# 8th International Conference on Information Systems Security and Privacy (ICISSP 2022)

Online 9 - 11 February 2022

**Editors:** 

Paolo Mori Gabriele Lenzini Steven Furnell

ISBN: 978-1-7138-5316-9

Printed from e-media with permission by:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2022) by SCITEPRESS – Science and Technology Publications, Lda. All rights reserved.

Printed with permission by Curran Associates, Inc. (2022)

For permission requests, please contact SCITEPRESS – Science and Technology Publications, Lda. at the address below.

SCITEPRESS – Science and Technology Publications, Lda. Avenida de S. Francisco Xavier, Lote 7 Cv. C, 2900-616 Setúbal, Portugal

Phone: +351 265 520 185 Fax: +351 265520 186

info@scitepress.org

### Additional copies of this publication are available from:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571 USA Phone: 845-758-0400 Fax: 845-758-2633 Email: curran@proceedings.com Web: www.proceedings.com

# **CONTENTS**

## **INVITED SPEAKERS**

### **KEYNOTE SPEAKERS**

Why Rigorous Underpinnings for Cyber Security Education and Training Matter? Experiences from CyBOK: The Cyber Security Body of Knowledge <i>Awais Rashid</i>	5
Data Security and Privacy in Emerging Scenarios Pierangela Samarati	7
Why Usability Has Become Privacy's Biggest Challenge and What We Can Do About It Norman Sadeh	9
PAPERS	
FULL PAPERS	
"Fake News Detector": An Automatic System for the Reliability Evaluation of Digital News Claudio Cilli, Giulio Magnanini, Lorenzo Manduca and Fabrizio Venettoni	15
Network Intrusion Detection: A Comprehensive Analysis of CIC-IDS2017 Arnaud Rosay, Eloïse Cheval, Florent Carlier and Pascal Leroux	25
Privacy-preserving Parallel Computation of Shortest Path Algorithms with Low Round Complexity Mohammad Anagreh, Peeter Laud and Eero Vainikko	37
Systematic Analysis of Programming Languages and Their Execution Environments for Spectre Attacks Amir Naseredini, Stefan Gast, Martin Schwarzl, Pedro Miguel Sousa Bernardo, Amel Smajic, Claudio Canella, Martin Berger and Daniel Gruss	48
Semantic Attack on Disassociated Transactions Asma AlShuhail and Jianhue Shao	60
Implementing Post-quantum Cryptography for Developers Julius Hekkala, Kimmo Halunen and Visa Vallivaara	73
Security Issue Classification for Vulnerability Management with Semi-supervised Learning Emil Wåreus, Anton Duppils, Magnus Tullberg and Martin Hell	84
Estimating the Time-To-Compromise of Exploiting Industrial Control System Vulnerabilities Engla Rencelj Ling and Mathias Ekstedt	96
Containment Strategy Formalism in a Probabilistic Threat Modelling Framework Per Fahlander, Mathias Ekstedt, Preetam Mukherjee and Ashish Kumar Dwivedi	108
Culturally-sensitive Cybersecurity Awareness Program Design for Iranian High-school Students Rooya Karimnia, Kaie Maennel and Mahtab Shahin	121
Analysis and Enhancement of Self-sovereign Identity System Properties Compiling Standards and Regulations Charnon Pattiyanon and Toshiaki Aoki	133

Public Key Compression and Fast Polynomial Multiplication for NTRU using the Corrected Hybridized NTT-Karatsuba Method 1 Rohon Kundu, Alessandro de Piccoli and Andrea Visconti	145
Intent-aware Permission Architecture: A Model for Rethinking Informed Consent for Android Apps <i>Md Rashedur Rahman, Elizabeth Miller, Moinul Hossain and Aisha Ali-Gombe</i> 1	154
A Fast and Cost-effective Design for FPGA-based Fuzzy Rainbow Tradeoffs Leonardo Veronese, Francesco Palmarini, Riccardo Focardi and Flaminia L. Luccio	165
Detecting Obfuscated Malware using Memory Feature Engineering1Tristan Carrier, Princy Victor, Ali Tekeoglu and Arash Habibi Lashkari1	177
Comparing the Detection of XSS Vulnerabilities in Node.js and a Multi-tier JavaScript-based Language via Deep Learning <i>Héloíse Maurel, Santiago Vidal and Tamara Rezk</i>	189
Differential-linear Attacks on Permutation Ciphers Revisited: Experiments on Ascon and DryGASCON 2 Aslí Başak Civek and Cihangir Tezcan	202
On Tracking Ransomware on the File System Luigi Catuogno and Clemente Galdi	210
SecTL: Secure and Verifiable Transfer Learning-based inference2Abbass Madi, Oana Stan, Renaud Sirdey and Cédric Gouy-Pailler2	220
TEEm: A Tangle-based Elastic Emulator for Storing Connected Vehicle Data in a Distributed Ledger Technology David Werden, Matthew Muccioli and Anyi Liu	230
Game Theoretic Analysis of Ransomware: A Preliminary Study Rudra Prasad Baksi and Shambhu Upadhyaya	242
SHORT PAPERS	
On the LPSE Password Meter's Discrepancies among Different Datasets Agnieszka Rucka and Wojciech Wodo	255
Classifying COVID-19 Disinformation on Twitter using a Convolutional Neural Network Mohamad Nabeel and Christine Große	264
Utility of Anonymised Data in Decision Tree Derivation2Jack R. Davies and Jianhua Shao2	273
Formalizing Real-world Threat Scenarios2Paul Tavolato, Robert Luh and Sebastian Eresheim2	281
Side Channel Identification using Granger Time Series Clustering with Applications to Control	
Systems Matthew Lee, Joshua Sylvester, Sunjoli Aggarwal, Aviraj Sinha, Michael Taylor, Nathan Srirama, Eric C. Larson and Mitchell A. Thornton	290
An Analysis of Cloud Certifications' Performance on Privacy Protections 2 <i>Tian Wang and Masooda Bashir</i>	299

Efficient and Secure Encryption Adjustment for JSON Data Maryam Almarwani, Boris Konev and Alexei Lisitsa	307
Towards a Better Understanding of Machine Learning based Network Intrusion Detection Systems in Industrial Networks Anne Borcherding, Lukas Feldmann, Markus Karch, Ankush Meshram and Jürgen Beyerer	314
Digital Supply Chain Vulnerabilities in Critical Infrastructure: A Systematic Literature Review on Cybersecurity in the Energy Sector <i>Mari Aarland and Terje Gjøsæter</i>	326
Cluster Crash: Learning from Recent Vulnerabilities in Communication Stacks Anne Borcherding, Philipp Takacs and Jürgen Beyerer	334
PREUNN: Protocol Reverse Engineering using Neural Networks Valentin Kiechle, Matthias Börsig, Sven Nitzsche, Ingmar Baumgart and Jürgen Becker	345
An Exploratory Study of Why UMLsec Is Not Adopted Shouki A. Ebad	357
A Tailored Model for Cyber Security Education Utilizing a Cyber Range Gregor Langner, Florian Skopik, Steven Furnell and Gerald Quirchmayr	365
Android Data Storage Locations and What App Developers Do with It from a Security and Privacy Perspective <i>Kris Heid, Tobias Tefke, Jens Heider and Ralf C. Staudemeyer</i>	378
SpamFender: A Semi-supervised Incremental Spam Classification System across Social Networks Shengyuan Wen and Weiqing Sun	388
A Novel Key Exchange Protocol using Logic Algebra for the Factorization Problem Junhui Xiao, Ashish Neupane, Hiba F. Fayoumi and Weiqing Sun	396
Cyber Exercises in Computer Science Education Melisa Gafic, Simon Tjoa, Peter Kieseberg, Otto Hellwig and Gerald Quirchmayr	404
Construction of a Support Tool for User Reading of Privacy Policies and Assessment of its User Impact Sachiko Kanamori, Hirotsune Sato, Naoya Tabata and Ryo Nojima	412
Impact of Cross-standard Cell Libraries on Machine Learning based Hardware Trojan Detection Shang-Wen Chen, Jian-Wei Liao, Chia-Wei Tien and Jung-Hsin Hsiao	420
Benchmarking Consumer Data and Privacy Knowledge in Connected and Autonomous Vehicles Flora Barber and Steven Furnell	426
Evaluating Deep Learning-based NIDS in Adversarial Settings Hesamodin Mohammadian, Arash Habibi Lashkari and Ali A. Ghorbani	435
Effective & Efficient Access Control in Smart Farms: Opportunities, Challenges & Potential Approaches Ghadeer I. Yassin and Lakshmish Ramaswamy	445
Feature Importance and Deep Learning for Android Malware Detection A. Talbi, A. Viens, LC. Leroux, M. François, M. Caillol and N. Nguyen	453

XIII

SMPG: Secure Multi Party Computation on Graph Databases Nouf Aljuaid, Alexei Lisitsa and Sven Schewe	463
Age Bias in Finger Vein Biometric Research Joanne L. Hall, Jomin John, Jessica Liebig and Anju Skariah	472
Industrial and Automation Control System Cyber Range Prototype for Offensive Capability Development Austris Uljāns and Bernhards Blumbergs	478
Planning for Cryptographic Readiness in an Era of Quantum Computing Advancement David Ott, Dennis Moreau and Manish Gaur	491
Incentivisation of Outsourced Network Testing: View from Platform Perspective Sultan Alasmari, Weichao Wang and Yu Wang	499
Protecting Shared Virtualized Environments against Cache Side-channel Attacks Abdullah Albalawi, Vassilios G. Vassilakis and Radu Calinescu	507
Revisiting Ontology Based Access Control: The Case for Ontology Based Data Access Ozgu Can and Murat Osman Unalir	515
Linguistic Steganography for Messaging Applications Elsa Serret, Antoine Lesueur and Alban Gabillon	519
DeDup.js: Discovering Malicious and Vulnerable Extensions by Detecting Duplication Pablo Picazo-Sanchez, Maximilian Algehed and Andrei Sabelfeld	528
Survey and Guidelines about Learning Cyber Security Risk Assessment Christophe Ponsard and Philippe Massonet	536
Comparing Perception of Disclosure of Different Types of Information Related to Automated Tools Vanessa Bracamonte and Takamasa Isohara	544
Post Quantum Cryptography Analysis of TLS Tunneling on a Constrained Device Jon Barton, William J. Buchanan, Nikolaos Pitropakis, Sarwar Sayeed and Will Abramson	551
PDF Malware Detection based on Stacking Learning Maryam Issakhani, Princy Victor, Ali Tekeoglu and Arash Habibi Lashkari	562
The GDPR Compliance and Access Control Systems: Challenges and Research Opportunities Said Daoudagh and Eda Marchetti	571
Who Watches the Watchers: A Multi-Task Benchmark for Anomaly Detection Phil Demetriou, Ingolf Becker and Stephen Hailes	579
Cyber Attack Stage Tracing System based on Attack Scenario Comparison Masahito Kumazaki, Hirokazu Hasegawa, Yukiko Yamaguchi, Hajime Shimada and Hiroki Takakura	587
Malware in Motion Robert Choudhury, Zhiyuan Luo and Khuong An Nguyen	595
Cryptanalysis of Some Electronic Checkbook Schemes Isa Sertkaya and Oznur Kalkar	603

The Role of Information Deserts in Information Security Awareness and Behaviour <i>D. P. Snyman and H. A. Kruger</i>	613
iProfile: Collecting and Analyzing Keystroke Dynamics from Android Users Haytham Elmiligi and Sherif Saad	621
WhatsApp Web Client Live Forensics Technique Alberto Magno Muniz Soares	629
A Privacy-Preserving Auction Platform with Public Verifiability for Smart Manufacturing Thomas Lorünser, Florian Wohner and Stephan Krenn	637
Can We Formally Catch Cheating in E-exams? Itzel Vazquez Sandoval and Gabriele Lenzini	648
Ransomware Detection with Deep Neural Networks Matan Davidian, Natalia Vanetik and Michael Kiperberg	656

# 6TH INTERNATIONAL SPECIAL SESSION ON FORMAL METHODS FOR SECURITY ENGINEERING

#### FULL PAPERS

On the Influence of Image Settings in Deep Learning-based Malware Detection <i>Francesco Mercaldo, Fabio Martinelli, Antonella Santone and Vinod P.</i>	669	
Tamer: A Sandbox for Facilitating and Automating IoT Malware Analysis with Techniques to Elicit Malicious Behavior Shun Yonamine, Yuzo Taenaka and Youki Kadobayashi	677	
Profile Hidden Markov Model Malware Detection and API Call Obfuscation Muhammad Ali, Monem Hamid, Jacob Jasser, Joachim Lerman, Samod Shetty and Fabio Di Troia	688	
NLP-based User Authentication through Mouse Dynamics Hoseong Asher Lee, Nikhil Prathapani, Rajesh Paturi, Sarp Parmaksiz and Fabio Di Troia	696	
AUTHOR INDEX	703	