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Computer Assisted Mathematical Proofs: using the computer to verify computers

Herman Geuvers
Radboud Universiteit
The Netherlands

Mathematical proofs get more and more difficult and complex. At the same time more and more computer systems (software and hardware) can be verified rigidly using mathematical proof, so there is an increasing request for completely verified mathematical proofs.

The field of Computer Assisted Mathematical Proofs fills this gap by allowing users to create complete mathematical proofs, interactively with the computer, where the computer checks each small reasoning step. In this way we obtain the utmost guarantees of correctness.

In the talks we will discuss the present state of Computer Assisted Mathematical Proofs and how it works by some examples. We will discuss its limitations, which basically rest on the limitations of proof automation. It has recently become clear that Machine Learning provides methods that apply very well to speeding up proof automation. Machine Learning does not supersede standard techniques (from Automated Theorem Proving) but provides the ideal additional technique.