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Description of Research Seminar:
Strict robustness in multi-objective
optimization

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Research Seminar

offered by Jonas Ide

in February 2012,

in Auckland, New Zealand

Subject: Strict robustness in multi-objective optimization

Problem: Many practical problems suffer from inaccurate, missing, or unreliable input data. This is a severe problem, since even small changes can make an optimal solution completely useless for practice.

Robust optimization approaches try to hedge against uncertain data. The goal is to find solutions which are good for all scenarios contained in some given uncertainty set.

Due to various applications, many different interpretations of optimality for such uncertain problems exist. So far, these only apply to single-objective functions. Hence, the question arises, if these concepts are useful in a multi-objective context and if so, how to extend them to multi-objective optimization.

Main Results: Some concepts of robustness for multi-objective optimization problems have been developed, such as the concept of strictly robust efficiency.

This concept applies to uncertain multi-objective problems and extends the definition of strictly robust optimality for uncertain single-objective problems.

It generalises the idea of efficiency for a deterministic multi-objective problem of a point to the efficiency of a set (the set of all objective values of a point in the different scenarios). If the set is non-dominated, we call the according point strictly robust efficient.

Different techniques on how to calculate these strictly robust efficient points have been developed, such as a generalization of the weighted

some method as well as the epsilon-constraint technique for deterministic multi-objective problems.

For a special class of problems it is even possible to define a deterministic multi-objective problem equivalent to the problem of finding strictly robust efficient solutions to the uncertain multi-objective problem. This provides the theoretical background for another technique of calculating strictly robust efficient solutions for uncertain multi-objective problems since these are exactly the efficient solutions of its equivalent.

These three techniques for calculating strictly robust efficient solutions have been studied. Furthermore the concept of strictly robust efficiency has been applied to portfolio optimization in order to analyse the benefits or disadvantages of such a concept.

Participants: students and researchers from UOA.

Publication: -