



Sequential Reprogramming of Biological Network Fate

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Abstract:

A major challenge in precision medicine consists in finding the appropriate network rewiring to induce a particular reprogramming of the cell phenotype. The rewiring is caused by specific network action either inhibiting or over-expressing targeted molecules. In some cases, a therapy abides by a time-scheduled drug administration protocol. Furthermore, some diseases are induced by a sequence of mutations leading to a sequence of actions on molecules. In this paper, we extend previous works on abductive-based inference of network reprogramming by investigating the sequential control of Boolean networks. We present a novel theoretical framework and give an upper bound on the size of control sequences as a function of the number of observed variables. We also define an algorithm for inferring minimal parsimonious control sequences allowing to reach a final state satisfying a particular phenotypic property.

Mini Bio :

Sergiu Ivanov is an associate professor (maitre de conférences) of computer science at the Department of Computer Science of University Val d'Evry, Université Paris-Saclay. He is currently member of the IBISC Laboratory and belongs to team COSMO, who study the fundamental properties of complex systems, and notably biological systems.

Sergiu Ivanov defended his PhD thesis focused on the computational power of biologically-inspired models of computing at University Paris-Est in 2015. His principal research interest lies in applying formal models to gain insight into medical and biological problems. He is currently working on employing formal networks to help infer cancer therapies and better understand the molecular and evolutionary causes of this disease (e.g., resilience, atavistic theory of cancer, etc.).

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Sergiu Ivanovatives main research domains are:

- precision medicine,
- theoretical biology,
- complex systems, and
- bio-inspired models of computing.