Dagstuhl Seminar 15031:
Understanding Complexity in Multiobjective Optimization

Understanding complexity in multiobjective optimization is of central importance for the two communities, MCDM and EMO, and several related disciplines. It enables us to wield existing methodologies with greater knowledge, control and effect, and should, more importantly, provide the foundations and impetus for the development of new, principled methods, in this area.

We believe that a strong route to further progress in multiobjective optimization is a determination to understand more about the various ways that complexity manifests itself in multiobjective optimization. We observe that in several fields, ranging from engineering to medicine to economics to homeland security, real-world problems are very often characterized by a high degree of complexity deriving from the presence of many competitive objectives to be optimized, many stakeholders expressing conflicting interests and the presence of many technical parameters being unstable in time and for which we have imperfect knowledge. These very complex problems require a specific methodology, mainly based on multiobjective optimization, that, using high computational capacities, takes into account robustness concerns and allows an effective participation of the several stakeholders in the decision process.

Monday, January 12, 2015

09:00 – 10:30: Welcome Session

- Welcome and Introduction
- Short presentation of all participants (3 minutes each!)

Coffee Break

11:00 – 12:00: Introduction to Complexity in Applications

- Robin Purshouse: Perspectives on the application of multi-objective optimization within complex engineering design environments
- Kaisa Miettinen: Sources of computational challenges in multiobjective optimization

Lunch

13:30 – 14:30: Introduction to Complexity in Preference

- Jürgen Branke, Salvatore Corrente, Salvatore Greco, Roman Slowinski, Piotr Zielnewicz: Preference learning in EMO: Complexity of preference models
- Manuel López-Ibánez: Machine Decision Makers: From Modeling Preferences to Modeling Decision Makers

Coffee Break

15:00 – 16:00: Introduction to Complexity in Optimisation

- Matthias Ehrgott: Computational Complexity in Multi-objective (Combinatorial) Optimisation
- Michael Emmerich: An Open Problems Project for Set-Oriented and Indicator-Based Multicriteria Optimization

Break

16:15 – 18:00: Group Discussion about Hot Topics and Working Groups

Tuesday, January 13, 2015

09:00 – 10:00: Complexity in MO optimization Chair: Daniel Vanderpooten

- Carlos Fonseca: Pareto front approximation statistics
- Andrzej Jaskiewicz: Complex combinatorial problems with heterogeneous objectives

Coffee Break

10:30 – 12:00: Working Groups

Lunch

13:30 – 14:30: Complexity in Applications Chair: Sanaz Mostaghim

- Silvia Poles: Understanding and managing complexity in real-case applications
- Patrick M. Reed: Many-objective robust decision making under deep uncertainty: A multi-city regional water supply example

Coffee Break

15:00 – 17:00: Working Groups

17:00 – 18:00: Reports from Working Groups

- 6 minutes / 3 slides per working group
- General discussion and working group adaptations

Wednesday, January 14, 2015

09:00 – 10:00: Complexity in Applications Chair: Carlos Coello Coello

- Ralph Steuer: Tutorial on large-scale multicriteria portfolio selection leading up to difficulties obstructing further progress
- Yaochu Jin: Bridging the gap between theory and application in multi-objective optimization

Coffee Break

10:30 – 12:00: Working Groups

Lunch

14:00: Group Foto (Outside)

14:05 – 16:00: Hiking Trip

16:30 – 18:00: Reports from Working Groups

- 15 minutes / 5 slides per working group

Thursday, January 15, 2015

9:00 – 12:00: Working Groups

Lunch

13:30 – 14:30: Complexity in Optimization Chair: Serpil Sayin

- Margaret M. Wiecek: Distributed MCDM under partial information
- Gabriele Eichfelder: Variable ordering structures - what can be assumed?

Coffee Break

15:00 – 16:00: General Discussion: 10 Years of MCDM-EMO Dagstuhl Seminars. What do we Expect for the Future?

Break

16:30 – 18:00: Working Groups

20:00: Wine & Cheese Party (Music Room)

Friday, January 16, 2015

9:00 – 11:00: Presentation of Working Group Results

Coffee Break

11:30 – 12:00: Summary, Feedback, and Next Steps

Lunch & Goodbye