Claudia Cauli

1$^{\text{st}}$ Year PhD Student

University of Leicester, UK

joint work with   Dr Nir Piterman

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Should I Take the Umbrella?
Probabilistic Languages in Everyday Life

Abstract

In this talk I will exploit an instance of probabilistic reasoning in everyday life to discuss the role of formal methods when applied to stochastic models. The ever-increasing importance of systems that show an uncertain behaviour has led to the development of several new formalisms and tools for the specification and evaluation of their properties. Such systems are represented by means of stochastic models borrowed from mathematics, the so-called Markov chains. In particular, I will focus on two probabilistic temporal formalisms that read Markov chains as input: a logic called μ^p-calculus and a class of automata known as p-automata. In general, logics offer a clearer syntax and automata provide better performance in terms of computability. For this reason, it is of the utmost importance to define classes of logics and automata that have the same expressive power and can be used interchangeably. By outlining a framework to translate from μ^p-calculus to p-automata and, backwards, from p-automata to μ^p-calculus, we prove that the two languages have the same expressive power. Thus, lifting the well-known connection between logics and automata theory to a probabilistic setting. Markov chains, μ^p-calculus, and p-automata serve as a key to understanding what happens behind the scenes when we ask Siri: *"Will it rain this morning?"*.