Provably Total NP Search Problems

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Abstract. Total NP search problems are studied to characterise the complexity of natural search problems which cannot be analysed as decision problems. Total NP search problems are clustered based on the reasoning used to prove that the search problem is total. For provably total NP search problems, totality is guaranteed by a mathematical theory, in particular Bounded Arithmetic.
Bounded Arithmetic forms a collection of weak theories of Arithmetic related to complexity classes of functions like the Polynomial Time Hierarchy. Many connections between Bounded Arithmetic and important questions about complexity classes have already been established, including more recently in form or provably total NP search problems.
In my talk, I will review the research programme of characterising provably total NP search problems in Bounded Arithmetic, and explain why it is important for current research in the area. I will highlight recent results and point to future directions.