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Jeffrey Sarnat*, jeffrey.sarnat@gmail.com. *Syntactic Finitism and its Metatheory*.

One of the central goals of programming-language research is to develop mathematically sound formal methods for precisely specifying and reasoning about the behavior of programs. The boundary between trusted and untrusted reasoning principles is inherently blurry, and different researchers draw the line in different places. However, just as certain principles are widely recognized to allow the proofs of contradictory statements, others are so uncontroversially ubiquitous in practice that they can be considered beyond reproach. In this talk, we posit the following questions: (1) what are these principles and (2) how much can we do with them?

Although neither has an uncontroversial answer, we propose an answer to the former by describing a viewpoint we refer to as "syntactic finitism," (heavily influenced by Gentzen's version of finitism) in which we take the principles of case analysis and structural induction on abstract syntax as our starting point. We explore the latter question by giving a proofs-as-logic-programs formalization of syntactic finitism, and analyze the expressivity of this approach using some of the ideas and results from ordinal analysis (spoiler: the resulting bound is ω^{ω^ω}). (Received January 31, 2012)