We demonstrate how this notion of Π^0_1-immunity is connected to other immunity notions, and construct Π^0_1-immune reals throughout the high/low and Ershov hierarchies. We also study those degrees that cannot compute or cannot co-enumerate a Π^0_1-immune set.

Finally, we discuss a recently discovered truth-table reduction for transforming a Kolmogorov–Loveland random input into a Martin-Löf random output by exploiting the fact that at least one half of such a KL-random is itself ML-random. We show that there is no better algorithm relying on this fact, in the sense that there is no positive, linear, or bounded truth-table reduction which does this. We also generalize these results to the problem of outputting randomness from infinitely many inputs, only some of which are random.

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XINHE WU, ***Boolean-Valued Models and Their Applications***, Massachusetts Institute of Technology, Cambridge, MA, USA. 2022. Supervised by Vann McGee. MSC: 03C90, 03E40, 03G05. Key words and phrases: Boolean-valued models, indeterminacy, set theory with urelements.

Abstract

Boolean-valued models generalize classical two-valued models by allowing arbitrary complete Boolean algebras as value ranges. The goal of my dissertation is to study Boolean-valued models and explore their philosophical and mathematical applications.

In Chapter 1, I build a robust theory of first-order Boolean-valued models that parallels the existing theory of two-valued models. I develop essential model-theoretic notions like "Boolean-valuation," "diagram," and "elementary diagram," and prove a series of theorems on Boolean-valued models, including the (strengthened) Soundness and Completeness Theorem, the Löwenheim–Skolem Theorems, the Elementary Chain Theorem, and many more.

Chapter 2 gives an example of a philosophical application of Boolean-valued models. I apply Boolean-valued models to the language of mereology to model indeterminacy in the parthood relation. I argue that Boolean-valued semantics is the best degree-theoretic semantics for the language of mereology. In particular, it trumps the well-known alternative—fuzzy-valued semantics. I also show that, contrary to what many have argued, indeterminacy in parthood entails neither indeterminacy in existence nor indeterminacy in identity, though being compatible with both.

Chapter 3 (joint work with Bokai Yao) gives an example of a mathematical application of Boolean-valued models. Scott and Solovay famously used Boolean-valued models on set theory to obtain relative consistency results. In Chapter 3, I investigate two ways of extending the Scott–Solovay construction to set theory with urelements. I argue that the standard way of extending the construction faces a serious problem, and offer a new way that is free from the problem.

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SVEN STORMS, ***The Buridan-Volpin Derivation System; Properties and Justification***, Department of Philosophy, Tilburg University, Tilburg, The Netherlands. May 4, 2022. Supervised by Harrie de Swart and Filip Buekens. MSC: 03B60, 03F05, 03F07, 03F30. *Key words and phrases*: Buridan Volpin system, inheritance, Cut elimination, Löwenheim–Skolem.

Abstract

Logic is traditionally considered to be a purely syntactic discipline, at least in principle. However, prof. David Isles has shown that this ideal is not yet met in traditional logic. Semantic residue is present in the assumption that the domain of a variable should be fixed