Lecture Notes

Although some of the lecture below were scribed during the 2005 version of this course, many of the scribed notes below are from previous versions of the course. These older notes were made available to the students.

Scribed notes were taken by the students and used with permission.

The instructor notes often span several lectures

LEC #	TOPICS	SCRIBE NOTES	INSTRUCTOR NOTES
1	Course Introduction Fibonacci Heaps	Fibonacci Heaps (PDF) (Courtesy of David Andersen, Ioana Dumitriu, John Dunagan, and Akshay Patil.)	(PDF 1) (PDF 2)
2	MST Persistent Data Structures	Persistent Data Structures (PDF) (Courtesy of Sommer Gentry and Eddie Kohler.)	(PDF)
3	Splay Trees	Splay Trees (PDF) (Courtesy of Xin Zhang.)	(PDF)
4	Splay Trees (cont.) Suffix Trees Tries	Suffix Trees and Fibonacci Heaps (PDF)	(PDF)
5	Suffix Trees (cont.) Tries (cont.) Dial's Algorithm		
6	Dijkstra's Algorithm Van Emde Boas Queues	Van Emde Boas Queues (PDF) (Courtesy of Abhi Shelat, Andrew Menard, and Akshay Patil.)	(PDF)
7	Van Emde Boas Queues (cont.) Hashing		(PDF)
8	2-Level Hashing Network Flows	Maximum Flows (PDF) (Courtesy of Alexandr Andoni.)	(PDF)
9	Network Flows: Augmenting Paths, Maximum Augmenting Paths, Scaling		
10	Reductions between Flow Problems Bipartite Matching Shortest Augmenting Path Blocking Flows		
11	Blocking Flows (cont.)		
12	Min-Cost Flows	Min-Cost Flow Algorithms (PDF) (Courtesy of Wendy Chang.)	(PDF)
13	Min-Cost Flows (cont.) Linear Programming		(PDF)
	Linear Programming (cont.)	Duality (PDF) (Courtesy of Jay-Kumar	

LEC #	TOPICS	SCRIBE NOTES	INSTRUCTOR NOTES
15	Linear Programming (cont.) Strong Duality	Duality(PDF) (Courtesy of Jay-Kumar Sundararajan.)	
16	Linear Programming (cont.) Complementary Slackness Algorithms: Simplex, Ellipsoid	Duality (PDF) (Courtesy of Jay-Kumar Sundararajan.)	
17	Linear Programming (cont.) Algorithms: Interior Point		
18	Approximation Algorithms NP-hard problems		(PDF)
19	4/3-Approximation for TSP		
20	Relaxations Directed TSP		
21	Randomized Rounding Chernoff Bound Fixed Parameter Tractability Kernelization		(PDF)
22	Online Algorithms (Ski Rental, Load Balancing, Paging)	Lower Bounds for Competitive Ratios of Randomized Online Algorithms (PDF) (Courtesy of Chun-Chieh Lin.)	(PDF)
23	Randomized Online Algorithms (Adversaries, Fiat's Marking Algorithm, Potential Functions, Yao's Minimax Principle)	Lower Bounds for Competitive Ratios of Randomized Online Algorithms (PDF) (Courtesy of Chun-Chieh Lin.)	
24	K-Server Problem Double-Coverage Algorithm Computational Geometry Introduction (Orthogonal Range Search)		
25	Sweep Algorithms (Convex Hull, Segment Intersection, Voronoi Diagrams)	Sweep Line (PDF) (Courtesy of Matt Rasmussen.)	(PDF)
26	Sweep Algorithms (Voronoi Diagrams) Randomized Incremental Constructions Backwards Analysis Linear Programming in Fixed Dimension		
27	(Optional Material) External Memory Algorithms		(PDF)
28	(Optional Material) Cache Oblivious Algorithms: Matrix Multiplication, Linked Lists, Median		
29	(Optional Material) Cache Oblivious Algorithms: Search Streaming Model		
29	(Optional Material) Parallel Algorithms		(PDF)

Lecture notes from the 2004 version of this course.

LEC #	TOPICS	SCRIBE NOTES
1	Course Introduction Fibonacci Heaps	(PDF) (Courtesy of David Andersen, Ioana Dumitriu, John Dunagan, and Akshay Patil.)
2	Persistent Data Structures Suffix Trees	(PDF 1) (Courtesy of Sommer Gentry and Eddie Kohler.) (PDF 2) (Courtesy of Jiawen Chen.)
3	Suffix Trees (cont.)	(PDF)
4	Treaps	
	Splay Trees	(PDF) (Courtesy of Naveen Sunkavally.)
5	Hashing: 2-Universal, Perfect Hashing Fingerprinting	