▸ WESLEY H. HOLLIDAY, *Axiomatizing reasoning about sets: cardinality, mereology, and decisiveness.*
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In this talk, I give three examples of axiomatizing reasoning about sets in special purpose languages. First, I consider reasoning about comparative cardinality: $A \geqslant B$ if there is an injection from B to A. I add principles to Boolean algebra to axiomatize reasoning not only about Boolean operations but also about $\geqslant$. Second, I consider reasoning about the subset relation ("set-theoretic mereology") in a modal language: $\Diamond\varphi$ is true at a set A if there is a nonempty $B \subseteq A$ such that φ is true at B. I discuss the longstanding open problem of giving a recursive axiomatization of the set of validities for finite sets. Finally, I give an example outside of pure mathematics from voting theory: a set A of voters is decisive over candidates x, y if whenever all voters in A prefer x to y, society must rank x above y. I present an axiomatization of reasoning about decisive sets of voters for voting methods satisfying well-known axioms. These examples are meant to illustrate a methodology familiar to modal logicians: to better understand the core principles governing some mathematical concept, try to axiomatize the validities of a lean language with dedicated operators whose semantics is given by the target concepts.

This talk is based on the following papers:

[1] Yifeng Ding, Matthew Harrison-Trainor, and Wesley H. Holliday, *The logic of comparative cardinality*, https://escholarship.org/uc/item/2nn3c35x.

[2] Wesley H. Holliday, *On the modal logic of subset and superset*, ***Studia Logica***, vol. 105 (2017), no. 1, pp. 13–35.

[3] Wesley H. Holliday and Eric Pacuit, *Arrow's decisive coalitions*, ***Social Choice and Welfare***, forthcoming, https://doi.org/10.1007/s00355-018-1163-z.