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   Nota di contenuto   Chapter 1. Introduction -- Chapter 2. A Theoretical Framework for
                                 Spectrum-based Fault Localization -- Chapter 3. Theoretical
                                 Comparison Among Risk Evaluation Formulas -- Chapter 4. On the
                                 Maximality of Spectrum-based Fault Localization -- Chapter 5. A
                                 Generalized Theoretical Framework for Hybrid Spectrum-based Fault
                                 Localization -- Chapter 6. Practicality of the Theoretical Frameworks --
                                 Chapter 7. Tackling the Oracle Problem in Spectrum-based Fault
                                 Localization -- Chapter 8. Spectrum-based Fault Localization for
                                 Multiple Faults -- Chapter 9. Conclusion.

   Sommario/riassunto   Program debugging has always been a difficult and time-consuming
                                 task in the context of software development, where spectrum-based
                                 fault localization (SBFL) is one of the most widely studied families of
                                 techniques. While it's not particularly difficult to learn about the
                                 process and empirical performance of a particular SBFL technique from
                                 the available literature, researchers and practitioners aren't always
                                 familiar with the underlying theories. This book provides the first
                                 comprehensive guide to fundamental theories in SBFL, while also
                                 addressing some emerging challenges in this area. The theoretical

framework introduced here reveals the intrinsic relations between various risk evaluation formulas, making it possible to construct a formula performance hierarchy. Further extensions of the framework provide a sufficient and necessary condition for a general maximal formula, as well as performance comparisons for hybrid SBFL methods. With regard to emerging challenges in SBFL, the book mainly covers the frequently encountered oracle problem in SBFL and introduces a metamorphic slice-based solution. In addition, it discusses the challenge of multiple-fault localization and presents cutting-edge approaches to overcoming it. SBFL is a widely studied research area with a massive amount of publications. Thus, it is essential that the software engineering community, especially those involved in program debugging, software maintenance and software quality assurance (including both newcomers and researchers who want to gain deeper insights) understand the most fundamental theories – which could also be very helpful to ensuring the healthy development of the field.