COSC 6320 Advanced Data Structures and Algorithms

Instructor: R.M. Verma, Office: PGH 532, Tel: 3-3348.

Textbook

- Introduction to Algorithms by T. Cormen, C. Leiserson, and R. Rivest, MIT Press/McGraw Hill, Third edition or later.

References

- Algorithm Design, by Kleinberg and Tardos, Pearson, 2005.
- Design and Analysis of Algorithms, by Aho, Hopcroft and Ullman, Addison-Wesley 1974.
- Algorithms from P to NP, Vol. 1, by B. Moret and H. Shapiro, Benjamin-Cummings, 1991.
- Computers and Intractability, by M. Garey and D. Johnson, Prentice Hall, 1979.
- Some Techniques for Solving Recurrences, G.S. Leuker, ACM Computing Surveys, 1980.
- A General Method and a Master theorem for Divide-and-Conquer Recurrences, R.M. Verma, Journal of Algorithms, Jan. 1994.
- Techniques for Analyzing Recursive Algorithms with Applications, R.M. Verma, SIAM Journal on Computing, April 1998.
- Speed Up in Dynamic Programming, F. Yao, SIAM J. on Alg. and Dis. Math., Dec. 1982.

Goals

- To provide computer science graduate students with a broad and deep understanding of the design and worst-case analysis of advanced data structures and algorithms including: sorting, selection, data structures for disjoint sets, binomial trees, graph algorithms, etc. To expose the students to hard problems and the theory of NP-completeness.

Topics

- Mathematical Foundations including Summations and Recurrences
- Sorting and Selection.
- Advanced Techniques (dynamic programming, greedy algorithms, amortized analysis)
- Data Structures for Disjoint Sets
- Graph algorithms
- Selected Symbolic computing algorithms (if time permits)
- NP-completeness
- Approximation Algorithms (as time permits)

Grading (subject to change: Class participation 3%, Homeworks 10%, Quiz 1 12%, Quiz 2 15%, Quiz 3 18%, Final 36%, Presentation/Writeup 6%. Homeworks will consists of two types of exercises: practice exercises, which must be done completely on your own and Problems Sets, on which you may collaborate with other people **in this class only**. You will be given 4-5 minutes for a brief update on the current status of a problem or algorithm *discussed in class* and you will turn in a 1-page write up on it with references in MLA format.

TA: Bangsheg Sui (suibangshenggmail.com) Office: PGH 313; Office Hours: Tu. 2.30-4.30pm

Academic Honesty Policy: No collaboration is allowed on practice exercises, exams and any programming assignments (yes, that excludes the internet as well - no searching for solutions on Internet and no posting of problems on Internet). The *appropriate* help of the instructor and the TA is of course allowed and encouraged. Do not expect us to debug your solutions for *assigned* exercises and problems. You are always welcome to discuss your work on exercises and problems that are not similar to the ones assigned.