

CS 791/891 Seminar: Approximation Algorithms
Spring 2004

Tues 9:30 – 10:45 A.M. Education 230B

Prof. Alex Pothen and Dr. Assefaw Gebremedhin

Computer Science

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Office hours: Tues, Thurs 11:30 A.M. – 12:30 P.M.

and by appointment

Algorithms are at the heart of problem solving in scientific computing and computer science. Unfortunately many of the combinatorial problems that arise in a computational context are NP-hard, so that optimal solutions are unlikely to be found in polynomial time. How can we cope with this intractability? One approach is to design algorithms that find approximate solutions guaranteed to be within some factor of the quality of the optimal solution. More recently, in large-scale scientific computing, even polynomial time algorithms that find exact solutions are deemed too expensive to be practical, and one needs faster (nearly linear time) approximation algorithms. We will consider the design of approximation algorithms for various graph-theoretical and combinatorial problems that commonly arise in scientific computing and computational biology. These include set covers (vertex covers in hypergraphs), matching, coloring, and multiple sequence alignments in computational biology. We will study techniques for algorithm design that are applicable for many problems.

Pre-requisite for this course is successful completion of a graduate course in algorithms (at the level of CS600). Students will be expected to participate in the class actively, read papers being discussed in the seminar, and give a talk on a suitable paper, chosen by them or assigned by the instructors.

The seminar will meet once a week for 1.5 hours. If you are interested in participating, please contact Prof. Alex Pothen at pothen@cs.odu.edu. The time for the class meeting will be decided at the first meeting of the class.

There is no text book for the course. The graph-theoretic concepts needed are discussed in Reinhard Diestel, Graph Theory, second edition, Springer Verlag, 2000. Students are encouraged to obtain this book or another book that discusses concepts such as vertex covers, matchings, colorings, etc. Other useful books for reference purposes include Approximation Algorithms,

by Vijay Vazirani, Springer Verlag; a collection of survey articles edited by Dorit Hochbaum, *Approximation Algorithms for NP-hard problems*, Brooks Cole Publishers; and a third book, *Complexity and Approximation*, by G. Ausiello, et al., Springer Verlag.