

- IOANNIS ELEFThERiADiS, *Algebraically universal categories of relational structures*.

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Since the original theorem of Birkhoff that every group may be realised as the automorphism group of a complete distributive lattice [2], there has been a series of results regarding the representation of groups in various structures. These culminated in the work of Isbell [4], who proposed full embeddings as the means of extending these representation results to a general setting, and lead to the study of *algebraically universal categories*, i.e. those categories that fully embed all categories of universal algebras.

Examples of algebraically universal categories include the categories of graphs, posets, semigroups, distributive lattices, and boolean algebras (all considered with homomorphisms) amongst many others [6]. More recently, Nešetřil and Ossona de Mendez established a partial characterisation of those categories of graphs that are algebraically universal in the framework of finite set theory [5]. This result is based on the combinatorial notion of *nowhere density* and its model theoretic consequences [1].

Motivated by the above, this paper generalises this characterisation to categories of relational structures of arbitrary sizes. This is given in terms of an infinitary variant of nowhere density, and a generalisation of the results in [3]. For the proof, a categorical framework for relational gadget constructions is developed, which is also of independent interest.

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