Colloquium d'Informatique
de Sorbonne Université

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Università di Bologna



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Coinduction: Why, When, How — and Its Duality with Induction

18h00
Précédé par un cocktail à 17h15

Amphi 15
Sorbonne Université - Faculté des Sciences
Campus Pierre et Marie Curie
4, place Jussieu, 75005 Paris

English

Abstract

Induction is one of the most familiar tools in computer science, used to define finite structures such as lists, trees and programs, and to prove their properties. Its dual, coinduction, is less familiar, yet just as fundamental. In this talk I will discuss why we need coinduction, when it was discovered, and how it works. Coinduction is a natural tool for reasoning about objects that may be infinite or circular. Such objects abound in computer science: streams, processes that interact forever with their environment, data structures with cycles. However coinduction and its best-known instance, bisimulation, emerged surprisingly late, around 1980, independently in three fields: computer science, modal logic and set theory. I will examine the reasons for this delay. I will introduce coinduction from scratch through its duality with induction, present some advanced proof techniques widely used today, and conclude with some current research directions.

Bio

Davide Sangiorgi holds a Laurea in Computer Science from the University of Pisa and a PhD from the University of Edinburgh. After a postdoctoral position in Edinburgh, he was a researcher at INRIA. Since 2002 he has been Full Professor of Computer Science at the University of Bologna, where he heads OLAS, a joint research team with INRIA. His research focuses on concurrency theory and the foundations of programming languages. He is the author of more than 130 papers and of three books published by Cambridge University Press. He is a member of the Accademia Nazionale dei Lincei, Academia Europaea and the Accademia delle Scienze di Bologna, and an EATCS Fellow. He chaired IFIP WG 2.2 from 2004 to 2011. He has received a LICS Test-of-Time Award (2013), a CONCUR Test-of-Time Award (2020), and a PPDP 10-Year Most Influential Paper Award (2022).

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