



Automated Theory Formation in Pure Mathematics (Distinguished Dissertations)

Simon Colton



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In recent years, Artificial Intelligence researchers have largely focused their efforts on solving specific problems, with less emphasis on 'the big picture' - automating large scale tasks which require human-level intelligence to undertake. The subject of this book, automated theory formation in mathematics, is such a large scale task. Automated theory formation requires the invention of new concepts, the calculating of examples, the making of conjectures and the proving of theorems. This book, representing four years of PhD work by Dr. Simon Colton demonstrates how theory formation can be automated. Building on over 20 years of research into constructing an automated mathematician carried out in Professor Alan Bundy's mathematical reasoning group in Edinburgh, Dr. Colton has implemented the HR system as a solution to the problem of forming theories by computer. HR uses various pieces of mathematical software, including automated theorem provers, model generators and databases, to build a theory from the bare minimum of information - the axioms of a domain. The main application of this work has been mathematical discovery, and HR has had many successes. In particular, it has invented 20 new types of number of sufficient interest to be accepted into the Encyclopaedia of Integer Sequences, a repository of over 60,000 sequences contributed by many (human) mathematicians.



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