

# Symmetry and Similarity

Martin Grohe 

RWTH Aachen University, Lehrstuhl Informatik 7, Ahornstr. 55, 52074 Aachen, Germany

<http://www.lics.rwth-aachen.de/~grohe>

grohe@informatik.rwth-aachen.de

---

## Abstract

Deciding if two graphs are isomorphic, or equivalently, computing the symmetries of a graph, is a fundamental algorithmic problem. It has many interesting applications, and it is one of the few natural problems in the class NP whose complexity status is still unresolved. Three years ago, Babai (STOC 2016) gave a quasi-polynomial time isomorphism algorithm. Despite of this breakthrough, the question for a polynomial algorithm remains wide open.

Related to the isomorphism problem is the problem of determining the similarity between graphs. Variations of this problems are known as robust graph isomorphism or graph matching (the latter in the machine learning and computer vision literature). This problem is significantly harder than the isomorphism problem, both from a complexity theoretical and from a practical point of view, but for many applications it is the more relevant problem.

My talk will be a survey of recent progress on the isomorphism and on the similarity problem. I will focus on generic algorithmic strategies (as opposed to algorithms tailored towards specific graph classes) that have proved to be useful and interesting in various context, both theoretical and practical.

**2012 ACM Subject Classification** Mathematics of computing → Graph theory; Theory of computation → Graph algorithms analysis

**Keywords and phrases** Graph Isomorphism, Graph Similarity, Graph Matching

**Digital Object Identifier** 10.4230/LIPIcs.ICALP.2019.2

**Category** Invited Talk



© Martin Grohe;

licensed under Creative Commons License CC-BY

46th International Colloquium on Automata, Languages, and Programming (ICALP 2019).

Editors: Christel Baier, Ioannis Chatzigiannakis, Paola Flocchini, and Stefano Leonardi;

Article No. 2; pp. 2:1–2:1



Leibniz International Proceedings in Informatics

Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Dagstuhl Publishing, Germany

