



THE WEIZMANN INSTITUTE OF SCIENCE
FACULTY OF MATHEMATICS AND COMPUTER SCIENCE

Special Guest Lecture

Room 1 ,Ziskind Building
on Monday, Sep 07, 2015
at 14:00

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Computing Cancer

Abstract:

Cancer is a highly complex aberrant cellular state where mutations impact a multitude of signalling pathways operating in different cell types. In recent years it has become apparent that in order to understand and fight cancer, it must be viewed as a system, rather than as a set of cellular activities. This mind shift calls for new techniques that will allow us to investigate cancer as a holistic system. In this talk, I will discuss some of the progress made towards achieving such a system-level understanding using computer modelling of biological behaviours, also known as Executable Biology. I will concentrate on our recent attempts to better understand cancer through the following examples: 1) drug target optimization for Chronic Myeloid Leukaemia using an innovative platform called BioModelAnalyzer, which allows to prove stabilization of biological systems; 2) dynamic hybrid modelling of Glioblastoma (brain tumour) development; 3) state-based modelling of cancer signalling pathways and their analysis using model-checking; and 4) synthesis of blood stem cell programs from single-cell gene expression data. Looking forward, inspired by David Harel's Grand Challenge proposed a decade ago, I will propose a smaller grand challenge for computing and biology that could shed new light on our ability to control cell fates during development and disease and potentially change the way we treat cancer in the future.