The Ada Lovelace Bicentenary Lectures on Computability, December 2015 – January 2016

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Structure in the Theory of Computing: Algorithms, Randomness, Cryptography and Hardness

Monday, 25 January, 16:00-17:30

The world around us, namely nature, society, science, mathematics,... presents us with a huge number and variety of computational problems, and for each we seek solutions which minimize various resources while maintaining other desirable properties. The Theory of Computation is charged with figuring out the feasibility and costs of this multitude of problems. Surprisingly, the past few decades of work have revealed remarkable structure: this complex world of problems, resources and properties clusters into few natural clusters which furthermore have conceptual meanings. I will try to survey some important aspects of this body of work, including: the tools of reduction and completeness, the reasons for clustering (which go to the very definition of computation by Turing), and the major challenges for better understanding of this universe.

Watch the video