contain inaccuracies or errors. Tutorials Point (I) Pvt. Ltd. provides no guarantee regarding the accuracy, timeliness or completeness of our website or its contents including this tutorial. If you discover any errors on our website or in this tutorial, please notify us at contact@tutorialspoint.com



Table of Contents

	About this Tutorial	i
	Audience	
	Prerequisites	i
	Copyright & Disclaimer	i
	Table of Contents	ii
BAS	SICS OF ALGORITHMS	1
1.	DAA – Introduction	2
2.	DAA – Analysis of Algorithms	4
•	DAA – Methodology of Analysis	
3.	Asymptotic Analysis	
	Solving Recurrence Equations	
	Amortized Analysis	
4.	DAA – Asymptotic Notations & Apriori Analysis	8
- ∙	Asymptotic Notations	
	O: Asymptotic Upper Bound	
	Ω: Asymptotic Opper Bound	
	Θ: Asymptotic Tight Bound	
	O - Notation	
	ω – Notation	
	Apriori and Apostiari Analysis	
5.	DAA – Space Complexities	12
	What is Space Complexity?	
	Savitch's Theorem	
DES	SIGN STRATEGIES	14
6.	DAA – Divide & Conquer	
о.	DAA – Divide & Collquer	13
7.	DAA – Max-Min Problem	
	Naïve Method	
	Divide and Conquer Approach	16
8.	DAA – Merge Sort	18
9.	DAA – Binary Search	20
10.		
	Naïve Method	22
	Strassen's Matrix Multiplication Algorithm	22
11.	DAA – Greedy Method	24



12.	•	
	Knapsack Problem	
	Fractional Knapsack	26
13.	DAA – Job Sequencing with Deadline	29
14.	DAA – Optimal Merge Pattern	31
15.	DAA – Dynamic Programming	34
16.	DAA – 0-1 Knapsack	35
	Dynamic-Programming Approach	36
17.	DAA – Longest Common Subsequence	38
GR/	APH THEORY	41
18.	DAA – Spanning Tree	42
	Minimum Spanning Tree	
	Prim's Algorithm	
19.		
	Dijkstra's Algorithm	
	Bellman Ford Algorithm	47
20.	DAA – Multistage Graph	51
21.	DAA – Travelling Salesman Problem	53
22.	DAA – Optimal Cost Binary Search Trees	56
	AD ALCORITURAC	50
HEA	AP ALGORITHMS	59
23.	DAA – Binary Heap	60
24.	DAA – Insert Method	63
25.	DAA – Heapify Method	65
26.	DAA – Extract Method	66
SOF	RTING METHODS	68
27.	DAA – Bubble Sort	69
28.	DAA – Insertion Sort	71
29.	DAA – Selection Sort	73
30.	DAA – Quick Sort	76



31.	DAA – Radix Sort	78
COI	MPLEXITY THEORY	80
32.	DAA – Deterministic vs. Nondeterministic Computations	81
	Deterministic Computation and the Class P	81
	Nondeterministic Computation and the Class NP	81
33.	DAA – Max Cliques	83
34.	DAA – Vertex Cover	85
35.	DAA – P and NP Class	88
36.	DAA – Cook's Theorem	90
37.	DAA – NP Hard & NP-Complete Classes	92
38.	DAA – Hill Climbing Algorithm	94
	Hill Climbing	94
	Problems of Hill Climbing Technique	
	Complexity of Hill Climbing Technique	
	Applications of Hill Climbing Technique	96



Basics of Algorithms

