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Sommario/riassunto	This book explores the Higgs boson and its interactions with fermions, as well as the detector technologies used to measure it. The Standard Model of Particle Physics has been a groundbreaking theory in our understanding of the fundamental properties of the universe, but it is incomplete, and there are significant hints which require new physics. The discovery of the Higgs boson in 2012 was a substantial confirmation of the Standard Model, but many of its decay modes remain elusive. This book presents the latest search for Higgs boson decays into c-quarks using a proton-proton collision dataset collected by the ATLAS experiment at the Large Hadron Collider (LHC). This decay mode has yet to be observed and requires advanced machine learning algorithms to identify c-quarks in the experiment. The results

provide an upper limit on the rate of Higgs boson decays to c-quarks and a direct measurement of the Higgs boson coupling strength to c-quarks. The book also discusses the future of particle physics and the need for significant improvements to the detector to cope with increased radiation damage and higher data rates at the High-Luminosity LHC. It presents the characterization of the ATLAS pixel detector readout chip for the inner detector upgrade (ITk). The chip was subjected to irradiations using X-rays and protons to simulate the radiation environment at the HL-LHC. The tests showed that all readout chip components, including the digital logic and analogue front-end, are sufficiently radiation-tolerant to withstand the expected radiation dose. Finally, this book describes monolithic pixel detectors as a possible technology for future pixel detectors. This book is ideal for individuals interested in exploring particle physics, the Higgs boson, and the development of silicon pixel detectors.