Why Do Things Go Wrong (or Right)?
Applications of Causal Reasoning to Verification

Hana Chockler
King’s College London
London, UK
hana.chockler@kcl.ac.uk

Abstract—In this talk I will look at the connections between causality and learning from one side, and verification and synthesis from the other side. I will introduce the relevant concepts and discuss how causality and learning can help to improve the quality of systems and reduce the amount of human effort in designing and verifying systems. I will (briefly) introduce the theory of actual causality as defined by Halpern and Pearl. This theory turns out to be extremely useful in various areas of computer science due to a good match between the results it produces and our intuition. I will illustrate the definitions by examples from formal verification. I will also argue that active learning can be viewed as a type of causal discovery. Tackling the problem of reducing the human effort from the other direction, I will discuss ways to improve the quality of specifications and will focus in particular on synthesis.