NC STATE UNIVERSITY

Upcoming Operations Research Master's Oral Exam

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Evolutionary Algorithms for Multiobjective Optimization with Applications in Portfolio Optimization
(under direction of Dr. Negash Medhin)

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Abstract:

Multiobjective optimization (MO) is the problem of maximizing/minimizing a set of nonlinear objective functions (modeling several performance criteria) subject to a set of nonlinear constraints (modeling availability of resources).

The MO problem has several applications in science, engineering, finance, etc. It is normally not possible to find an optimal solution in MO, since the various objective functions in the problem are usually in conflict with each other. Therefore, the objective in MO is to find the "Pareto front" of efficient solutions that provide a tradeoff between the various objectives.

Classical techniques assign weights to the various objectives in the MO problem, and solve the resulting single objective problem using standard algorithms for nonlinear optimization. Moreover, these techniques only compute a single solution to the problem forcing the decision maker to miss out on other desirable solutions in the MO problem.

We investigate the use of evolutionary **algorithms** to solve MO problems in this thesis. Unlike classical methods, evolutionary strategies directly solve the MO problem to find the Pareto front. These algorithms use probabilistic rules to search for solutions and are very efficient in solving medium sized MO problems.

We use evolutionary algorithms to compute the "efficient frontier" in the classical Markowitz mean-variance optimization problem in finance, and illustrate our results on an example.