Towards a science of complex systems

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Abstract :

There are two kinds of interdisciplinarity within complex systems. *The first begins with a particular complex system and addresses a variety of questions coming from its particular domain and points of view. The second begins with a question which is fundamental to complex systems in general.* The first kind leads to domain-specific interdisciplinary fields such as cognitive science. The science of complex system belongs to a second kind of interdisciplinarity, starting from fundamental open questions relevant to many domains, and searches for methods to deal with them.

As examples of classes of complex systems, we have cells, multicellular organisms, cognition, the economy, road traffic, telecom systems, the web, society, and the ecosphere. As examples of questions, we have reconstruction of multiscale dynamics, robustness and structural stability, multilevel simulation and resilience, autopoiesis, adaptation, emergence of spatio-temporal patterns, self-organized criticality, power laws, small worlds, mentioning just some of the most important.

The talk will select some main questions and discuss how they are crossing classes of complex systems.

Because it is concerned with complex systems both inside and outside us, complex systems science will enable harmonisation between science and societal needs. It can enhance the understanding of our internal and external environment. By naturalising our artefacts, it can both allow the design of much more complex artificial systems at the same time being much more in harmony with Nature.