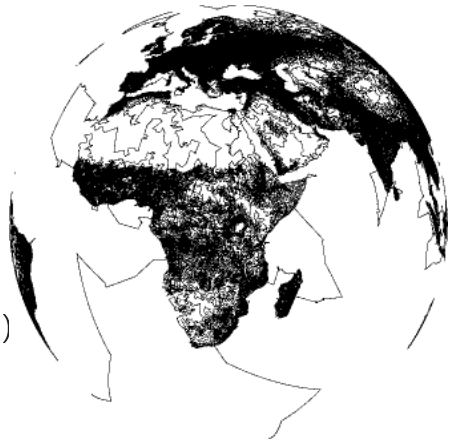
COT 5405: ANALYSIS OF ALGORITHMS

Syllabus

"People who analyze algorithms have double happiness. First of all they experience the sheer beauty of elegant mathematical patterns that surround computational procedures. Then, they receive a practical payoff when their theories make it possible to get other jobs done more quickly and more economically..."
Donald E. Knuth

Basic Info

- **Semester:** Spring 2006
- **Schedule:** Tue 4, Thu 4 and 5
- **Location:** CSE E107
- **Professor:** Alper Üngör
  E430 CSE Building
  ungor@cise.ufl.edu
- **Teaching Assistants:**
  Jianhua Fan (jfan@cise.ufl.edu)
  Ravi Jampani (rjampani@cise.ufl.edu)
  Xinyan Zha (TBA)
- **Catalog number:** 1091
- **Credit hours:** 3



World TSP

- **Office hours:**

	Mon	Tue	Wed	Thu	Fri
10:40		Lecture		Lecture	Jianhua
11:45		Alper		Lecture	
12:50				Alper	
13:55	Ravi		Ravi		
15:00	Jianhua				

- **Web-page:** `http://www.cise.ufl.edu/~ungor/courses/spring06`
- **Prerequisites:** COP 3530 or equivalent, or Instructor's permission

Main Theme

The study of algorithms is aimed at creating techniques that will enable a computer to perform a certain task in an efficient manner. An *algorithm* is a set of well-defined instructions for accomplishing some task, often explained by analogy with a culinary recipe. To analyze an algorithm is to determine the amount of resources (such as time and storage) necessary to execute it. Usually the efficiency or complexity of an algorithm is stated as a function relating the input length to the number of steps (time complexity) or storage locations (space or memory complexity) required to execute the algorithm. In this course, we will study various algorithmic paradigms (such as divide-and-conquer, greedy, dynamic programming), various analysis techniques (such as worst-case, expected, approximate), various problem domains (such as searching, sorting, graph, geometric, and combinatorially hard) problems.

Coursework

Grades will be based on homeworks (25%), mid-term exam I (20%), mid-term exam II (25%), and a final exam (30%).

- **Homework:** There will be 5 assignments, each consisting of 5-6 problems.
- **Exam:** The two mid-term exams will be in class. The final exam will be held during the official final exams week. The exams will be closed book.
- **Attendance:** Class participation is strongly encouraged.

Course Material

- **Recommended Textbooks:**
  1. *Introduction to Algorithms (2nd ed).*, T.H. Cormen, C.E. Leiserson, R.L. Rivest, and C. Stein. (MIT Press and McGraw-Hill, 2001).
  2. *Computer Algorithms.* E. Horowitz, S. Sahni and S. Rajasekaran. (Computer Science Press, 1997).
  3. Algorithm Design. J. Kleinberg and E. Tardos. (Addison Wesley, 2005).
  4. *Computers and Intractability.* M. R. Garey and D. S. Johnson, (Freeman, 1979).
  5. I will also distribute other papers and sources.
- **Conferences:** STOC, FOCS, SODA, APPROX, RANDOM, SoCG, LATIN, ESA
- **Journals:** Journal of Algorithms, Algorithmica, Theoretical Computer Science, SIAM Journal on Computing, Journal of the ACM, International Journal of Computational Geometry and Applications, Computational Geometry : Theory and Applications
- Also watch the class web page for other survey and research papers, links, etc.

Tentative Timeline

Date	Lecture Topic	Assignments
Jan 10 Tu	Syllabus, course structure, introduction	
Jan 12 Th	Recurrences	
Jan 17 Tu	Probabilistic Analysis and Randomized Algorithms	
Jan 19 Th	Sorting Algorithms	HW#1 out
Jan 24 Tu	Hashing	
Jan 26 Th	Dynamic Search Structures	
Jan 31 Tu	Dynamic Programming	HW#1 due
Feb 2 Th	Greedy Algorithms	HW#2 out
Feb 7 Tu	Amortized Analysis	
Feb 9 Th	Binomial Heaps	
Feb 14 Tu	Fibonacci Heaps	HW#2 due
Feb 16 Th	MIDTERM EXAM I	
Feb 21 Tu	Elementary Graph Algorithms	
Feb 23 Th	Minimum Spanning Trees	HW#3 out
Feb 28 Tu	Single-Source Shortest Paths	
Mar 2 Th	Multiple Source Shortest Paths	
Mar 7 Tu	Maximum Flow	HW#3 due
Mar 9 Th	Geometric Algorithms	
Mar 14 Tu	*SPRING BREAK*	
Mar 16 Th	*SPRING BREAK*	
Mar 21 Tu	Triangulations	
Mar 23 Th	Line Segment Intersections	HW#4 out
Mar 28 Tu	Convex Hull Algorithms	
Mar 30 Th	MIDTERM EXAM II	
Apr 4 Tu	Polynomials and the FFT	HW#4 due
Apr 6 Th	Number-Theoretic Algorithms	
Apr 11 Tu	String Matching	
Apr 13 Th	NP-completeness	HW#5 out
Apr 18 Tu	NP-completeness	
Apr 20 Th	Approximation Algorithms	
Apr 25 Tu	Approximation Algorithms	HW#5 due
? ? ?	FINAL EXAM	

Other Issues

- **Announcements:** Students are responsible following the announcements on the course web-page (`http://www.cise.ufl.edu/~ungor/courses/spring06`). Schedule updates regarding the homeworks, exams and office hours will appear on the web-page.
- **Accommodations for Students with Disabilities:** Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation.
- **The University's Honesty Policy:** All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a student at the University of Florida and to be honest in all work submitted and exams taken in this class and all others.
  The following links contain additional information relating to academic honesty:
  - `http://lss.at.ufl.edu/services/turnitin/resources.html`
  - `http://www.dso.ufl.edu/judicial`