

**Date:**

November 24th – November 30th, 2013

**Organizers:**

Paul Flondor, Bucharest

Jeremy Gibbons, Oxford

Cezar Ionescu, Potsdam

**Programme:**

We will present category theory techniques for program construction applied to implementing validated numerical methods via interval analysis. The participants will learn

1. basic category theory concepts used in program calculation;
2. data structures and algorithms useful for symbolic computation and scientific programming;
3. interval analysis and applications to optimization;

Among the topics to be discussed are equational reasoning in program development, techniques for improving efficiency, such as: fusion or deforestation, generic algorithms for the optimal bracketing problem, the interval-based Newton method for computing zeroes of elementary functions, interval-based global optimization.

The intended audience consists of current and future practitioners of scientific programming with a strong interest in validated computing. Familiarity with a functional programming language such as Haskell will be a plus.

**Preparatory reading:**

1. Chapters 1–4 of “Introduction to functional programming using Haskell” by Richard Bird, or Chapter 1–7 of “Programming in Haskell” by Graham Hutton;
2. “Undergraduate Analysis” by Serge Lang (or similar texts);
3. “Computer Arithmetic and Validity” by Ulrich Kulisch.