



# Automated Physical Database Design and Tuning (Emerging Directions in Database Systems and Applications)

*Nicolas Bruno*

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Due to the increasing complexity in application workloads and query engines, database administrators are turning to automated tuning tools that systematically explore the space of physical design alternatives. A critical element of such tuning is physical database design since the choice of physical structures has a significant impact on the performance of the database system. **Automated Physical Database Design and Tuning** presents a detailed overview of the fundamental ideas and algorithms for automatically recommending changes to the physical design of a database system.

The first part of the book introduces the necessary technical background. The author explains SQL, the space of execution plans for answering SQL queries, query optimization, how the choice of access paths (e.g., indexes) is crucial to performance, and the complexity of the physical design problem.

The second part extensively discusses automated physical design techniques, covering fundamental research ideas in the last 15 years that have resulted in a new generation of tuning tools. The text focuses on the search space of alternatives, the necessity of a cost model to compare such alternatives, different mechanisms to traverse and enumerate the search space, and practical aspects in real-world tuning tools.

In the third part, the author explores new advances in automated physical design. He applies previous approaches to other physical structures, such as materialized views, partitioning, and multidimensional clustering. He also analyzes workload models for new types of applications, generalizes the optimizing function of current physical design tools to cope with other application scenarios, and examines open-ended challenges in physical database design.

This book offers valuable insights on well-established principles and cutting-edge research results in automated physical design. It helps readers gain a deeper understanding of how automated tuning tools work in database installations as well as the challenges and opportunities involved in designing next-generation tuning tools.

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