Istituto di Analisi dei Sistemi ed Informatica "Antonio Ruberti"
Consiglio Nazionale delle Ricerche

# *colloquia@iasi*



*"La mente è come un paracadute.*
*Funziona solo se si apre"*
*A. Einstein*

## Computations with numerical infinities and infinitesimals

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Abstract

In this talk, a recent computational methodology is described. It has been introduced with the intention to allow one to work with infinities and infinitesimals numerically in a unique computational framework. It is based on the principle 'The part is less than the whole' applied to all quantities (finite, infinite, and infinitesimal) and to all sets and processes (finite and infinite). The methodology uses as a computational device the Infinity Computer (patented in USA and EU) working numerically with infinite and infinitesimal numbers that can be written in a positional system with an infinite radix. On a number of examples (numerical differentiation and optimization, divergent series, ordinary differential equations, fractals, set theory, etc.) it is shown that the new approach can be useful from both theoretical and computational points of view. The accuracy of the obtained results is continuously compared with results obtained by traditional tools used to work with mathematical objects involving infinity.