

LOGICAL FOUNDATIONS OF COMPLEXITY THEORY

1 September to 18 December 2026

Complexity theory investigates the capabilities and limits of efficient algorithms and computations. One of its key challenges is the P vs NP problem, which asks whether problems whose solutions can be verified in polynomial time can also be solved in polynomial time. The problem has a significant relation to mathematical logic and can be seen as a feasible variant of the influential Entscheidungsproblem posed by D. Hilbert. Despite extensive efforts, the resolution of the P vs NP problem, along with other central questions—such as the security of modern cryptography, the existence of provably correct learning algorithms for expressive classes of functions, and the intractability of searching for mathematical proofs—remains elusive. Could it be the case that the standard arsenal of mathematical techniques is simply insufficient to settle these fundamental problems?

While researchers have pondered this question for decades, recent years have witnessed a surge of interest and significant advancements in the logical foundations of complexity theory. These include intricate connections among logic, complexity theory, and computational learning theory. Researchers have also identified fragments of arithmetic that can formalise the majority of results in algorithms and complexity, and made notable progress on the unprovability of complexity bounds within these same logical theories. Building upon these advances and emerging connections, this programme aims to harness their potential and foster collaboration among experts from complexity theory, mathematical logic, and related disciplines towards a renewed attack on fundamental problems about the complexity of computations and what we can prove about them.

Workshops

Frontiers in complexity lower bounds

7 - 11 SEP 2026

Logical foundations of complexity theory

19 - 23 OCT 2026

Bridges between proofs, communication, and computation

30 NOV - 4 DEC 2026

Programme Organisers



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