

Christoph Böhm
Maximilian Hofer

Physical Unclonable Functions in Theory and Practice

 Springer

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Michael Seilmaier



Physical Unclonable Functions In Theory And Practice:

Physical Unclonable Functions in Theory and Practice Christoph Böhm, Maximilian Hofer, 2012-10-16 In Physical Unclonable Functions in Theory and Practice the authors present an in depth overview of various topics concerning PUFs providing theoretical background and application details This book concentrates on the practical issues of PUF hardware design focusing on dedicated microelectronic PUF circuits Additionally the authors discuss the whole process of circuit design layout and chip verification The book also offers coverage of Different published approaches focusing on dedicated microelectronic PUF circuits Specification of PUF circuits General design issues Minimizing error rate from the circuit s perspective Transistor modeling issues of Montecarlo mismatch simulation and solutions Examples of PUF circuits including an accurate description of the circuits and testing measurement results Different error rate reducing pre selection techniques This monograph gives insight into PUFs in general and provides knowledge in the field of PUF circuit design and implementation It could be of interest for all circuit designers confronted with PUF design and also for professionals and students being introduced to the topic

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On the Learnability of Physically Unclonable Functions Fatemeh Ganji, 2018-03-24 This book addresses the issue of Machine Learning ML attacks on Integrated Circuits through Physical Unclonable Functions PUFs It provides the mathematical proofs of the vulnerability of various PUF families including Arbiter XOR Arbiter ring oscillator and bistable ring PUFs to ML attacks To achieve this goal it develops a generic framework for the assessment of these PUFs based on two main approaches First with regard to the inherent physical characteristics it establishes fit for purpose mathematical representations of the PUFs mentioned above which adequately reflect the physical behavior of these primitives To this end notions and formalizations that are already familiar to the ML theory world are reintroduced in order to give a better understanding of why how and to what extent ML attacks against PUFs can be feasible

in practice Second the book explores polynomial time ML algorithms which can learn the PUFs under the appropriate representation More importantly in contrast to previous ML approaches the framework presented here ensures not only the accuracy of the model mimicking the behavior of the PUF but also the delivery of such a model Besides off the shelf ML algorithms the book applies a set of algorithms hailing from the field of property testing which can help to evaluate the security of PUFs They serve as a toolbox from which PUF designers and manufacturers can choose the indicators most relevant for their requirements Last but not least on the basis of learning theory concepts the book explicitly states that the PUF families cannot be considered as an ultimate solution to the problem of insecure ICs As such it provides essential insights into both academic research on and the design and manufacturing of PUFs

Cryptography and Security: From Theory to Applications David Naccache, 2012-02-21 This Festschrift volume published in honor of Jean Jaques Quisquater on the occasion of his 65th Birthday contains 33 papers from colleagues all over the world and deals with all the fields to which Jean Jaques dedicated his work during his academic career Focusing on personal tributes and re visits of Jean Jaques Quisquater s legacy the volume addresses the following central topics symmetric and asymmetric cryptography side channels attacks hardware and implementations smart cards and information security In addition there are four more contributions just as diverse as Jean Jacques scientific interests

Physically Unclonable Functions Roel Maes, 2013-11-19 Physically unclonable functions PUFs are innovative physical security primitives that produce unclonable and inherent instance specific measurements of physical objects in many ways they are the inanimate equivalent of biometrics for human beings Since they are able to securely generate and store secrets they allow us to bootstrap the physical implementation of an information security system In this book the author discusses PUFs in all their facets the multitude of their physical constructions the algorithmic and physical properties which describe them and the techniques required to deploy them in security applications The author first presents an extensive overview and classification of PUF constructions with a focus on so called intrinsic PUFs He identifies subclasses implementation properties and design techniques used to amplify submicroscopic physical distinctions into observable digital response vectors He lists the useful qualities attributed to PUFs and captures them in descriptive definitions identifying the truly PUF defining properties in the process and he also presents the details of a formal framework for deploying PUFs and similar physical primitives in cryptographic reductions The author then describes a silicon test platform carrying different intrinsic PUF structures which was used to objectively compare their reliability uniqueness and unpredictability based on experimental data In the final chapters the author explains techniques for PUF based entity identification entity authentication and secure key generation He proposes practical schemes that implement these techniques and derives and calculates measures for assessing different PUF constructions in these applications based on the quality of their response statistics Finally he presents a fully functional prototype implementation of a PUF based cryptographic key generator demonstrating the full benefit of using PUFs and the efficiency of the processing techniques

described This is a suitable introduction and reference for security researchers and engineers and graduate students in information security and cryptography **Secure System Design and Trustable Computing** Chip-Hong Chang, Miodrag Potkonjak, 2015-09-17 This book provides the foundations for understanding hardware security and trust which have become major concerns for national security over the past decade Coverage includes issues related to security and trust in a variety of electronic devices and systems related to the security of hardware firmware and software spanning system applications online transactions and networking services This serves as an invaluable reference to the state of the art research that is of critical significance to the security of and trust in modern society s microelectronic supported infrastructures Security and Fault Tolerance in Internet of Things Rajat Subhra Chakraborty, Jimson Mathew, Athanasios V. Vasilakos, 2018-12-13 This book covers various aspects of security privacy and reliability in Internet of Things IoT and Cyber Physical System design analysis and testing In particular various established theories and practices both from academia and industry are presented and suitably organized targeting students engineers and researchers Fifteen leading academicians and practitioners wrote this book pointing to the open problems and biggest challenges on which research in the near future will be focused

Reliable, Secure, Efficient Physical Unclonable Functions Mudit Bhargava, 2013 Towards Hardware-Intrinsic Security Ahmad-Reza Sadeghi, David Naccache, 2010-11-03 Hardware intrinsic security is a young field dealing with secure secret key storage By generating the secret keys from the intrinsic properties of the silicon e g from intrinsic Physical Unclonable Functions PUFs no permanent secret key storage is required anymore and the key is only present in the device for a minimal amount of time The field is extending to hardware based security primitives and protocols such as block ciphers and stream ciphers entangled with the hardware thus improving IC security While at the application level there is a growing interest in hardware security for RFID systems and the necessary accompanying system architectures This book brings together contributions from researchers and practitioners in academia and industry an interdisciplinary group with backgrounds in physics mathematics cryptography coding theory and processor theory It will serve as important background material for students and practitioners and will stimulate much further research and development Towards Reliable and Secure Physical Unclonable Functions Mohd Syafiq Mispan, 2018 **Towards Hardware-Intrinsic Security** Ahmad-Reza Sadeghi, David Naccache, 2010-11-04 Hardware intrinsic security is a young field dealing with secure secret key storage By generating the secret keys from the intrinsic properties of the silicon e g from intrinsic Physical Unclonable Functions PUFs no permanent secret key storage is required anymore and the key is only present in the device for a minimal amount of time The field is extending to hardware based security primitives and protocols such as block ciphers and stream ciphers entangled with the hardware thus improving IC security While at the application level there is a growing interest in hardware security for RFID systems and the necessary accompanying system architectures This book brings together contributions from researchers and practitioners in academia and industry an interdisciplinary group with backgrounds in physics

mathematics cryptography coding theory and processor theory It will serve as important background material for students and practitioners and will stimulate much further research and development

Strengthening Physical Unclonable Functions Using Composition Zhuanhao Wu,2019 *Security with Noisy Data* Pim Tuyls,Boris Škorić,Tom Kevenaar,2007-10-24 Noisy data appear very naturally in applications where the authentication is based on physical identifiers This book provides a self contained overview of the techniques and applications of security based on noisy data It covers both the theory of authentication based on noisy data and shows it in practice as a key tool for prevention of counterfeiting Biometrics and physical unclonable functions are discussed extensively Key new technologies discussed include Algorithms to derive secure keys form noisy data in particular from Physical Unclonable Functions and Biometrics also the theory which proves that those algorithms are secure is made accessible Practical Implementations of the above mentioned algorithms Techniques that give insight in the security of those systems in practice An overview and detailed description of new applications that become possible by using these new algorithms This book can serve as a starting point for PhD students entering the field and will also benefit professionals

Development of Benchmarks for Physical Unclonable Functions Martin Gruber,2016 *Modelling-Resistant Physical Unclonable Functions* ,2014 *Higher-order Alphabet Physical Unclonable Functions* Vincent Charles Immler,2019 *A New Physical Unclonable Function Architecture**Project Supported by the National Natural Science Foundation of China (No. 61376031). ,2015

Functions + Logic in theory and practice Richard B. Kiebertz,1987 **Frontiers in Hardware Security and Trust** Chip Hong Chang,Yuan Cao,2020-10-12 Frontiers in Hardware Security and Trust provides a comprehensive review of emerging security threats and privacy protection issues and the versatile state of the art hardware based security countermeasures and applications proposed by the hardware security community

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Physical Unclonable Functions In Theory And Practice

displacement 454 cid 7 4l block heads cast iron configuration 90 v8 bore x stroke 4 25 x 4 0 compression ratio 10 25 1 11 25
1 8 2 1 firing order 1 8 4 3 6 5 7 2 engine weight 685 lbs max horsepower 450 hp 5600 rpm