

RESEARCH TALK: AN INTRODUCTION TO ISABELLE FOR FORMALISED MATHEMATICS

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While the formalisation of mathematics, particularly using Lean, has seen a notable increase in interest from mathematicians in the last five years, formal mathematics libraries are available across numerous proof assistants dating back to the 1970s. In this talk, I'll give an introduction to the process of formalising mathematics in Isabelle/HOL, which has math libraries dating back to the 1990s. Isabelle is a proof assistant based on Higher Order logic, and has several features which make it ideal for formalising mathematical proofs, including strong automation via Sledgehammer, the human-readable Isar formal proof language, and significant pre-existing mathematical libraries in both the distribution and Archive of Formal Proofs. Recent years have continued to see notable growth in these libraries, including research level mathematics. As an example, I'll present a brief summary of some of my own research work in this space on formalising probabilistic techniques for combinatorial structures. To conclude, I'll discuss some of the advantages and limitations of Isabelle, and how we as a community can benefit from mathematical formalisations across different systems.