

ICTS Seminar

Title : Numeric Uncertainty in Scientific Computing, and What To Do About It

Speaker : Thomas Wahl, Northeastern University, USA

Date : Friday, December 16, 2016

Time : 2:00 PM

Venue : Emmy Noether Seminar Room, ICTS Campus, Bangalore

Abstract : Many computer systems in science and engineering manipulate data according to the textbook laws of mathematics and control theory. These laws treat numeric data as real numbers. For efficiency reasons, however, modern computers approximate the reals using floating-point arithmetic (FPA). The use of such approximations incurs uncertainties about numeric software, due among others to the lack of standardization of FPA implementations on computers. This platform dependence of numeric code can lead to significantly different results in different computing environments, resulting in unstable and untrusted outcomes.

In this talk I will first give a gentle introduction to floating-point arithmetic, and the mathematical and computational consequences of it being different from real-number arithmetic. I will then focus on the above-mentioned platform-dependence problem, define it formally, present examples from scientific computing, and discuss remedies that we are currently working on, along with some initial results.

The talk assumes little to no prior knowledge of floating-point arithmetic -- all necessary background will be given. An appreciation for basic computing principles, such as finiteness of storage and the desire to parallelize computations for increased efficiency, will be helpful.