

Weisfeiler and Leman's Unlikely Journey from Graph Isomorphism to Neural Networks

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Abstract

The Weisfeiler-Leman algorithm is a well-known combinatorial graph isomorphism test going back to work of Weisfeiler and Leman in the late 1960s. The algorithm has a surprising number of seemingly unrelated characterisations in terms of logic, algebra, linear and semi-definite programming, and graph homomorphisms. Due to its simplicity and efficiency, it is an important subroutine of all modern graph isomorphism tools. In recent years, further applications in linear optimisation, probabilistic inference, and machine learning have surfaced. In the first part of my talk, I will give an introduction to the Weisfeiler-Leman algorithm and its various characterisations. In the second part I will speak about its applications, in particular about recent work relating the algorithm to graph neural networks.

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