

32nd USENIX Security Symposium (USENIX Security'23)

Anaheim, California, USA
9-11 August 2023

Volume 1 of 10

ISBN: 978-1-7138-7949-7

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© (2023) by Usenix Association
All rights reserved.

Printed with permission by Curran Associates, Inc. (2023)

For permission requests, please contact Usenix Association
at the address below.

Usenix Association
2560 Ninth Street, Suite 215
Berkeley, California, 94710

<https://www.usenix.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

32nd USENIX Security Symposium

August 9–11, 2023

Anaheim, CA, USA

Wednesday, August 9

Breaking Wireless Protocols

PhyAuth: Physical-Layer Message Authentication for ZigBee Networks 1
Ang Li and Jiawei Li, *Arizona State University*; Dianqi Han, *University of Texas at Arlington*; Yan Zhang, *The University of Akron*; Tao Li, *Indiana University–Purdue University Indianapolis*; Ting Zhu, *The Ohio State University*;
Yanchao Zhang, *Arizona State University*

Time for Change: How Clocks Break UWB Secure Ranging 19
Claudio Anliker, Giovanni Camurati, and Srdjan Čapkun, *ETH Zurich*

Formal Analysis and Patching of BLE-SC Pairing 37
Min Shi, Jing Chen, Kun He, Haoran Zhao, Meng Jia, and Ruiying Du, *Wuhan University*

Framing Frames: Bypassing Wi-Fi Encryption by Manipulating Transmit Queues 53
Domien Schepers and Aanjan Ranganathan, *Northeastern University*; Mathy Vanhoef, *imec-DistriNet, KU Leuven*

Interpersonal Abuse

Abuse Vectors: A Framework for Conceptualizing IoT-Enabled Interpersonal Abuse 69
Sophie Stephenson and Majed Almansoori, *University of Wisconsin–Madison*; Pardis Emami-Naeini, *Duke University*;
Danny Yuxing Huang, *New York University*; Rahul Chatterjee, *University of Wisconsin–Madison*

The Digital-Safety Risks of Financial Technologies for Survivors of Intimate Partner Violence 87
Rosanna Bellini, *Cornell University*; Kevin Lee, *Princeton University*; Megan A. Brown, *Center for Social Media and Politics, New York University*; Jeremy Shaffer, *Cornell University*; Rasika Bhalerao, *Northeastern University*;
Thomas Ristenpart, *Cornell Tech*

“It’s the Equivalent of Feeling Like You’re in Jail”: Lessons from Firsthand and Secondhand Accounts of IoT-Enabled Intimate Partner Abuse 105
Sophie Stephenson and Majed Almansoori, *University of Wisconsin–Madison*; Pardis Emami-Naeini, *Duke University*;
Rahul Chatterjee, *University of Wisconsin–Madison*

Sneaky Spy Devices and Defective Detectors: The Ecosystem of Intimate Partner Surveillance with Covert Devices 123
Rose Ceccio and Sophie Stephenson, *University of Wisconsin–Madison*; Varun Chadha, *Capital One*;
Danny Yuxing Huang, *New York University*; Rahul Chatterjee, *University of Wisconsin–Madison*

Inferring User Details

Towards a General Video-based Keystroke Inference Attack 141
Zhuolin Yang, Yuxin Chen, and Zain Sarwar, *University of Chicago*; Hadleigh Schwartz, *Columbia University*;
Ben Y. Zhao and Haitao Zheng, *University of Chicago*

Going through the motions: AR/VR keylogging from user head motions 159
Carter Slocum, Yicheng Zhang, Nael Abu-Ghazaleh, and Jiasi Chen, *University of California, Riverside*

Auditory Eyesight: Demystifying μ s-Precision Keystroke Tracking Attacks on Unconstrained Keyboard Inputs . . . 175
Yazhou Tu, Liqun Shan, and Md Imran Hossen, *University of Louisiana at Lafayette*; Sara Rampazzi and Kevin Butler, *University of Florida*; Xiali Hei, *University of Louisiana at Lafayette*

Watch your Watch: Inferring Personality Traits from Wearable Activity Trackers 193
Noé Zufferey and Mathias Humbert, *University of Lausanne, Switzerland*; Romain Tavenard, *University of Rennes, CNRS, LETG, France*; Kévin Huguenin, *University of Lausanne, Switzerland*

Adversarial ML beyond ML

Squint Hard Enough: Attacking Perceptual Hashing with Adversarial Machine Learning 211

Jonathan Prokos, *Johns Hopkins University*; Neil Fendley, *Johns Hopkins University Applied Physics Laboratory*; Matthew Green, *Johns Hopkins University*; Roei Schuster, *Vector Institute*; Eran Tromer, *Tel Aviv University and Columbia University*; Tushar Jois and Yinzhi Cao, *Johns Hopkins University*

How to Cover up Anomalous Accesses to Electronic Health Records 229

Xiaojun Xu, Qingying Hao, Zhuolin Yang, and Bo Li, *University of Illinois at Urbana-Champaign*; David Liebovitz, *Northwestern University*; Gang Wang and Carl A. Gunter, *University of Illinois at Urbana-Champaign*

KENKU: Towards Efficient and Stealthy Black-box Adversarial Attacks against ASR Systems 247

Xinghui Wu, *Xi'an Jiaotong University*; Shiqing Ma, *University of Massachusetts Amherst*; Chao Shen and Chenhao Lin, *Xi'an Jiaotong University*; Qian Wang, *Wuhan University*; Qi Li, *Tsinghua University*; Yuan Rao, *Xi'an Jiaotong University*

Tubes Among Us: Analog Attack on Automatic Speaker Identification 265

Shimaa Ahmed and Yash Wani, *University of Wisconsin-Madison*; Ali Shahin Shamsabadi, *Alan Turing Institute*; Mohammad Yaghini, *University of Toronto and Vector Institute*; Ilia Shumailov, *Vector Institute and University of Oxford*; Nicolas Papernot, *University of Toronto and Vector Institute*; Kassem Fawaz, *University of Wisconsin-Madison*

Private Set Operations

Efficient Unbalanced Private Set Intersection Cardinality and User-friendly Privacy-preserving Contact Tracing .. 283

Mingli Wu and Tsz Hon Yuen, *The University of Hong Kong*

Near-Optimal Oblivious Key-Value Stores for Efficient PSI, PSU and Volume-Hiding Multi-Maps 301

Alexander Bienstock, *New York University*; Sarvar Patel and Joon Young Seo, *Google*; Kevin Yeo, *Google and Columbia University*

Distance-Aware Private Set Intersection 319

Anrin Chakraborti, *Duke University*; Giulia Fanti, *Carnegie Mellon University*; Michael K. Reiter, *Duke University*

Linear Private Set Union from Multi-Query Reverse Private Membership Test. 337

Cong Zhang, *State Key Laboratory of Information Security, Institute of Information Engineering, Chinese Academy of Sciences; School of Cyber Security, University of Chinese Academy of Sciences*; Yu Chen, *School of Cyber Science and Technology, Shandong University; State Key Laboratory of Cryptology; Key Laboratory of Cryptologic Technology and Information Security, Ministry of Education, Shandong University*; Weiran Liu, *Alibaba Group*; Min Zhang, *School of Cyber Science and Technology, Shandong University; State Key Laboratory of Cryptology; Key Laboratory of Cryptologic Technology and Information Security, Ministry of Education, Shandong University*; Dongdai Lin, *State Key Laboratory of Information Security, Institute of Information Engineering, Chinese Academy of Sciences; School of Cyber Security, University of Chinese Academy of Sciences*

Logs and Auditing

Auditing Frameworks Need Resource Isolation: A Systematic Study on the Super Producer Threat to System Auditing and Its Mitigation 355

Peng Jiang, Ruizhe Huang, Ding Li, Yao Guo, and Xiangqun Chen, *MOE Key Lab of HCST, School of Computer Science, Peking University*; Jianhai Luan, Yuxin Ren, and Xinwei Hu, *Huawei Technologies*

AIRTAG: Towards Automated Attack Investigation by Unsupervised Learning with Log Texts 373

Hailun Ding, *Rutgers University*; Juan Zhai, *University of Massachusetts Amherst*; Yuhong Nan, *Sun Yat-sen University*; Shiqing Ma, *University of Massachusetts Amherst*

Rethinking System Audit Architectures for High Event Coverage and Synchronous Log Availability 391

Varun Gandhi, *Harvard University*; Sarbartha Banerjee, *University of Texas at Austin*; Aniket Agrawal and Adil Ahmad, *Arizona State University*; Sangho Lee and Marcus Peinado, *Microsoft Research*

Improving Logging to Reduce Permission Over-Granting Mistakes 409

Bingyu Shen, Tianyi Shan, and Yuanyuan Zhou, *University of California, San Diego*

Fighting the Robots

Diving into Robocall Content with SnorCall 427
Sathvik Prasad, Trevor Dunlap, Alexander Ross, and Bradley Reaves, *North Carolina State University*

UCBlocker: Unwanted Call Blocking Using Anonymous Authentication 445
Changlai Du and Hexuan Yu, *Virginia Tech*; Yang Xiao, *University of Kentucky*; Y. Thomas Hou, *Virginia Tech*;
Angelos D. Keromytis, *Georgia Institute of Technology*; Wenjing Lou, *Virginia Tech*

Combating Robocalls with Phone Virtual Assistant Mediated Interaction 463
Sharbani Pandit, *Georgia Institute of Technology*; Krishanu Sarker, *Georgia State University*; Roberto Perdisci,
University of Georgia and Georgia Institute of Technology; Mustaque Ahamad and Diyi Yang, *Georgia Institute
of Technology*

BotScreen: Trust Everybody, but Cut the Aimbots Yourself 481
Minyeop Choi, *KAIST*; Gihyuk Ko, *Cyber Security Research Center at KAIST and Carnegie Mellon University*;
Sang Kil Cha, *KAIST and Cyber Security Research Center at KAIST*

Perspectives and Incentives

**“If I could do this, I feel anyone could:” The Design and Evaluation of a Secondary Authentication
Factor Manager** 499
Garrett Smith, Tarun Yadav, and Jonathan Dutton, *Brigham Young University*; Scott Ruoti, *University of Tennessee Knoxville*;
Kent Seamons, *Brigham Young University*

Exploring Privacy and Incentives Considerations in Adoption of COVID-19 Contact Tracing Apps 517
Oshrat Ayalon, *Max Planck Institute for Software Systems*; Dana Turjeman, *Reichman University*; Elissa M. Redmiles,
Max Planck Institute for Software Systems

Exploring Tenants’ Preferences of Privacy Negotiation in Airbnb 535
Zixin Wang, *Zhejiang University*; Danny Yuxing Huang, *New York University*; Yaxing Yao, *University of Maryland,
Baltimore County*

**Know Your Cybercriminal: Evaluating Attacker Preferences by Measuring Profile Sales on an Active,
Leading Criminal Market for User Impersonation at Scale** 553
Michele Campobasso and Luca Allodi, *Eindhoven University of Technology*

Traffic Analysis

HorusEye: A Realtime IoT Malicious Traffic Detection Framework using Programmable Switches 571
Yutao Dong, *Tsinghua Shenzhen International Graduate School, Shenzhen, China*; Peng Cheng Laboratory, *Shenzhen,
China*; Qing Li, *Peng Cheng Laboratory, Shenzhen, China*; Kaidong Wu and Ruoyu Li, *Tsinghua Shenzhen International
Graduate School, Shenzhen, China*; Peng Cheng Laboratory, *Shenzhen, China*; Dan Zhao, *Peng Cheng Laboratory,
Shenzhen, China*; Gareth Tyson, *Hong Kong University of Science and Technology (GZ), Guangzhou, China*;
Junkun Peng, Yong Jiang, and Shutao Xia, *Tsinghua Shenzhen International Graduate School, Shenzhen, China*;
Peng Cheng Laboratory, Shenzhen, China; Mingwei Xu, *Tsinghua University, Beijing, China*

An Input-Agnostic Hierarchical Deep Learning Framework for Traffic Fingerprinting 589
Jian Qu, Xiaobo Ma, and Jianfeng Li, *Xi’an Jiaotong University*; Xiapu Luo, *The Hong Kong Polytechnic University*;
Lei Xue, *Sun Yat-sen University*; Junjie Zhang, *Wright State University*; Zhenhua Li, *Tsinghua University*; Li Feng,
Southwest Jiaotong University; Xiaohong Guan, *Xi’an Jiaotong University*

Subverting Website Fingerprinting Defenses with Robust Traffic Representation 607
Meng Shen, *School of Cyberspace Science and Technology, Beijing Institute of Technology*; Kexin Ji and Zhenbo Gao,
School of Computer Science, Beijing Institute of Technology; Qi Li, *Institute for Network Sciences and Cyberspace,
Tsinghua University*; Liehuang Zhu, *School of Cyberspace Science and Technology, Beijing Institute of Technology*;
Ke Xu, *Department of Computer Science and Technology, Tsinghua University*

**Rosetta: Enabling Robust TLS Encrypted Traffic Classification in Diverse Network Environments
with TCP-Aware Traffic Augmentation** 625
Renjie Xie and Jiahao Cao, *Tsinghua University*; Enhuan Dong and Mingwei Xu, *Tsinghua University and
Quan Cheng Laboratory*; Kun Sun, *George Mason University*; Qi Li and Licheng Shen, *Tsinghua University*;
Menghao Zhang, *Tsinghua University and Kuaishou Technology*

Adversarial Patches and Images

- Towards Targeted Obfuscation of Adversarial Unsafe Images using Reconstruction and Counterfactual Super Region Attribution Explainability.** 643
Mazal Bethany, Andrew Seong, Samuel Henrique Silva, Nicole Beebe, Nishant Vishwamitra, and Peyman Najafirad, *The University of Texas at San Antonio*
- TPatch: A Triggered Physical Adversarial Patch** 661
Wenjun Zhu and Xiaoyu Ji, *USSLAB, Zhejiang University*; Yushi Cheng, *BNRist, Tsinghua University*; Shibo Zhang and Wenyan Xu, *USSLAB, Zhejiang University*
- CAPatch: Physical Adversarial Patch against Image Captioning Systems.** 679
Shibo Zhang, *USSLAB, Zhejiang University*; Yushi Cheng, *BNRist, Tsinghua University*; Wenjun Zhu, Xiaoyu Ji, and Wenyan Xu, *USSLAB, Zhejiang University*
- Hard-label Black-box Universal Adversarial Patch Attack** 697
Guanhong Tao, Shengwei An, Siyuan Cheng, Guangyu Shen, and Xiangyu Zhang, *Purdue University*

Decentralized Finance

- Anatomy of a High-Profile Data Breach: Dissecting the Aftermath of a Crypto-Wallet Case.** 715
Svetlana Abramova and Rainer Böhme, *Universität Innsbruck*
- Glimpse: On-Demand PoW Light Client with Constant-Size Storage for DeFi.** 733
Giulia Scaffino, *TU Wien and Christian Doppler Laboratory Blockchain Technologies for the Internet of Things*; Lukas Aumayr and Zeta Avarikioti, *TU Wien*; Matteo Maffei, *TU Wien and Christian Doppler Laboratory Blockchain Technologies for the Internet of Things*
- Mixed Signals: Analyzing Ground-Truth Data on the Users and Economics of a Bitcoin Mixing Service** 751
Fieke Miedema, Kelvin Lubbertsen, Verena Schrama, and Rolf van Wegberg, *Delft University of Technology*
- Is Your Wallet Snitching On You? An Analysis on the Privacy Implications of Web3** 769
Christof Ferreira Torres, Fiona Willi, and Shweta Shinde, *ETH Zurich*

Memory

- CAPSTONE: A Capability-based Foundation for Trustless Secure Memory Access** 787
Jason Zhijingcheng Yu, *National University of Singapore*; Conrad Watt, *University of Cambridge*; Aditya Badole, Trevor E. Carlson, and Prateek Saxena, *National University of Singapore*
- FloatZone: Accelerating Memory Error Detection using the Floating Point Unit.** 805
Floris Gorter, Enrico Barberis, Raphael Isemann, Erik van der Kouwe, Cristiano Giuffrida, and Herbert Bos, *Vrije Universiteit Amsterdam*
- PUMM: Preventing Use-After-Free Using Execution Unit Partitioning.** 823
Carter Yagemann, *The Ohio State University*; Simon P. Chung, Brendan Saltaformaggio, and Wenke Lee, *Georgia Institute of Technology*
- MTSan: A Feasible and Practical Memory Sanitizer for Fuzzing COTS Binaries** 841
Xingman Chen, *Tsinghua University*; Yinghao Shi, *Institute of Information Engineering, Chinese Academy of Sciences*; Zheyu Jiang and Yuan Li, *Tsinghua University*; Ruoyu Wang, *Arizona State University*; Haixin Duan, *Tsinghua University and Zhongguancun Laboratory*; Haoyu Wang, *Huazhong University of Science and Technology*; Chao Zhang, *Tsinghua University and Zhongguancun Laboratory*

Security in Digital Realities

- Hidden Reality: Caution, Your Hand Gesture Inputs in the Immersive Virtual World are Visible to All!** 859
Sindhu Reddy Kalathur Gopal and Diksha Shukla, *University of Wyoming*; James David Wheelock, *University of Colorado Boulder*; Nitesh Saxena, *Texas A&M University, College Station*
- LocIn: Inferring Semantic Location from Spatial Maps in Mixed Reality** 877
Habiba Farrukh, Reham Mohamed, Aniket Nare, Antonio Bianchi, and Z. Berkay Celik, *Purdue University*

Unique Identification of 50,000+ Virtual Reality Users from Head & Hand Motion Data	895
Vivek Nair and Wenbo Guo, <i>UC Berkeley</i> ; Justus Mattern, <i>RWTH Aachen</i> ; Rui Wang and James F. O'Brien, <i>UC Berkeley</i> ; Louis Rosenberg, <i>Unanimous AI</i> ; Dawn Song, <i>UC Berkeley</i>	
Exploring User Reactions and Mental Models Towards Perceptual Manipulation Attacks in Mixed Reality	911
Kaiming Cheng, Jeffery F. Tian, Tadayoshi Kohno, and Franziska Roesner, <i>University of Washington</i>	
Erebus: Access Control for Augmented Reality Systems	929
Yoonsang Kim, Sanket Goutam, Amir Rahmati, and Arie Kaufman, <i>Stony Brook University</i>	
Password Guessing	
No Single Silver Bullet: Measuring the Accuracy of Password Strength Meters	947
Ding Wang, Xuan Shan, and Qiying Dong, <i>Nankai University</i> ; Yaosheng Shen, <i>Peking University</i> ; Chunfu Jia, <i>Nankai University</i>	
Password Guessing Using Random Forest	965
Ding Wang and Yunkai Zou, <i>Nankai University</i> ; Zijian Zhang, <i>Peking University</i> ; Kedong Xiu, <i>Nankai University</i>	
PASS2EDIT: A Multi-Step Generative Model for Guessing Edited Passwords	983
Ding Wang and Yunkai Zou, <i>Nankai University</i> ; Yuan-An Xiao, <i>Peking University</i> ; Siqi Ma, <i>The University of New South Wales</i> ; Xiaofeng Chen, <i>Xidian University</i>	
Improving Real-world Password Guessing Attacks via Bi-directional Transformers	1001
Ming Xu and Jitao Yu, <i>Fudan University</i> ; Xinyi Zhang, <i>Facebook</i> ; Chuanwang Wang, Shenghao Zhang, Haoqi Wu, and Weili Han, <i>Fudan University</i>	
Araña: Discovering and Characterizing Password Guessing Attacks in Practice	1019
Mazharul Islam, <i>University of Wisconsin–Madison</i> ; Marina Sanusi Bohuk, <i>Cornell Tech</i> ; Paul Chung, <i>University of Wisconsin–Madison</i> ; Thomas Ristenpart, <i>Cornell Tech</i> ; Rahul Chatterjee, <i>University of Wisconsin–Madison</i>	
Privacy Policies, Labels, Etc.	
POLIGRAPH: Automated Privacy Policy Analysis using Knowledge Graphs	1037
Hao Cui, Rahmadi Trimananda, Athina Markopoulou, and Scott Jordan, <i>University of California, Irvine</i>	
Calpric: Inclusive and Fine-grain Labeling of Privacy Policies with Crowdsourcing and Active Learning	1055
Wenjun Qiu, David Lie, and Lisa Austin, <i>University of Toronto</i>	
POLICYCOMP: Counterpart Comparison of Privacy Policies Uncovers Overbroad Personal Data Collection Practices	1073
Lu Zhou, <i>Xidian University and Shanghai Jiao Tong University</i> ; Chengyongxiao Wei, Tong Zhu, and Guoxing Chen, <i>Shanghai Jiao Tong University</i> ; Xiaokuan Zhang, <i>George Mason University</i> ; Suguo Du, Hui Cao, and Haojin Zhu, <i>Shanghai Jiao Tong University</i>	
Lalaine: Measuring and Characterizing Non-Compliance of Apple Privacy Labels	1091
Yue Xiao, Zhengyi Li, and Yue Qin, <i>Indiana University Bloomington</i> ; Xiaolong Bai, <i>Orion Security Lab, Alibaba Group</i> ; Jiale Guan, Xiaojing Liao, and Luyi Xing, <i>Indiana University Bloomington</i>	
Automated Cookie Notice Analysis and Enforcement	1109
Rishabh Khandelwal and Asmit Nayak, <i>University of Wisconsin–Madison</i> ; Hamza Harkous, <i>Google, Inc.</i> ; Kassem Fawaz, <i>University of Wisconsin–Madison</i>	
ML Applications to Malware	
Continuous Learning for Android Malware Detection	1127
Yizheng Chen, Zhoujie Ding, and David Wagner, <i>UC Berkeley</i>	
Humans vs. Machines in Malware Classification	1145
Simone Aonzo, <i>EURECOM</i> ; Yufei Han, <i>INRIA</i> ; Alessandro Mantovani and Davide Balzarotti, <i>EURECOM</i>	
Adversarial Training for Raw-Binary Malware Classifiers	1163
Keane Lucas, Samruddhi Pai, Weiran Lin, and Lujo Bauer, <i>Carnegie Mellon University</i> ; Michael K. Reiter, <i>Duke University</i> ; Mahmood Sharif, <i>Tel Aviv University</i>	

Black-box Adversarial Example Attack towards FCG Based Android Malware Detection under Incomplete Feature Information 1181
Heng Li, *Huazhong University of Science and Technology*; Zhang Cheng, *NSFOCUS Technologies Group Co., Ltd. and Huazhong University of Science and Technology*; Bang Wu, Liheng Yuan, Cuiying Gao, and Wei Yuan, *Huazhong University of Science and Technology*; Xiapu Luo, *The Hong Kong Polytechnic University*

Evading Provenance-Based ML Detectors with Adversarial System Actions 1199
Kunal Mukherjee, Joshua Wiedemeier, Tianhao Wang, James Wei, Feng Chen, Muhyun Kim, Murat Kantarcioglu, and Kangkook Jee, *The University of Texas at Dallas*

Secure Messaging

TreeSync: Authenticated Group Management for Messaging Layer Security 1217
Théophile Wallez, *Inria Paris*; Jonathan Protzenko, *Microsoft Research*; Benjamin Beurdouche, *Mozilla*; Karthikeyan Bhargavan, *Inria Paris*

Formal Analysis of Session-Handling in Secure Messaging: Lifting Security from Sessions to Conversations 1235
Cas Cremers, *CISPA Helmholtz Center for Information Security*; Charlie Jacomme, *Inria Paris*; Aurora Naska, *CISPA Helmholtz Center for Information Security*

Cryptographic Administration for Secure Group Messaging 1253
David Balbás, *IMDEA Software Institute & Universidad Politécnica de Madrid*; Daniel Collins and Serge Vaudenay, *EPFL*

Wink: Deniable Secure Messaging 1271
Anrin Chakraborti, *Duke University*; Darius Suci and Radu Sion, *Stony Brook University*

Three Lessons From Threema: Analysis of a Secure Messenger 1289
Kenneth G. Paterson, Matteo Scarlata, and Kien Tuong Truong, *ETH Zurich*

x-Fuzz

MorFuzz: Fuzzing Processor via Runtime Instruction Morphing enhanced Synchronizable Co-simulation 1307
Jinyan Xu and Yiyuan Liu, *Zhejiang University*; Sirui He, *City University of Hong Kong*; Haoran Lin and Yajin Zhou, *Zhejiang University*; Cong Wang, *City University of Hong Kong*

μ FUZZ: Redesign of Parallel Fuzzing using Microservice Architecture 1325
Yongheng Chen, *Georgia Institute of Technology*; Rui Zhong, *Pennsylvania State University*; Yupeng Yang, *Georgia Institute of Technology*; Hong Hu and Dinghao Wu, *Pennsylvania State University*; Wenke Lee, *Georgia Institute of Technology*

FISHFUZZ: Catch Deeper Bugs by Throwing Larger Nets 1343
Han Zheng, *National Computer Network Intrusion Protection Center, University of Chinese Academy of Science; School of Computer and Communication Sciences, EPFL; Zhongguancun Laboratory*; Jiayuan Zhang, *National Computer Network Intrusion Protection Center, University of Chinese Academy of Science; School of Computer and Communication, Lanzhou University of Technology*; Yuhang Huang, *National Computer Network Intrusion Protection Center, University of Chinese Academy of Science*; Zezhong Ren, *National Computer Network Intrusion Protection Center, University of Chinese Academy of Science; Zhongguancun Laboratory*; He Wang, *School of Cyber Engineering, Xidian University*; Chunjie Cao, *School of Cyberspace Security, Hainan University*; Yuqing Zhang, *National Computer Network Intrusion Protection Center, University of Chinese Academy of Science; Zhongguancun Laboratory; School of Cyberspace Security, Hainan University; School of Cyber Engineering, Xidian University*; Flavio Toffalini and Mathias Payer, *School of Computer and Communication Sciences, EPFL*

HyPFuzz: Formal-Assisted Processor Fuzzing 1361
Chen Chen, Rahul Kande, Nathan Nguyen, Flemming Andersen, and Aakash Tyagi, *Texas A&M University*; Ahmad-Reza Sadeghi, *Technische Universität Darmstadt*; Jeyavijayan Rajendran, *Texas A&M University*

POLYFUZZ: Holistic Greybox Fuzzing of Multi-Language Systems 1379
Wen Li, Jinyang Ruan, and Guangbei Yi, *Washington State University*; Long Cheng, *Clemson University*; Xiapu Luo, *The Hong Kong Polytechnic University*; Haipeng Cai, *Washington State University*

Programs, Code, and Binaries

VIPER: Spotting Syscall-Guard Variables for Data-Only Attacks 1397
Hengkai Ye, Song Liu, Zhechang Zhang, and Hong Hu, *The Pennsylvania State University*

AURC: Detecting Errors in Program Code and Documentation 1415
Peiwei Hu, Ruigang Liang, and Ying Cao, *SKLOIS, Institute of Information Engineering, Chinese Academy of Sciences, China, and School of Cyber Security, University of Chinese Academy of Sciences, China*; Kai Chen, *SKLOIS, Institute of Information Engineering, Chinese Academy of Sciences, China, School of Cyber Security, University of Chinese Academy of Sciences, China, and Beijing Academy of Artificial Intelligence, China*; Runze Zhang, *SKLOIS, Institute of Information Engineering, Chinese Academy of Sciences, China, and School of Cyber Security, University of Chinese Academy of Sciences, China*

Not All Data are Created Equal: Data and Pointer Prioritization for Scalable Protection Against Data-Oriented Attacks 1433
Salman Ahmed, *IBM Research*; Hans Liljestrand, *University of Waterloo*; Hani Jamjoom, *IBM Research*; Matthew Hicks, *Virginia Tech*; N. Asokan, *University of Waterloo*; Danfeng (Daphne) Yao, *Virginia Tech*

SAFER: Efficient and Error-Tolerant Binary Instrumentation 1451
Soumyakant Priyadarshan, Huan Nguyen, Rohit Chouhan, and R. Sekar, *Stony Brook University*

Reassembly is Hard: A Reflection on Challenges and Strategies 1469
Hyungseok Kim, *KAIST and The Affiliated Institute of ETRI*; Soomin Kim and Junoh Lee, *KAIST*; Kangkook Jee, *University of Texas at Dallas*; Sang Kil Cha, *KAIST*

IoT Security Expectations and Barriers

Measuring Up to (Reasonable) Consumer Expectations: Providing an Empirical Basis for Holding IoT Manufacturers Legally Responsible 1487
Lorenz Kustosch and Carlos Gañán, *TU Delft*; Mattis van 't Schip, *Radboud University*; Michel van Eeten and Simon Parkin, *TU Delft*

Are Consumers Willing to Pay for Security and Privacy of IoT Devices? 1505
Pardis Emami-Naeini, *Duke University*; Janarth Dheenadhayalan, Yuvraj Agarwal, and Lorrie Faith Cranor, *Carnegie Mellon University*

Examining Consumer Reviews to Understand Security and Privacy Issues in the Market of Smart Home Devices . . 1523
Swaathi Vetrivel, Veerle van Harten, Carlos H. Gañán, Michel van Eeten, and Simon Parkin, *Delft University of Technology*

Internet Service Providers' and Individuals' Attitudes, Barriers, and Incentives to Secure IoT 1541
Nissy Sombatruang, *National Institute of Information and Communications Technology*; Tristan Caulfield and Ingolf Becker, *University College London*; Akira Fujita, Takahiro Kasama, Koji Nakao, and Daisuke Inoue, *National Institute of Information and Communications Technology*

Detecting and Handling IoT Interaction Threats in Multi-Platform Multi-Control-Channel Smart Homes 1559
Haotian Chi, *Shanxi University and Temple University*; Qiang Zeng, *George Mason University*; Xiaojiang Du, *Stevens Institute of Technology*

Differential Privacy

Private Proof-of-Stake Blockchains using Differentially-Private Stake Distortion 1577
Chenghong Wang, David Pujol, Kartik Nayak, and Ashwin Machanavajjhala, *Duke University*

PRIVATEFL: Accurate, Differentially Private Federated Learning via Personalized Data Transformation 1595
Yuchen Yang, Bo Hui, and Haolin Yuan, *The Johns Hopkins University*; Neil Gong, *Duke University*; Yinzhi Cao, *The Johns Hopkins University*

What Are the Chances? Explaining the Epsilon Parameter in Differential Privacy 1613
Priyanka Nanayakkara, *Northwestern University*; Mary Anne Smart, *University of California San Diego*; Rachel Cummings, *Columbia University*; Gabriel Kaptchuk, *Boston University*; Elissa M. Redmiles, *Max Planck Institute for Software Systems*

Tight Auditing of Differentially Private Machine Learning	1631
Milad Nasr, Jamie Hayes, Thomas Steinke, and Borja Balle, <i>Google DeepMind</i> ; Florian Tramèr, <i>ETH Zurich</i> ; Matthew Jagielski, Nicholas Carlini, and Andreas Terzis, <i>Google DeepMind</i>	
PrivTrace: Differentially Private Trajectory Synthesis by Adaptive Markov Models	1649
Haiming Wang, <i>Zhejiang University</i> ; Zhikun Zhang, <i>CISPA Helmholtz Center for Information Security</i> ; Tianhao Wang, <i>University of Virginia</i> ; Shibo He, <i>Zhejiang University</i> ; Michael Backes, <i>CISPA Helmholtz Center for Information Security</i> ; Jiming Chen, <i>Zhejiang University</i> ; Yang Zhang, <i>CISPA Helmholtz Center for Information Security</i>	
Poisoning	
META-SIFT: How to Sift Out a Clean Subset in the Presence of Data Poisoning?	1667
Yi Zeng, <i>Virginia Tech and SONY AI</i> ; Minzhou Pan, Himanshu Jahagirdar, and Ming Jin, <i>Virginia Tech</i> ; Lingjuan Lyu, <i>SONY AI</i> ; Ruoxi Jia, <i>Virginia Tech</i>	
Towards A Proactive ML Approach for Detecting Backdoor Poison Samples	1685
Xiangyu Qi, Tinghao Xie, Jiachen T. Wang, Tong Wu, Saeed Mahloujifar, and Prateek Mittal, <i>Princeton University</i>	
PORE: Provably Robust Recommender Systems against Data Poisoning Attacks	1703
Jinyuan Jia, <i>The Pennsylvania State University</i> ; Yupei Liu, Yuepeng Hu, and Neil Zhenqiang Gong, <i>Duke University</i>	
Every Vote Counts: Ranking-Based Training of Federated Learning to Resist Poisoning Attacks	1721
Hamid Mozaffari, Virat Shejwalkar, and Amir Houmansadr, <i>University of Massachusetts Amherst</i>	
Fine-grained Poisoning Attack to Local Differential Privacy Protocols for Mean and Variance Estimation	1739
Xiaoguang Li, <i>Xidian University and Purdue University</i> ; Ninghui Li and Wenhai Sun, <i>Purdue University</i> ; Neil Zhenqiang Gong, <i>Duke University</i> ; Hui Li, <i>Xidian University</i>	
Smart Contracts	
Your Exploit is Mine: Instantly Synthesizing Counterattack Smart Contract	1757
Zhuo Zhang, <i>Purdue University</i> ; Zhiqiang Lin and Marcelo Morales, <i>Ohio State University</i> ; Xiangyu Zhang and Kaiyuan Zhang, <i>Purdue University</i>	
Smart Learning to Find Dumb Contracts	1775
Tamer Abdelaziz, <i>National University of Singapore</i> ; Aquinas Hobor, <i>University College London</i>	
Confusum Contractum: Confused Deputy Vulnerabilities in Ethereum Smart Contracts	1793
Fabio Gritti, Nicola Ruaro, Robert McLaughlin, Priyanka Bose, Dipanjan Das, Ilya Grishchenko, Christopher Kruegel, and Giovanni Vigna, <i>University of California, Santa Barbara</i>	
Panda: Security Analysis of Algorand Smart Contracts	1811
Zhiyuan Sun, <i>The Hong Kong Polytechnic University and Southern University of Science and Technology</i> ; Xiapu Luo, <i>The Hong Kong Polytechnic University</i> ; Yinqian Zhang, <i>Southern University of Science and Technology</i>	
Proxy Hunting: Understanding and Characterizing Proxy-based Upgradeable Smart Contracts in Blockchains ..	1829
William E Bodell III, Sajad Meisami, and Yue Duan, <i>Illinois Institute of Technology</i>	
x-Fuzz and Fuzz-x	
Fuzztruction: Using Fault Injection-based Fuzzing to Leverage Implicit Domain Knowledge	1847
Nils Bars, Moritz Schloegel, Tobias Scharnowski, and Nico Schiller, <i>Ruhr-Universität Bochum</i> ; Thorsten Holz, <i>CISPA Helmholtz Center for Information Security</i>	
FuzzJIT: Oracle-Enhanced Fuzzing for JavaScript Engine JIT Compiler	1865
Junjie Wang, <i>College of Intelligence and Computing, Tianjin University</i> ; Zhiyi Zhang, <i>CodeSafe Team</i> , <i>Qi An Xin Group Corp.</i> ; Shuang Liu, <i>College of Intelligence and Computing, Tianjin University</i> ; Xiaoning Du, <i>Monash University</i> ; Junjie Chen, <i>College of Intelligence and Computing, Tianjin University</i>	
GLeeFuzz: Fuzzing WebGL Through Error Message Guided Mutation	1883
Hui Peng, <i>Purdue University</i> ; Zhihao Yao and Ardalan Amiri Sani, <i>UC Irvine</i> ; Dave (Jing) Tian, <i>Purdue University</i> ; Mathias Payer, <i>EPFL</i>	

autofz: Automated Fuzzer Composition at Runtime	1901
Yu-Fu Fu, Jaehyuk Lee, and Taesoo Kim, <i>Georgia Institute of Technology</i>	
CarpetFuzz: Automatic Program Option Constraint Extraction from Documentation for Fuzzing	1919
Dawei Wang, Ying Li, and Zhiyu Zhang, <i>SKLOIS, Institute of Information Engineering, Chinese Academy of Sciences, China; School of Cyber Security, University of Chinese Academy of Sciences, China</i> ; Kai Chen, <i>SKLOIS, Institute of Information Engineering, Chinese Academy of Sciences, China; School of Cyber Security, University of Chinese Academy of Sciences, China; Beijing Academy of Artificial Intelligence, China</i>	
Cache Attacks	
SCARF – A Low-Latency Block Cipher for Secure Cache-Randomization	1937
Federico Canale, <i>Ruhr-University Bochum</i> ; Tim Güneysu, <i>Ruhr-University Bochum and DFKI</i> ; Gregor Leander and Jan Philipp Thoma, <i>Ruhr-University Bochum</i> ; Yosuke Todo, <i>NTT Social Informatics Laboratories</i> ; Rei Ueno, <i>Tohoku University</i>	
The Gates of Time: Improving Cache Attacks with Transient Execution	1955
Daniel Katzman, <i>Tel Aviv University</i> ; William Kosasih, <i>The University of Adelaide</i> ; Chitchanok Chuengsatiansup, <i>The University of Melbourne</i> ; Eyal Ronen, <i>Tel Aviv University</i> ; Yuval Yarom, <i>The University of Adelaide</i>	
Synchronization Storage Channels (S²C): Timer-less Cache Side-Channel Attacks on the Apple M1 via Hardware Synchronization Instructions	1973
Jiyong Yu and Aishani Dutta, <i>University of Illinois Urbana-Champaign</i> ; Trent Jaeger, <i>Pennsylvania State University</i> ; David Kohlbrenner, <i>University of Washington</i> ; Christopher W. Fletcher, <i>University of Illinois Urbana-Champaign</i>	
CLEPSYDRACACHE – Preventing Cache Attacks with Time-Based Evictions	1991
Jan Philipp Thoma, <i>Ruhr University Bochum</i> ; Christian Niesler, <i>University of Duisburg-Essen</i> ; Dominic Funke, Gregor Leander, Pierre Mayr, and Nils Pohl, <i>Ruhr University Bochum</i> ; Lucas Davi, <i>University of Duisburg-Essen</i> ; Tim Güneysu, <i>Ruhr University Bochum & DFKI</i>	
CACHEQL: Quantifying and Localizing Cache Side-Channel Vulnerabilities in Production Software	2009
Yuanyuan Yuan, Zhibo Liu, and Shuai Wang, <i>The Hong Kong University of Science and Technology</i>	
Authentication	
InfinityGauntlet: Expose Smartphone Fingerprint Authentication to Brute-force Attack	2027
Yu Chen and Yang Yu, <i>Xuanwu Lab, Tencent</i> ; Lidong Zhai, <i>Institute of Information Engineering, Chinese Academy of Sciences</i>	
A Study of Multi-Factor and Risk-Based Authentication Availability	2043
Anthony Gavazzi, Ryan Williams, Engin Kirda, and Long Lu, <i>Northeastern University</i> ; Andre King, Andy Davis, and Tim Leek, <i>MIT Lincoln Laboratory</i>	
A Large-Scale Measurement of Website Login Policies	2061
Suood Al Roomi, <i>Georgia Institute of Technology, Kuwait University</i> ; Frank Li, <i>Georgia Institute of Technology</i>	
Security and Privacy Failures in Popular 2FA Apps	2079
Conor Gilsean, <i>UC Berkeley / ICSI</i> ; Fuzail Shakir and Noura Alomar, <i>UC Berkeley</i> ; Serge Egelman, <i>UC Berkeley / ICSI</i>	
Multi-Factor Key Derivation Function (MFKDF) for Fast, Flexible, Secure, & Practical Key Management	2097
Vivek Nair and Dawn Song, <i>University of California, Berkeley</i>	
Private Data Leaks	
Log: It's Big, It's Heavy, It's Filled with Personal Data! Measuring the Logging of Sensitive Information in the Android Ecosystem	2115
Allan Lyons, <i>University of Calgary</i> ; Julien Gamba, <i>IMDEA Networks Institute and Universidad Carlos III de Madrid</i> ; Austin Shawaga, <i>University of Calgary</i> ; Joel Reardon, <i>University of Calgary and AppCensus, Inc.</i> ; Juan Tapiador, <i>Universidad Carlos III de Madrid</i> ; Serge Egelman, <i>ICSI and UC Berkeley and AppCensus, Inc.</i> ; Narseo Vallina-Rodriguez, <i>IMDEA Networks Institute and AppCensus, Inc.</i>	
CodexLeaks: Privacy Leaks from Code Generation Language Models in GitHub Copilot	2133
Liang Niu and Shujaat Mirza, <i>New York University</i> ; Zayd Maradni and Christina Pöpper, <i>New York University Abu Dhabi</i>	

Freaky Leaky SMS: Extracting User Locations by Analyzing SMS Timings 2151
Evangelos Bitsikas, *Northeastern University*; Theodor Schnitzler, *Research Center Trustworthy Data Science and Security*;
Christina Pöpper, *New York University Abu Dhabi*; Aanjhan Ranganathan, *Northeastern University*

The Writing on the Wall and 3D Digital Twins: Personal Information in (not so) Private Real Estate 2169
Rachel McAmis and Tadayoshi Kohno, *University of Washington*

Generative AI

Glaze: Protecting Artists from Style Mimicry by Text-to-Image Models 2187
Shawn Shan, Jenna Cryan, Emily Wenger, Haitao Zheng, Rana Hanocka, and Ben Y. Zhao, *University of Chicago*

Lost at C: A User Study on the Security Implications of Large Language Model Code Assistants 2205
Gustavo Sandoval, Hammond Pearce, Teo Nys, Ramesh Karri, Siddharth Garg, and Brendan Dolan-Gavitt,
New York University

Two-in-One: A Model Hijacking Attack Against Text Generation Models 2223
Wai Man Si, Michael Backes, and Yang Zhang, *CISPA Helmholtz Center for Information Security*; Ahmed Salem, *Microsoft*

PTW: Pivotal Tuning Watermarking for Pre-Trained Image Generators 2241
Nils Lukas and Florian Kerschbaum, *University of Waterloo*

Security Worker Perspectives

Lessons Lost: Incident Response in the Age of Cyber Insurance and Breach Attorneys 2259
Daniel W. Woods, *University of Edinburgh*; Rainer Böhme, *University of Innsbruck*; Josephine Wolff, *Tufts University*;
Daniel Schwarcz, *University of Minnesota*

Bug Hunters' Perspectives on the Challenges and Benefits of the Bug Bounty Ecosystem 2275
Omer Akgul, *University of Maryland*; Taha Eghtesad, *Pennsylvania State University*; Amit Elazari, *University of California, Berkeley*;
Omprakash Gnawali, *University of Houston*; Jens Grossklags, *Technical University of Munich*;
Michelle L. Mazurek, *University of Maryland*; Daniel Votipka, *Tufts University*; Aron Laszka, *Pennsylvania State University*

Work-From-Home and COVID-19: Trajectories of Endpoint Security Management in a Security Operations Center 2293
Kailani R. Jones and Dalton A. Brucker-Hahn, *University of Kansas*; Bradley Fidler, *Independent Researcher*;
Alexandru G. Bardas, *University of Kansas*

“Employees Who Don’t Accept the Time Security Takes Are Not Aware Enough”: The CISO View of Human-Centred Security 2311
Jonas Hielscher and Uta Menges, *Ruhr University Bochum*; Simon Parkin, *TU Delft*; Annette Kluge and M. Angela Sasse,
Ruhr University Bochum

Deep Thoughts on Deep Learning

Aegis: Mitigating Targeted Bit-flip Attacks against Deep Neural Networks 2329
Jialai Wang, *Tsinghua University*; Ziyuan Zhang, *Beijing University of Posts and Telecommunications*; Meiqi Wang,
Tsinghua University; Han Qiu, *Tsinghua University and Zhongguancun Laboratory*; Tianwei Zhang, *Nanyang Technological University*;
Qi Li, *Tsinghua University and Zhongguancun Laboratory*; Zongpeng Li, *Tsinghua University and Hangzhou Dianzi University*;
Tao Wei, *Ant Group*; Chao Zhang, *Tsinghua University and Zhongguancun Laboratory*

Rethinking White-Box Watermarks on Deep Learning Models under Neural Structural Obfuscation 2347
Yifan Yan, Xudong Pan, Mi Zhang, and Min Yang, *Fudan University*

PELICAN: Exploiting Backdoors of Naturally Trained Deep Learning Models In Binary Code Analysis 2365
Zhuo Zhang, Guanhong Tao, Guangyu Shen, Shengwei An, Qiuling Xu, Yingqi Liu, and Yapeng Ye, *Purdue University*;
Yaoyuan Wu, *University of California, Los Angeles*; Xiangyu Zhang, *Purdue University*

IvySyn: Automated Vulnerability Discovery in Deep Learning Frameworks 2383
Neophytos Christou, Di Jin, and Vaggelis Atlidakis, *Brown University*; Baishakhi Ray, *Columbia University*;
Vasileios P. Kemerlis, *Brown University*

Thursday, August 10

Smart? Assistants

Hey Kimya, Is My Smart Speaker Spying on Me? Taking Control of Sensor Privacy Through Isolation and Amnesia 2401
Piet De Vaere and Adrian Perrig, *ETH Zürich*

Spying through Your Voice Assistants: Realistic Voice Command Fingerprinting 2419
Dilawer Ahmed, Aafaq Sabir, and Anupam Das, *North Carolina State University*

QFA2SR: Query-Free Adversarial Transfer Attacks to Speaker Recognition Systems 2437
Guangke Chen, Yedi Zhang, and Zhe Zhao, *ShanghaiTech University*; Fu Song, *ShanghaiTech University*; *Automotive Software Innovation Center*; *Institute of Software, Chinese Academy of Sciences & University of Chinese Academy of Sciences*

Learning Normality is Enough: A Software-based Mitigation against Inaudible Voice Attacks 2455
Xinfeng Li, Xiaoyu Ji, and Chen Yan, *USSLAB, Zhejiang University*; Chaohao Li, *USSLAB, Zhejiang University and Hangzhou Hikvision Digital Technology Co., Ltd.*; Yichen Li, *Hong Kong University of Science and Technology*; Zhenning Zhang, *University of Illinois at Urbana-Champaign*; Wenyan Xu, *USSLAB, Zhejiang University*

Powering for Privacy: Improving User Trust in Smart Speaker Microphones with Intentional Powering and Perceptible Assurance 2473
Youngwook Do and Nivedita Arora, *Georgia Institute of Technology*; Ali Mirzazadeh and Injoo Moon, *Georgia Institute of Technology and Massachusetts Institute of Technology*; Eryue Xu, *Georgia Institute of Technology*; Zhihan Zhang, *Georgia Institute of Technology and University of Washington*; Gregory D. Abowd, *Georgia Institute of Technology and Northeastern University*; Sauvik Das, *Georgia Institute of Technology and Carnegie Mellon University*

Security-Adjacent Worker Perspectives

To Cloud or not to Cloud: A Qualitative Study on Self-Hosters' Motivation, Operation, and Security Mindset ... 2491
Lea Gröber, *CISPA Helmholtz Center for Information Security and Saarland University*; Rafael Mrowczynski, *CISPA Helmholtz Center for Information Security*; Nimisha Vijay and Daphne A. Muller, *Nextcloud*; Adrian Dabrowski and Katharina Krombholz, *CISPA Helmholtz Center for Information Security*

"I wouldn't want my unsafe code to run my pacemaker": An Interview Study on the Use, Comprehension, and Perceived Risks of Unsafe Rust 2509
Sandra Höltervennhoff, *Leibniz University Hannover*; Philip Klostermeyer and Noah Wöhler, *CISPA Helmholtz Center for Information Security*; Yasemin Acar, *Paderborn University, George Washington University*; Sascha Fahl, *CISPA Helmholtz Center for Information Security*

Pushed by Accident: A Mixed-Methods Study on Strategies of Handling Secret Information in Source Code Repositories 2527
Alexander Krause, *CISPA Helmholtz Center for Information Security*; Jan H. Klemmer and Nicolas Huaman, *Leibniz University Hannover*; Dominik Wermke, *CISPA Helmholtz Center for Information Security*; Yasemin Acar, *Paderborn University, George Washington University*; Sascha Fahl, *CISPA Helmholtz Center for Information Security*

A Mixed-Methods Study of Security Practices of Smart Contract Developers 2545
Tanusree Sharma, Zhixuan Zhou, Andrew Miller, and Yang Wang, *University of Illinois at Urbana Champaign*

The Role of Professional Product Reviewers in Evaluating Security and Privacy 2563
Wentao Guo, Jason Walter, and Michelle L. Mazurek, *University of Maryland*

Censorship and Internet Freedom

Network Responses to Russia's Invasion of Ukraine in 2022: A Cautionary Tale for Internet Freedom 2581
Reethika Ramesh, Ram Sundara Raman, and Apurva Virkud, *University of Michigan*; Alexandra Dirksen, *TU Braunschweig*; Armin Huremagic, *University of Michigan*; David Fifield, *unaffiliated*; Dirk Rodenburg and Rod Hynes, *Psiphon*; Doug Madory, *Kentik*; Roya Ensafi, *University of Michigan*

A Study of China's Censorship and Its Evasion Through the Lens of Online Gaming 2599
Yuzhou Feng, *Florida International University*; Ruyi Zhai, *Hangzhou Dianzi University*; Radu Sion, *Stony Brook University*; Bogdan Carbutar, *Florida International University*

DeResistor: Toward Detection-Resistant Probing for Evasion of Internet Censorship 2617
Abderrahmen Amich and Birhanu Eshete, *University of Michigan, Dearborn*; Vinod Yegneswaran, *SRI International*;
Nguyen Phong Hoang, *University of Chicago*

Timeless Timing Attacks and Preload Defenses in Tor’s DNS Cache 2635
Rasmus Dahlberg and Tobias Pulls, *Karlstad University*

How the Great Firewall of China Detects and Blocks Fully Encrypted Traffic 2653
Mingshi Wu, *GFW Report*; Jackson Sippe, *University of Colorado Boulder*; Danesh Sivakumar and Jack Burg,
University of Maryland; Peter Anderson, *Independent researcher*; Xiaokang Wang, *V2Ray Project*; Kevin Bock,
University of Maryland; Amir Houmansadr, *University of Massachusetts Amherst*; Dave Levin, *University of Maryland*;
Eric Wustrow, *University of Colorado Boulder*

Machine Learning Backdoors

A Data-free Backdoor Injection Approach in Neural Networks 2671
Peizhuo Lv, Chang Yue, Ruigang Liang, and Yunfei Yang, *SKLOIS, Institute of Information Engineering,
Chinese Academy of Sciences, China*; *School of Cyber Security, University of Chinese Academy of Sciences, China*;
Shengzhi Zhang, *Department of Computer Science, Metropolitan College, Boston University, USA*; Hualong Ma,
SKLOIS, Institute of Information Engineering, Chinese Academy of Sciences, China; *School of Cyber Security,
University of Chinese Academy of Sciences, China*; Kai Chen, *SKLOIS, Institute of Information Engineering,
Chinese Academy of Sciences, China*; *School of Cyber Security, University of Chinese Academy of Sciences, China*;
Beijing Academy of Artificial Intelligence, China

Sparsity Brings Vulnerabilities: Exploring New Metrics in Backdoor Attacks 2689
Jianwen Tian, *NKLSTISS, Institute of Systems Engineering, Academy of Military Sciences, China*; Kefan Qiu, *School of
Cyberspace Science and Technology, Beijing Institute of Technology*; Debin Gao, *Singapore Management University*;
Zhi Wang, *DISSec, College of Cyber Science, Nankai University*; Xiaohui Kuang and Gang Zhao, *NKLSTISS, Institute of
Systems Engineering, Academy of Military Sciences, China*

Aliasing Backdoor Attacks on Pre-trained Models 2707
Cheng’an Wei, *SKLOIS, Institute of Information Engineering, Chinese Academy of Sciences, China*; *School of
Cyber Security, University of Chinese Academy of Sciences, China*; Yeonjoon Lee, *Hanyang University, Ansan,
Republic of Korea*; Kai Chen, Guozhu Meng, and Peizhuo Lv, *SKLOIS, Institute of Information Engineering,
Chinese Academy of Sciences, China*; *School of Cyber Security, University of Chinese Academy of Sciences, China*

ASSET: Robust Backdoor Data Detection Across a Multiplicity of Deep Learning Paradigms 2725
Minzhou Pan and Yi Zeng, *Virginia Tech*; Lingjuan Lyu, *Sony AI*; Xue Lin, *Northeastern University*; Ruoxi Jia,
Virginia Tech

VILLAIN: Backdoor Attacks Against Vertical Split Learning 2743
Yijie Bai and Yanjiao Chen, *Zhejiang University*; Hanlei Zhang and Wenyan Xu, *Zhejiang University*; Haiqin Weng
and Dou Goodman, *Ant Group*

Integrity

ARI: Attestation of Real-time Mission Execution Integrity 2761
Jinwen Wang, Yujie Wang, and Ao Li, *Washington University in St. Louis*; Yang Xiao, *University of Kentucky*;
Ruide Zhang, Wenjing Lou, and Y. Thomas Hou, *Virginia Polytechnic Institute and State University*; Ning Zhang,
Washington University in St. Louis

Design of Access Control Mechanisms in Systems-on-Chip with Formal Integrity Guarantees 2779
Dino Mehmedagić, Mohammad Rahmani Fadiheh, Johannes Müller, Anna Lena Duque Antón, Dominik Stoffel,
and Wolfgang Kunz, *Rheinland-Pfälzische Technische Universität (RPTU) Kaiserslautern-Landau, Germany*

HashTag: Hash-based Integrity Protection for Tagged Architectures 2797
Lukas Lamster, Martin Unterguggenberger, David Schrammel, and Stefan Mangard, *Graz University of Technology*

XCheck: Verifying Integrity of 3D Printed Patient-Specific Devices via Computing Tomography 2815
Zhiyuan Yu, Yuanhaur Chang, Shixuan Zhai, Nicholas Deily, and Tao Ju, *Washington University in St. Louis*;
XiaoFeng Wang, *Indiana University Bloomington*; Uday Jammalamadaka, *Rice University*; Ning Zhang,
Washington University in St. Louis

Demystifying Pointer Authentication on Apple M1 2833
Zechao Cai, Jiaxun Zhu, Wenbo Shen, Yutian Yang, and Rui Chang, *Zhejiang University and ZJU-Hangzhou Global Scientific and Technological Innovation Center*; Yu Wang, *Hangzhou Cyberserval Co., Ltd.*; Jinku Li, *Xidian University*; Kui Ren, *Zhejiang University and ZJU-Hangzhou Global Scientific and Technological Innovation Center*

Fuzzing Firmware and Drivers

DDRace: Finding Concurrency UAF Vulnerabilities in Linux Drivers with Directed Fuzzing 2849
Ming Yuan and Bodong Zhao, *Tsinghua University*; Penghui Li, *The Chinese University of Hong Kong*; Jiashuo Liang and Xinhui Han, *Peking University*; Xiapu Luo, *The Hong Kong Polytechnic University*; Chao Zhang, *Tsinghua University and Zhongguancun Lab*

Automata-Guided Control-Flow-Sensitive Fuzz Driver Generation 2867
Cen Zhang and Yuekang Li, *Nanyang Technological University, Continental-NTU Corporate Lab*; Hao Zhou, *The Hong Kong Polytechnic University*; Xiaohan Zhang, *Xidian University*; Yaowen Zheng, *Nanyang Technological University, Continental-NTU Corporate Lab*; Xian Zhan, *Southern University of Science and Technology*; *The Hong Kong Polytechnic University*; Xiaofei Xie, *Singapore Management University*; Xiapu Luo, *The Hong Kong Polytechnic University*; Xinghua Li, *Xidian University*; Yang Liu, *Nanyang Technological University, Continental-NTU Corporate Lab*; Sheikh Mahbub Habib, *Continental AG, Germany*

HOEDUR: Embedded Firmware Fuzzing using Multi-Stream Inputs 2885
Tobias Scharnowski and Simon Wörner, *CISPA Helmholtz Center for Information Security*; Felix Buchmann, *Ruhr University Bochum*; Nils Bars, Moritz Schloegel, and Thorsten Holz, *CISPA Helmholtz Center for Information Security*

Forming Faster Firmware Fuzzers 2903
Lukas Seidel, *Qwiet AI*; Dominik Maier, *TU Berlin*; Marius Muench, *VU Amsterdam and University of Birmingham*

ReUSB: Replay-Guided USB Driver Fuzzing 2921
Jisoo Jang, Minsuk Kang, and Dokyung Song, *Yonsei University*

Vehicles and Security

Exorcising “Wraith”: Protecting LiDAR-based Object Detector in Automated Driving System from Appearing Attacks 2939
Qifan Xiao, Xudong Pan, Yifan Lu, Mi Zhang, Jiarun Dai, and Min Yang, *Fudan University*

Discovering Adversarial Driving Maneuvers against Autonomous Vehicles 2957
Ruoyu Song, Muslum Ozgur Ozmen, Hyungsub Kim, Raymond Muller, Z. Berkay Celik, and Antonio Bianchi, *Purdue University*

Understand Users’ Privacy Perception and Decision of V2X Communication in Connected Autonomous Vehicles . . . 2975
Zekun Cai and Aiping Xiong, *The Pennsylvania State University*

You Can’t See Me: Physical Removal Attacks on LiDAR-based Autonomous Vehicles Driving Frameworks 2993
Yulong Cao, *University of Michigan*; S. Hrushikesh Bhupathiraju and Pirouz Naghavi, *University of Florida*; Takeshi Sugawara, *The University of Electro-Communications*; Z. Morley Mao, *University of Michigan*; Sara Rampazzi, *University of Florida*

PatchVerif: Discovering Faulty Patches in Robotic Vehicles 3011
Hyungsub Kim, Muslum Ozgur Ozmen, Z. Berkay Celik, Antonio Bianchi, and Dongyan Xu, *Purdue University*

Verifying Users

Fast IDentity Online with Anonymous Credentials (FIDO-AC) 3029
Wei-Zhu Yeoh, *CISPA Helmholtz Center for Information Security*; Michal Kepkowski, *Macquarie University*; Gunnar Heide, *CISPA Helmholtz Center for Information Security*; Dali Kaafar, *Macquarie University*; Lucjan Hanzlik, *CISPA Helmholtz Center for Information Security*

How to Bind Anonymous Credentials to Humans 3047
Julia Hesse, *IBM Research Europe - Zurich*; Nitin Singh, *IBM Research India - Bangalore*; Alessandro Sorniotti, *IBM Research Europe - Zurich*

Inducing Authentication Failures to Bypass Credit Card PINs	3065
David Basin, Patrick Schaller, and Jorge Toro-Pozo, <i>ETH Zurich</i>	
An Empirical Study & Evaluation of Modern CAPTCHAs	3081
Andrew Searles, <i>University of California, Irvine</i> ; Yoshimichi Nakatsuka, <i>ETH Zürich</i> ; Ercan Ozturk, <i>University of California, Irvine</i> ; Andrew Paverd, <i>Microsoft</i> ; Gene Tsudik, <i>University of California, Irvine</i> ; Ai Enkoji, <i>Lawrence Livermore National Laboratory</i>	
Account Verification on Social Media: User Perceptions and Paid Enrollment	3099
Madelyne Xiao, Mona Wang, Anunay Kulshrestha, and Jonathan Mayer, <i>Princeton University</i>	
DNS Security	
User Awareness and Behaviors Concerning Encrypted DNS Settings in Web Browsers	3117
Alexandra Nisenoff, <i>Carnegie Mellon University and University of Chicago</i> ; Ranya Sharma and Nick Feamster, <i>University of Chicago</i>	
Two Sides of the Shield: Understanding Protective DNS adoption factors	3135
Elsa Rodríguez, Radu Anghel, Simon Parkin, Michel van Eeten, and Carlos Gañán, <i>Delft University of Technology</i>	
The Maginot Line: Attacking the Boundary of DNS Caching Protection	3153
Xiang Li, Chaoyi Lu, and Baojun Liu, <i>Tsinghua University</i> ; Qifan Zhang and Zhou Li, <i>University of California, Irvine</i> ; Haixin Duan, <i>Tsinghua University, QI-ANXIN Technology Research Institute, and Zhongguancun Laboratory</i> ; Qi Li, <i>Tsinghua University and Zhongguancun Laboratory</i>	
Fourteen Years in the Life: A Root Server’s Perspective on DNS Resolver Security	3171
Alden Hilton, <i>Sandia National Laboratories</i> ; Casey Deccio, <i>Brigham Young University</i> ; Jacob Davis, <i>Sandia National Laboratories</i>	
NRDelegationAttack: Complexity DDoS attack on DNS Recursive Resolvers	3187
Yehuda Afek and Anat Bremler-Barr, <i>Tel-Aviv University</i> ; Shani Stajnsrod, <i>Reichman University</i>	
Graphs and Security	
Inductive Graph Unlearning	3205
Cheng-Long Wang, <i>King Abdullah University of Science and Technology and SDAIA-KAUST Center of Excellence in Data Science and Artificial Intelligence</i> ; Mengdi Huai, <i>Iowa State University</i> ; Di Wang, <i>King Abdullah University of Science and Technology, Computational Bioscience Research Center, and SDAIA-KAUST Center of Excellence in Data Science and Artificial Intelligence</i>	
GAP: Differentially Private Graph Neural Networks with Aggregation Perturbation	3223
Sina Sajadmanesh, <i>Idiap Research Institute and EPFL</i> ; Ali Shahin Shamsabadi, <i>Alan Turing Institute</i> ; Aurélien Bellet, <i>Inria</i> ; Daniel Gatica-Perez, <i>Idiap Research Institute and EPFL</i>	
PrivGraph: Differentially Private Graph Data Publication by Exploiting Community Information	3241
Quan Yuan, <i>Zhejiang University</i> ; Zhikun Zhang, <i>Stanford University and CISPA Helmholtz Center for Information Security</i> ; Linkang Du, <i>Zhejiang University</i> ; Min Chen, <i>CISPA Helmholtz Center for Information Security</i> ; Peng Cheng and Mingyang Sun, <i>Zhejiang University</i>	
On the Security Risks of Knowledge Graph Reasoning	3259
Zhaohan Xi, Tianyu Du, Changjiang Li, and Ren Pang, <i>Pennsylvania State University</i> ; Shouling Ji, <i>Zhejiang University</i> ; Xiapu Luo, <i>The Hong Kong Polytechnic University</i> ; Xusheng Xiao, <i>Arizona State University</i> ; Fenglong Ma and Ting Wang, <i>Pennsylvania State University</i>	
The Case for Learned Provenance Graph Storage Systems	3277
Hailun Ding, Juan Zhai, Dong Deng, and Shiqing Ma, <i>Rutgers University</i>	
Ethereum Security	
A Large Scale Study of the Ethereum Arbitrage Ecosystem	3295
Robert McLaughlin, Christopher Kruegel, and Giovanni Vigna, <i>University of California, Santa Barbara</i>	
ACON²: Adaptive Conformal Consensus for Provable Blockchain Oracles	3313
Sangdon Park, <i>Georgia Institute of Technology</i> ; Osbert Bastani, <i>University of Pennsylvania</i> ; Taesoo Kim, <i>Georgia Institute of Technology</i>	

Snapping Snap Sync: Practical Attacks on Go Ethereum Synchronising Nodes	3331
Massimiliano Taverna and Kenneth G. Paterson, <i>ETH Zurich</i>	
Token Spammers, Rug Pulls, and Sniper Bots: An Analysis of the Ecosystem of Tokens in Ethereum and in the Binance Smart Chain (BNB)	3349
Federico Cernera, Massimo La Morgia, Alessandro Mei, and Francesco Sassi, <i>Sapienza University of Rome</i>	
Automated Inference on Financial Security of Ethereum Smart Contracts	3367
Wansen Wang and Wenchao Huang, <i>University of Science and Technology of China</i> ; Zhaoyi Meng, <i>Anhui University</i> ; Yan Xiong and Fuyou Miao, <i>University of Science and Technology of China</i> ; Xianjin Fang, <i>Anhui University of Science and Technology</i> ; Caichang Tu and Renjie Ji, <i>University of Science and Technology of China</i>	
Supply Chains and Third-Party Code	
LibScan: Towards More Precise Third-Party Library Identification for Android Applications	3385
Yafei Wu and Cong Sun, <i>State Key Lab of ISN, School of Cyber Engineering, Xidian University, China</i> ; Dongrui Zeng, <i>Palo Alto Networks, Inc., Santa Clara, CA, USA</i> ; Gang Tan, <i>The Pennsylvania State University, University Park, PA, USA</i> ; Siqi Ma, <i>University of New South Wales, Australia</i> ; Peicheng Wang, <i>State Key Lab of ISN, School of Cyber Engineering, Xidian University, China</i>	
Union under Duress: Understanding Hazards of Duplicate Resource Mismediation in Android Software Supply Chain	3403
Xueqiang Wang, <i>University of Central Florida</i> ; Yifan Zhang and XiaoFeng Wang, <i>Indiana University Bloomington</i> ; Yan Jia, <i>Nankai University</i> ; Luyi Xing, <i>Indiana University Bloomington</i>	
UVSCAN: Detecting Third-Party Component Usage Violations in IoT Firmware	3421
Binbin Zhao, <i>Georgia Institute of Technology and Zhejiang University</i> ; Shouling Ji and Xuhong Zhang, <i>Zhejiang University</i> ; Yuan Tian, <i>University of California, Los Angeles</i> ; Qinying Wang, Yuwen Pu, and Chenyang Lyu, <i>Zhejiang University</i> ; Raheem Beyah, <i>Georgia Institute of Technology</i>	
Beyond Typosquatting: An In-depth Look at Package Confusion	3439
Shradha Neupane, <i>Worcester Polytechnic Institute</i> ; Grant Holmes, Elizabeth Wyss, and Drew Davidson, <i>University of Kansas</i> ; Lorenzo De Carli, <i>University of Calgary</i>	
SANDRILLER: A Fully-Automated Approach for Testing Language-Based JavaScript Sandboxes	3457
Abdullah AlHamdan and Cristian-Alexandru Staicu, <i>CISPA Helmholtz Center for Information Security</i>	
Cellular Networks	
Instructions Unclear: Undefined Behaviour in Cellular Network Specifications	3475
Daniel Klischies, <i>Ruhr University Bochum</i> ; Moritz Schloegel and Tobias Scharnowski, <i>CISPA Helmholtz Center for Information Security</i> ; Mikhail Bogodukhov, <i>Independent</i> ; David Rupprecht, <i>Radix Security</i> ; Veelasha Moonsamy, <i>Ruhr University Bochum</i>	
MOBILEATLAS: Geographically Decoupled Measurements in Cellular Networks for Security and Privacy Research . .	3493
Gabriel K. Gegenhuber, <i>University of Vienna</i> ; Wilfried Mayer, <i>SBA Research</i> ; Edgar Weippl, <i>University of Vienna</i> ; Adrian Dabrowski, <i>CISPA Helmholtz Center for Information Security</i>	
Eavesdropping Mobile App Activity via Radio-Frequency Energy Harvesting	3511
Tao Ni, <i>Shenzhen Research Institute, City University of Hong Kong, and Department of Computer Science, City University of Hong Kong</i> ; Guohao Lan, <i>Department of Software Technology, Delft University of Technology</i> ; Jia Wang, <i>College of Computer Science and Software Engineering, Shenzhen University</i> ; Qingchuan Zhao, <i>Department of Computer Science, City University of Hong Kong</i> ; Weitao Xu, <i>Shenzhen Research Institute, City University of Hong Kong, and Department of Computer Science, City University of Hong Kong</i>	
Sherlock on Specs: Building LTE Conformance Tests through Automated Reasoning	3529
Yi Chen and Di Tang, <i>Indiana University Bloomington</i> ; Yepeng Yao, <i>{CAS-KLONAT, BKLONSPT}, Institute of Information Engineering, CAS, and School of Cyber Security, University of Chinese Academy of Sciences</i> ; Mingming Zha and Xiaofeng Wang, <i>Indiana University Bloomington</i> ; Xiaozhong Liu, <i>Worcester Polytechnic Institute</i> ; Haixu Tang, <i>Indiana University Bloomington</i> ; Baoxu Liu, <i>{CAS-KLONAT, BKLONSPT}, Institute of Information Engineering, CAS, and School of Cyber Security, University of Chinese Academy of Sciences</i>	

BASECOMP: A Comparative Analysis for Integrity Protection in Cellular Baseband Software 3547
Eunsoo Kim, Min Woo Baek, and CheolJun Park, *KAIST*; Dongkwan Kim, *Samsung SDS*; Yongdae Kim and Insu Yun, *KAIST*

Usability and User Perspectives

Investigating Verification Behavior and Perceptions of Visual Digital Certificates 3565
Dañiel Gerhardt and Alexander Ponticello, *CISPA Helmholtz Center for Information Security and Saarland University*;
Adrian Dabrowski and Katharina Krombholz, *CISPA Helmholtz Center for Information Security*

“My Privacy for their Security”: Employees’ Privacy Perspectives and Expectations when using Enterprise Security Software 3583
Jonah Stegman, Patrick J. Trottier, Caroline Hillier, and Hassan Khan, *University of Guelph*; Mohammad Mannan, *Concordia University*

Account Security Interfaces: Important, Unintuitive, and Untrustworthy. 3601
Alaa Daffalla and Marina Bohuk, *Cornell University*; Nicola Dell, *Jacobs Institute Cornell Tech*; Rosanna Bellini, *Cornell University*; Thomas Ristenpart, *Cornell Tech*

Defining “Broken”: User Experiences and Remediation Tactics When Ad-Blocking or Tracking-Protection Tools Break a Website’s User Experience 3619
Alexandra Nisenoff, *University of Chicago and Carnegie Mellon University*; Arthur Borem, Madison Pickering, Grant Nakanishi, Maya Thumpasery, and Blase Ur, *University of Chicago*

Cryptographic Deniability: A Multi-perspective Study of User Perceptions and Expectations. 3637
Tarun Kumar Yadav, *Brigham Young University*; Devashish Gosain, *KU Leuven*; Kent Seamons, *Brigham Young University*

Entomology

Silent Bugs Matter: A Study of Compiler-Introduced Security Bugs 3655
Jianhao Xu, *Nanjing University*; Kangjie Lu, *University of Minnesota*; Zhengjie Du, Zhu Ding, and Linke Li, *Nanjing University*; Qiushi Wu, *University of Minnesota*; Mathias Payer, *EPFL*; Bing Mao, *Nanjing University*

A Bug’s Life: Analyzing the Lifecycle and Mitigation Process of Content Security Policy Bugs 3673
Gertjan Franken, Tom Van Goethem, Lieven Desmet, and Wouter Joosen, *imec-DistriNet, KU Leuven*

Remote Code Execution from SSTI in the Sandbox: Automatically Detecting and Exploiting Template Escape Bugs 3691
Yudi Zhao, Yuan Zhang, and Min Yang, *Fudan University*

Detecting API Post-Handling Bugs Using Code and Description in Patches 3709
Miaoqian Lin, Kai Chen, and Yang Xiao, *Institute of Information Engineering, Chinese Academy of Sciences, China*; *School of Cyber Security, University of Chinese Academy of Sciences, China*

Place Your Locks Well: Understanding and Detecting Lock Misuse Bugs. 3727
Yuandao Cai, Peisen Yao, Chengfeng Ye, and Charles Zhang, *The Hong Kong University of Science and Technology*

Adversarial Examples

The Space of Adversarial Strategies 3745
Ryan Sheatsley, Blaine Hoak, Eric Pauley, and Patrick McDaniel, *University of Wisconsin-Madison*

“Security is not my field, I’m a stats guy”: A Qualitative Root Cause Analysis of Barriers to Adversarial Machine Learning Defenses in Industry 3763
Jaron Mink, *University of Illinois at Urbana-Champaign*; Harjot Kaur, *Leibniz University Hannover*; Juliane Schmußer and Sascha Fahl, *CISPA Helmholtz Center for Information Security*; Yasemin Acar, *Paderborn University and George Washington University*

X-Adv: Physical Adversarial Object Attacks against X-ray Prohibited Item Detection 3781
Aishan Liu and Jun Guo, *Beihang University*; Jiakai Wang, *Zhongguancun Laboratory*; Siyuan Liang, *Chinese Academy of Sciences*; Renshuai Tao, *Beihang University*; Wenbo Zhou, *University of Science and Technology of China*; Cong Liu, *iFLYTEK*; Xianglong Liu, *Beihang University, Zhongguancun Laboratory, and Hefei Comprehensive National Science Center*; Dacheng Tao, *JD Explore Academy*

SMACK: Semantically Meaningful Adversarial Audio Attack	3799
Zhiyuan Yu, Yuanhaur Chang, and Ning Zhang, <i>Washington University in St. Louis</i> ; Chaowei Xiao, <i>Arizona State University</i>	
URET: Universal Robustness Evaluation Toolkit (for Evasion)	3817
Kevin Eykholt, Taesung Lee, Douglas Schales, Jiyong Jang, and Ian Molloy, <i>IBM Research</i> ; Masha Zorin, <i>University of Cambridge</i>	
Private Record Access	
Authenticated private information retrieval	3835
Simone Colombo, <i>EPFL</i> ; Kirill Nikitin, <i>Cornell Tech</i> ; Henry Corrigan-Gibbs, <i>MIT</i> ; David J. Wu, <i>UT Austin</i> ; Bryan Ford, <i>EPFL</i>	
Don't be Dense: Efficient Keyword PIR for Sparse Databases	3853
Sarvar Patel and Joon Young Seo, <i>Google</i> ; Kevin Yeo, <i>Google and Columbia University</i>	
GigaDORAM: Breaking the Billion Address Barrier	3871
Brett Falk, <i>University of Pennsylvania</i> ; Rafail Ostrovsky, Matan Shtepel, and Jacob Zhang, <i>University of California, Los Angeles</i>	
One Server for the Price of Two: Simple and Fast Single-Server Private Information Retrieval	3889
Alexandra Henzinger, Matthew M. Hong, and Henry Corrigan-Gibbs, <i>MIT</i> ; Sarah Meiklejohn, <i>Google</i> ; Vinod Vaikuntanathan, <i>MIT</i>	
DUORAM: A Bandwidth-Efficient Distributed ORAM for 2- and 3-Party Computation	3907
Adithya Vadapalli, <i>University of Waterloo</i> ; Ryan Henry, <i>University of Calgary</i> ; Ian Goldberg, <i>University of Waterloo</i>	
It's All Fun and Games Until...	
A Peek into the Metaverse: Detecting 3D Model Clones in Mobile Games	3925
Chaoshun Zuo, Chao Wang, and Zhiqiang Lin, <i>The Ohio State University</i>	
PATROL: Provable Defense against Adversarial Policy in Two-player Games	3943
Wenbo Guo, <i>UC Berkeley</i> ; Xian Wu, <i>Northwestern University</i> ; Lun Wang, <i>UC Berkeley</i> ; Xinyu Xing, <i>Northwestern University</i> ; Dawn Song, <i>UC Berkeley</i>	
The Blockchain Imitation Game	3961
Kaihua Qin, <i>Imperial College London, RDI</i> ; Stefanos Chaliasos, <i>Imperial College London</i> ; Liyi Zhou, <i>Imperial College London, RDI</i> ; Benjamin Livshits, <i>Imperial College London</i> ; Dawn Song, <i>UC Berkeley, RDI</i> ; Arthur Gervais, <i>University College London, RDI</i>	
It's all in your head(set): Side-channel attacks on AR/VR systems	3979
Yicheng Zhang, Carter Slocum, Jiasi Chen, and Nael Abu-Ghazaleh, <i>University of California, Riverside</i>	
Egg Hunt in Tesla Infotainment: A First Look at Reverse Engineering of Qt Binaries	3997
Haohuang Wen and Zhiqiang Lin, <i>The Ohio State University</i>	
Enclaves and Serverless Computing	
Reusable Enclaves for Confidential Serverless Computing	4015
Shixuan Zhao, <i>The Ohio State University</i> ; Pinshen Xu, <i>Southern University of Science and Technology</i> ; Guoxing Chen, <i>Shanghai Jiao Tong University</i> ; Mengya Zhang, <i>The Ohio State University</i> ; Yinqian Zhang, <i>Southern University of Science and Technology</i> ; Zhiqiang Lin, <i>The Ohio State University</i>	
ENIGMAP: External-Memory Oblivious Map for Secure Enclaves	4033
Afonso Tinoco, Sixiang Gao, and Elaine Shi, <i>CMU</i>	
AEX-Notify: Thwarting Precise Single-Stepping Attacks through Interrupt Awareness for Intel SGX Enclaves	4051
Scott Constable, <i>Intel Corporation</i> ; Jo Van Bulck, <i>imec-DistriNet, KU Leuven</i> ; Xiang Cheng, <i>Georgia Institute of Technology</i> ; Yuan Xiao, Cedric Xing, and Ilya Alexandrovich, <i>Intel Corporation</i> ; Taesoo Kim, <i>Georgia Institute of Technology</i> ; Frank Piessens, <i>imec-DistriNet, KU Leuven</i> ; Mona Vij, <i>Intel Corporation</i> ; Mark Silberstein, <i>Technion</i>	
Controlled Data Races in Enclaves: Attacks and Detection	4069
Sanchuan Chen, <i>Fordham University</i> ; Zhiqiang Lin, <i>The Ohio State University</i> ; Yinqian Zhang, <i>Southern University of Science and Technology</i>	

Guarding Serverless Applications with Kalium 4087
Deepak Sirone Jegan, *University of Wisconsin-Madison*; Liang Wang, *Princeton University*; Siddhant Bhagat, *Microsoft*;
Michael Swift, *University of Wisconsin-Madison*

Email and Phishing

“To Do This Properly, You Need More Resources”: The Hidden Costs of Introducing Simulated Phishing Campaigns..... 4105
Lina Brunken, Annalina Buckmann, Jonas Hielscher, and M. Angela Sasse, *Ruhr University Bochum*

You’ve Got Report: Measurement and Security Implications of DMARC Reporting 4123
Md. Ishtiaq Ashiq and Weitong Li, *Virginia Tech*; Tobias Fiebig, *Max-Planck-Institut für Informatik*; Taejoong Chung, *Virginia Tech*

Knowledge Expansion and Counterfactual Interaction for Reference-Based Phishing Detection..... 4139
Ruofan Liu, *Shanghai Jiao Tong University and National University of Singapore*; Yun Lin, *Shanghai Jiao Tong University*;
Yifan Zhang, Penn Han Lee, and Jin Song Dong, *National University of Singapore*

Rods with Laser Beams: Understanding Browser Fingerprinting on Phishing Pages 4157
Iskander Sanchez-Rola and Leyla Bilge, *Norton Research Group*; Davide Balzarotti, *EURECOM*; Armin Buescher, *Crosspoint Labs*; Petros Efstathopoulos, *Norton Research Group*

Content-Type: multipart/oracle - Tapping into Format Oracles in Email End-to-End Encryption 4175
Fabian Insing, *Münster University of Applied Sciences and National Research Center for Applied Cybersecurity ATHENE*;
Damian Poddebniak and Tobias Kappert, *Münster University of Applied Sciences*; Christoph Saatjohann and Sebastian Schinzel, *Münster University of Applied Sciences and National Research Center for Applied Cybersecurity ATHENE*

OSes and Security

PET: Prevent Discovered Errors from Being Triggered in the Linux Kernel 4193
Zicheng Wang, *Nanjing University*; Yueqi Chen, *University of Colorado Boulder*; Qingkai Zeng, *Nanjing University*

A Hybrid Alias Analysis and Its Application to Global Variable Protection in the Linux Kernel 4211
Guoren Li, *University of California, Riverside*; Hang Zhang, *Georgia Institute of Technology*; Jinmeng Zhou and Wenbo Shen, *Zhejiang University*; Yulei Sui, *University of New South Wales*; Zhiyun Qian, *University of California, Riverside*

AlphaEXP: An Expert System for Identifying Security-Sensitive Kernel Objects 4229
Ruipeng Wang, *National University of Defense Technology*; Kaixiang Chen and Chao Zhang, *Tsinghua University*;
Zulie Pan and Qianyu Li, *National University of Defense Technology*; Siliang Qin, *University of Chinese Academy of Sciences*; Shenglin Xu, Min Zhang, and Yang Li, *National University of Defense Technology*

Mitigating Security Risks in Linux with KLAUS: A Method for Evaluating Patch Correctness 4247
Yuhang Wu and Zhenpeng Lin, *Northwestern University*; Yueqi Chen, *University of Colorado Boulder*; Dang K Le, *Northwestern University*; Dongliang Mu, *Huazhong University of Science and Technology*; Xinyu Xing, *Northwestern University*

Detecting Union Type Confusion in Component Object Model..... 4265
Yuxing Zhang, *East China Normal University*; Xiaogang Zhu, *Swinburne University of Technology*; Daojing He, *East China Normal University*; Harbin Institute of Technology, *Shenzhen*; Minhui Xue, *CSIRO’s Data61*; Shouling Ji, *Zhejiang University*; Mohammad Sayad Haghighi and Sheng Wen, *Swinburne University of Technology*; Zhiniang Peng, *Sangfor Technologies Inc.*

Intrusion Detection

Network Detection of Interactive SSH Impostors Using Deep Learning 4283
Julien Piet, *UC Berkeley and Corelight*; Aashish Sharma, *Lawrence Berkeley National Laboratory*; Vern Paxson, *Corelight and UC Berkeley*; David Wagner, *UC Berkeley*

ARGUS: Context-Based Detection of Stealthy IoT Infiltration Attacks..... 4301
Phillip Rieger, Marco Chilese, Reham Mohamed, Markus Miettinen, Hossein Fereidooni, and Ahmad-Reza Sadeghi, *Technical University of Darmstadt*

Generative Intrusion Detection and Prevention on Data Stream	4319
HyungBin Seo and MyungKeun Yoon, <i>Kookmin University</i>	
xNIDS: Explaining Deep Learning-based Network Intrusion Detection Systems for Active Intrusion Responses ..	4337
Feng Wei, <i>University at Buffalo</i> ; Hongda Li, <i>Palo Alto Networks</i> ; Ziming Zhao and Hongxin Hu, <i>University at Buffalo</i>	
PROGRAPHER: An Anomaly Detection System based on Provenance Graph Embedding	4355
Fan Yang, <i>The Chinese University of Hong Kong</i> ; Jiacen Xu, <i>University of California, Irvine</i> ; Chunlin Xiong, <i>Sangfor Technologies Inc.</i> ; Zhou Li, <i>University of California, Irvine</i> ; Kehuan Zhang, <i>The Chinese University of Hong Kong</i>	
Privacy Preserving Crypto Blocks	
Dubhe: Succinct Zero-Knowledge Proofs for Standard AES and related Applications	4373
Changchang Ding and Yan Huang, <i>Indiana University Bloomington</i>	
Curve Trees: Practical and Transparent Zero-Knowledge Accumulators	4391
Matteo Campanelli, <i>Protocol Labs</i> ; Mathias Hall-Andersen and Simon Holmgard Kamp, <i>Aarhus University, Denmark</i>	
BalanceProofs: Maintainable Vector Commitments with Fast Aggregation	4409
Weijie Wang, Annie Ulichney, and Charalampos Papamanthou, <i>Yale University</i>	
zkSaaS: Zero-Knowledge SNARKs as a Service	4427
Sanjam Garg, <i>University of California, Berkeley, and NTT Research</i> ; Aarushi Goel, <i>NTT Research</i> ; Abhishek Jain, <i>Johns Hopkins University</i> ; Guru-Vamsi Policharla and Sruthi Sekar, <i>University of California, Berkeley</i>	
VERIZEXE: Decentralized Private Computation with Universal Setup	4445
Alex Luoyuan Xiong, <i>Espresso Systems, National University of Singapore</i> ; Binyi Chen and Zhenfei Zhang, <i>Espresso Systems</i> ; Benedikt Bünz, <i>Espresso Systems, Stanford University</i> ; Ben Fisch, <i>Espresso Systems, Yale University</i> ; Fernando Krell and Philippe Camacho, <i>Espresso Systems</i>	
Warm and Fuzzing	
INTENDER: Fuzzing Intent-Based Networking with Intent-State Transition Guidance	4463
Jiwon Kim, <i>Purdue University</i> ; Benjamin E. Ujcich, <i>Georgetown University</i> ; Dave (Jing) Tian, <i>Purdue University</i>	
BLEEM: Packet Sequence Oriented Fuzzing for Protocol Implementations	4481
Zhengxiong Luo, Junze Yu, Feilong Zuo, Jianzhong Liu, and Yu Jiang, <i>Tsinghua University</i> ; Ting Chen, <i>University of Electronic Science and Technology of China</i> ; Abhik Roychoudhury, <i>National University of Singapore</i> ; Jianguang Sun, <i>Tsinghua University</i>	
Automated Exploitable Heap Layout Generation for Heap Overflows Through Manipulation	
Distance-Guided Fuzzing	4499
Bin Zhang, Jiongyi Chen, Runhao Li, Chao Feng, Ruilin Li, and Chaojing Tang, <i>National University of Defense Technology</i>	
MINER: A Hybrid Data-Driven Approach for REST API Fuzzing	4517
Chenyang Lyu, Jiacheng Xu, Shouling Ji, Xuhong Zhang, and Qinying Wang, <i>Zhejiang University</i> ; Binbin Zhao, <i>Georgia Institute of Technology</i> ; Gaoning Pan, <i>Zhejiang University</i> ; Wei Cao and Peng Chen, <i>Ant Group</i> ; Raheem Beyah, <i>Georgia Institute of Technology</i>	
Systematic Assessment of Fuzzers using Mutation Analysis	4535
Philipp Görz, Björn Mathis, and Keno Hassler, <i>CISPA Helmholtz Center for Information Security</i> ; Emre Güler, <i>Ruhr-Universität Bochum</i> ; Thorsten Holz and Andreas Zeller, <i>CISPA Helmholtz Center for Information Security</i> ; Rahul Gopinath, <i>University of Sydney</i>	
Remote Attacks	
HOME SPY: The Invisible Sniffer of Infrared Remote Control of Smart TVs	4553
Kong Huang, YuTong Zhou, and Ke Zhang, <i>The Chinese University of Hong Kong</i> ; Jiacen Xu, <i>University of California, Irvine</i> ; Jiongyi Chen, <i>National University of Defense Technology</i> ; Di Tang, <i>Indiana University Bloomington</i> ; Kehuan Zhang, <i>The Chinese University of Hong Kong</i>	

Remote Attacks on Speech Recognition Systems Using Sound from Power Supply 4571
Lanqing Yang, Xinqi Chen, Xiangyong Jian, Leping Yang, Yijie Li, Qianfei Ren, Yi-Chao Chen, and Guangtao Xue,
Shanghai Jiao Tong University; Xiaoyu Ji, Zhejiang University

Near-Ultrasound Inaudible Trojan (NUIT): Exploiting Your Speaker to Attack Your Microphone 4589
Qi Xia and Qian Chen, *University of Texas at San Antonio; Shouhuai Xu, University of Colorado Colorado Springs*

Medusa Attack: Exploring Security Hazards of In-App QR Code Scanning 4607
Xing Han, Yuheng Zhang, and Xue Zhang, *University of Electronic Science and Technology of China and Shanghai Qi Zhi Institute; Zeyuan Chen, G.O.S.S.I.P; Mingzhe Wang, Xidian University; Yiwei Zhang, Purdue University; Siqi Ma, The University of New South Wales; Yu Yu, Shanghai Qi Zhi Institute and Shanghai Jiao Tong University; Elisa Bertino, Purdue University; Juanru Li, Shanghai Qi Zhi Institute and Shanghai Jiao Tong University*

Understanding Communities, Part 1

Othered, Silenced and Scapegoated: Understanding the Situated Security of Marginalised Populations in Lebanon 4625
Jessica McClearn and Rikke Bjerg Jensen, *Royal Holloway, University of London; Reem Talhouk, Northumbria University*

Examining Power Dynamics and User Privacy in Smart Technology Use Among Jordanian Households 4643
Wael Albayaydh and Ivan Flechais, *University of Oxford*

“If sighted people know, I should be able to know:” Privacy Perceptions of Bystanders with Visual Impairments around Camera-based Technology 4661
Yuhang Zhao, *University of Wisconsin—Madison; Yaxing Yao, University of Maryland, Baltimore County; Jiaru Fu and Nihan Zhou, University of Wisconsin—Madison*

A Research Framework and Initial Study of Browser Security for the Visually Impaired 4679
Elaine Lau and Zachary Peterson, *Cal Poly, San Luis Obispo*

Keeping Computations Confidential

ELASM: Error-Latency-Aware Scale Management for Fully Homomorphic Encryption 4697
Yongwoo Lee, Seonyoung Cheon, and Dongkwan Kim, *Yonsei University; Dongyoon Lee, Stony Brook University; Hanjun Kim, Yonsei University*

HECO: Fully Homomorphic Encryption Compiler 4715
Alexander Viand, Patrick Jattke, Miro Haller, and Anwar Hithnawi, *ETH Zurich*

A Verified Confidential Computing as a Service Framework for Privacy Preservation 4733
Hongbo Chen and Haobin Hiroki Chen, *Indiana University Bloomington; Mingshen Sun, Independent Researcher; Kang Li and Zhaofeng Chen, CertiK; XiaoFeng Wang, Indiana University Bloomington*

CSHER: A System for Compact Storage with HE-Retrieval 4751
Adi Akavia and Neta Oren, *University of Haifa; Boaz Sapir and Margarita Vald, Intuit Israel Inc.*

Towards Robust Learning

Precise and Generalized Robustness Certification for Neural Networks 4769
Yuanyuan Yuan, *The Hong Kong University of Science and Technology and ETH Zurich; Shuai Wang, The Hong Kong University of Science and Technology; Zhendong Su, ETH Zurich*

DiffSmooth: Certifiably Robust Learning via Diffusion Models and Local Smoothing 4787
Jiawei Zhang, *UIUC; Zhongzhu Chen, University of Michigan, Ann Arbor; Huan Zhang, Carnegie Mellon University; Chaowei Xiao, Arizona State University; Bo Li, UIUC*

ACORN: Input Validation for Secure Aggregation 4805
James Bell and Adrià Gascón, *Google LLC; Tancredè Lepoint, Amazon; Baiyu Li, Sarah Meiklejohn, and Mariana Raykova, Google LLC; Cathie Yun*

HOLMES: Efficient Distribution Testing for Secure Collaborative Learning 4823
Ian Chang and Katerina Sotiraki, *UC Berkeley; Weikeng Chen, UC Berkeley & DZK Labs; Murat Kantarcioglu, University of Texas at Dallas & UC Berkeley; Raluca Popa, UC Berkeley*

Network Cryptographic Protocols

Keep Your Friends Close, but Your Routers Closer: Insights into RPKI Validation in the Internet 4841

Tomas Hlavacek, *Fraunhofer Institute for Secure Information Technology SIT and National Research Center for Applied Cybersecurity ATHENE*; Haya Shulman and Niklas Vogel, *Fraunhofer Institute for Secure Information Technology SIT, National Research Center for Applied Cybersecurity ATHENE, and Goethe-Universität Frankfurt*; Michael Waidner, *Fraunhofer Institute for Secure Information Technology SIT, National Research Center for Applied Cybersecurity ATHENE, and Technische Universität Darmstadt*

Exploring the Unknown DTLS Universe: Analysis of the DTLS Server Ecosystem on the Internet 4859

Nurullah Erinola and Marcel Maehren, *Ruhr University Bochum*; Robert Merget, *Technology Innovation Institute*; Juraj Somorovsky, *Paderborn University*; Jörg Schwenk, *Ruhr University Bochum*

We Really Need to Talk About Session Tickets: A Large-Scale Analysis of Cryptographic Dangers with TLS Session Tickets 4877

Sven Hebrok, *Paderborn University*; Simon Nachtigall, *Paderborn University and achelos GmbH*; Marcel Maehren and Nurullah Erinola, *Ruhr University Bochum*; Robert Merget, *Technology Innovation Institute and Ruhr University Bochum*; Juraj Somorovsky, *Paderborn University*; Jörg Schwenk, *Ruhr University Bochum*

Extended Hell(o): A Comprehensive Large-Scale Study on Email Confidentiality and Integrity Mechanisms in the Wild 4895

Birk Blechschmidt, *Saarland University*; Ben Stock, *CISPA Helmholtz Center for Information Security*

Warmer and Fuzzers

No Linux, No Problem: Fast and Correct Windows Binary Fuzzing via Target-embedded Snapshotting 4913

Leo Stone and Rishi Ranjan, *Virginia Tech*; Stefan Nagy, *University of Utah*; Matthew Hicks, *Virginia Tech*

DAFL: Directed Grey-box Fuzzing guided by Data Dependency 4931

Tae Eun Kim, *KAIST*; Jaeseung Choi, *Sogang University*; Kihong Heo and Sang Kil Cha, *KAIST*

DynSQL: Stateful Fuzzing for Database Management Systems with Complex and Valid SQL Query Generation . . 4949

Zu-Ming Jiang, *ETH Zurich*; Jia-Ju Bai, *Tsinghua University*; Zhendong Su, *ETH Zurich*

AIFORE: Smart Fuzzing Based on Automatic Input Format Reverse Engineering 4967

Ji Shi, {*CAS-KLONAT, BKLONSPT*}, *Institute of Information Engineering, Chinese Academy of Sciences; Institute for Network Science and Cyberspace & BNRist, Tsinghua University; Zhongguancun Lab; Singular Security Lab, Huawei Technologies; School of Cyber Security, University of Chinese Academy of Sciences*; Zhun Wang, *Institute for Network Science and Cyberspace & BNRist, Tsinghua University; Zhongguancun Lab*; Zhiyao Feng, *Institute for Network Science and Cyberspace & BNRist, Tsinghua University; Zhongguancun Lab*; EPFL; Yang Lan and Shisong Qin, *Institute for Network Science and Cyberspace & BNRist, Tsinghua University; Zhongguancun Lab*; Wei You, *Renmin University of China*; Wei Zou, {*CAS-KLONAT, BKLONSPT*}, *Institute of Information Engineering, Chinese Academy of Sciences; School of Cyber Security, University of Chinese Academy of Sciences*; Mathias Payer, *EPFL*; Chao Zhang, *Institute for Network Science and Cyberspace & BNRist, Tsinghua University; Zhongguancun Lab*

Friday, August 11

Kernel Analysis

BoKASAN: Binary-only Kernel Address Sanitizer for Effective Kernel Fuzzing 4985

Mingi Cho, Dohyeon An, Hoyong Jin, and Taekyoung Kwon, *Yonsei University*

ACTOR: Action-Guided Kernel Fuzzing 5003

Marius Fleischer, Dipanjan Das, and Priyanka Bose, *University of California, Santa Barbara*; Weiheng Bai and Kangjie Lu, *University of Minnesota*; Mathias Payer, *EPFL*; Christopher Kruegel and Giovanni Vigna, *University of California, Santa Barbara*

FirmSolo: Enabling dynamic analysis of binary Linux-based IoT kernel modules 5021

Ioannis Angelakopoulos, Gianluca Stringhini, and Manuel Egele, *Boston University*

XextFuzz: Fuzzing macOS Kernel EXTensions on Apple Silicon via Exploiting Mitigations 5039

Tingting Yin, *Tsinghua University and Ant Group*; Zicong Gao, *State Key Laboratory of Mathematical Engineering and Advanced Computing*; Zhenghang Xiao, *Hunan University*; Zheyu Ma, *Tsinghua University*; Min Zheng, *Ant Group*; Chao Zhang, *Tsinghua University and Zhongguancun Laboratory*

UNCONTAINED: Uncovering Container Confusion in the Linux Kernel..... 5055
Jakob Koschel, *Vrije Universiteit Amsterdam*; Pietro Borrello and Daniele Cono D’Elia, *Sapienza University of Rome*;
Herbert Bos and Cristiano Giuffrida, *Vrije Universiteit Amsterdam*

It’s Academic

“I’m going to trust this until it burns me” Parents’ Privacy Concerns and Delegation of Trust in K-8 Educational Technology 5073
Victoria Zhong, *New York University*; Susan McGregor, *Columbia University*; Rachel Greenstadt, *New York University*

Educators’ Perspectives of Using (or Not Using) Online Exam Proctoring 5091
David G. Balash, Elena Korkes, Miles Grant, and Adam J. Aviv, *The George Washington University*; Rahel A. Fainchtein and Micah Sherr, *Georgetown University*

No more Reviewer #2: Subverting Automatic Paper-Reviewer Assignment using Adversarial Learning 5109
Thorsten Eisenhofer, *Ruhr University Bochum*; Erwin Quiring, *Ruhr University Bochum and International Computer Science Institute (ISCI) Berkeley*; Jonas Möller, *Technische Universität Berlin*; Doreen Riepel, *Ruhr University Bochum*; Thorsten Holz, *CISPA Helmholtz Center for Information Security*; Konrad Rieck, *Technische Universität Berlin*

A Two-Decade Retrospective Analysis of a University’s Vulnerability to Attacks Exploiting Reused Passwords .. 5127
Alexandra Nisenoff, *University of Chicago / Carnegie Mellon University*; Maximilian Golla, *University of Chicago / Max Planck Institute for Security and Privacy*; Miranda Wei, *University of Chicago / University of Washington*; Juliette Hainline, Hayley Szymanek, Annika Braun, Annika Hildebrandt, Blair Christensen, David Langenberg, and Blase Ur, *University of Chicago*

Ethical Frameworks and Computer Security Trolley Problems: Foundations for Conversations 5145
Tadayoshi Kohno, *University of Washington*; Yasemin Acar, *Paderborn University & George Washington University*; Wulf Loh, *Universität Tübingen*

De-anonymization and Re-identification

CATCH YOU AND I CAN: Revealing Source Voiceprint Against Voice Conversion..... 5163
Jiangyi Deng, Yanjiao Chen, Yinan Zhong, and Qianhao Miao, *Zhejiang University*; Xueluan Gong, *Wuhan University*; Wenyan Xu, *Zhejiang University*

V-CLOAK: Intelligibility-, Naturalness- & Timbre-Preserving Real-Time Voice Anonymization 5181
Jiangyi Deng, Fei Teng, and Yanjiao Chen, *Zhejiang University*; Xiaofu Chen and Zhaohui Wang, *Wuhan University*; Wenyan Xu, *Zhejiang University*

Assessing Anonymity Techniques Employed in German Court Decisions: A De-Anonymization Experiment 5199
Dominic Deuber and Michael Keuchen, *Friedrich-Alexander-Universität Erlangen-Nürnberg*; Nicolas Christin, *Carnegie Mellon University*

Person Re-identification in 3D Space: A WiFi Vision-based Approach 5217
Yili Ren and Yichao Wang, *Florida State University*; Sheng Tan, *Trinity University*; Yingying Chen, *Rutgers University*; Jie Yang, *Florida State University*

In the Quest to Protect Users from Side-Channel Attacks – A User-Centred Design Space to Mitigate Thermal Attacks on Public Payment Terminals 5235
Karola Marky, *Ruhr-University Bochum and University of Glasgow*; Shaun Macdonald, *University of Glasgow*; Yasmeen Abdrabou, *Lancaster University*; Mohamed Khamis, *University of Glasgow*

Thieves in the House

Extracting Training Data from Diffusion Models..... 5253
Nicholas Carlini, *Google*; Jamie Hayes, *DeepMind*; Milad Nasr and Matthew Jagielski, *Google*; Vikash Sehwal, *Princeton University*; Florian Tramèr, *ETH Zurich*; Borja Balle, *DeepMind*; Daphne Ippolito, *Google*; Eric Wallace, *UC Berkeley*

PCAT: Functionality and Data Stealing from Split Learning by Pseudo-Client Attack..... 5271
Xinben Gao and Lan Zhang, *University of Science and Technology of China*

A Plot is Worth a Thousand Words: Model Information Stealing Attacks via Scientific Plots 5289
Boyang Zhang and Xinlei He, *CISPA Helmholtz Center for Information Security*; Yun Shen, *NetApp*; Tianhao Wang, *University of Virginia*; Yang Zhang, *CISPA Helmholtz Center for Information Security*

Beyond The Gates: An Empirical Analysis of HTTP-Managed Password Stealers and Operators 5307
Athanasios Avgetidis, Omar Alrawi, Kevin Valakuzhy, and Charles Lever, *Georgia Institute of Technology*; Paul Burbage, *MalBeacon*; Angelos D. Keromytis, Fabian Monrose, and Manos Antonakakis, *Georgia Institute of Technology*

LightThief: Your Optical Communication Information is Stolen behind the Wall 5325
Xin Liu, *The Ohio State University*; Wei Wang, *Saint Louis University*; Guanqun Song and Ting Zhu, *The Ohio State University*

Distributed Secure Computations

WaterBear: Practical Asynchronous BFT Matching Security Guarantees of Partially Synchronous BFT 5341
Haibin Zhang, *Beijing Institute of Technology*; Sisi Duan, *Tsinghua University, Zhongguancun Laboratory*; Boxin Zhao, *Zhongguancun Laboratory*; Liehuang Zhu, *Beijing Institute of Technology*

Practical Asynchronous High-threshold Distributed Key Generation and Distributed Polynomial Sampling 5359
Sourav Das, *University of Illinois at Urbana-Champaign*; Zhuolun Xiang, *Aptos*; Lefteris Kokoris-Kogias, *IST Austria and Mysten Labs*; Ling Ren, *University of Illinois at Urbana-Champaign*

Efficient 3PC for Binary Circuits with Application to Maliciously-Secure DNN Inference 5377
Yun Li, *Tsinghua University, Ant Group*; Yufei Duan, *Tsinghua University*; Zhicong Huang, *Alibaba Group*; Cheng Hong, *Ant Group*; Chao Zhang and Yifan Song, *Tsinghua University*

TVA: A multi-party computation system for secure and expressive time series analytics 5395
Muhammad Faisal, *Boston University*; Jerry Zhang, *University of California San Diego*; John Liagouris, *Vasiliki Kalavri*, and Mayank Varia, *Boston University*

Long Live The Honey Badger: Robust Asynchronous DPSS and its Applications 5413
Thomas Yurek, *University of Illinois at Urbana-Champaign, NTT Research, and IC3*; Zhuolun Xiang, *Aptos*; Yu Xia, *MIT CSAIL and NTT Research*; Andrew Miller, *University of Illinois at Urbana-Champaign and IC3*

Mobile Security and Privacy

Powering Privacy: On the Energy Demand and Feasibility of Anonymity Networks on Smartphones 5431
Daniel Hugenroth and Alastair R. Beresford, *University of Cambridge*

EYE-SHIELD: Real-Time Protection of Mobile Device Screen Information from Shoulder Surfing 5449
Brian Jay Tang and Kang G. Shin, *University of Michigan*

The OK Is Not Enough: A Large Scale Study of Consent Dialogs in Smartphone Applications 5467
Simon Koch, *TU Braunschweig*; Benjamin Altpeter, *Datenanfragen.de e.V.*; Martin Johns, *TU Braunschweig*

Notice the Imposter! A Study on User Tag Spoofing Attack in Mobile Apps 5485
Shuai Li, Zhemin Yang, Guangliang Yang, Hange Zhang, Nan Hua, Yurui Huang, and Min Yang, *Fudan University*

Lost in Conversion: Exploit Data Structure Conversion with Attribute Loss to Break Android Systems 5503
Rui Li, *School of Cyber Science and Technology, Shandong University; Key Laboratory of Cryptologic Technology and Information Security, Ministry of Education, SDU; The Chinese University of Hong Kong*; Wenrui Diao and Shishuai Yang, *School of Cyber Science and Technology, Shandong University; Key Laboratory of Cryptologic Technology and Information Security, Ministry of Education, SDU*; Xiangyu Liu, *Alibaba Group*; Shanqing Guo, *School of Cyber Science and Technology, Shandong University; Key Laboratory of Cryptologic Technology and Information Security, Ministry of Education, SDU*; Kehuan Zhang, *The Chinese University of Hong Kong*

Web Security

Silent Spring: Prototype Pollution Leads to Remote Code Execution in Node.js 5521
Mikhail Shcherbakov and Musard Balliu, *KTH Royal Institute of Technology*; Cristian-Alexandru Staicu, *CISPA Helmholtz Center for Information Security*

Cookie Crumbles: Breaking and Fixing Web Session Integrity 5539
Marco Squarcina, *TU Wien*; Pedro Adão, *Instituto Superior Técnico, ULisboa, Instituto de Telecomunicações*; Lorenzo Veronese and Matteo Maffei, *TU Wien*

Minimalist: Semi-automated Debloating of PHP Web Applications through Static Analysis 5577
Rasoul Jahanshahi, *Boston University*; Babak Amin Azad and Nick Nikiforakis, *Stony Brook University*; Manuel Egele, *Boston University*

AnimateDead: Debloating Web Applications Using Concolic Execution 5575
Babak Amin Azad, *Stony Brook University*; Rasoul Jahanshahi, *Boston University*; Chris Tsoukaladelis, *Stony Brook University*; Manuel Egele, *Boston University*; Nick Nikiforakis, *Stony Brook University*

NAUTILUS: Automated RESTful API Vulnerability Detection. 5593
Gelei Deng, *Nanyang Technological University*; Zhiyi Zhang, *CodeSafe Team, Qi An Xin Group Corp.*; Yuekang Li, Yi Liu, Tianwei Zhang, and Yang Liu, *Nanyang Technological University*; Guo Yu, *China Industrial Control Systems Cyber Emergency Response Team*; Dongjin Wang, *Institute of Scientific and Technical Information, China Academy of Railway Sciences*

Understanding Communities, Part 2

“Un-Equal Online Safety?” A Gender Analysis of Security and Privacy Protection Advice and Behaviour Patterns .. 5611
Kovila P.L. Coopamootoo, *King’s College London*; Magdalene Ng, *University of Westminster*

“Millions of people are watching you”: Understanding the Digital-Safety Needs and Practices of Creators. 5629
Patrawat Samermit, Anna Turner, Patrick Gage Kelley, Tara Matthews, Vanessa Wu, Sunny Consolvo, and Kurt Thomas, *Google*

How Library IT Staff Navigate Privacy and Security Challenges and Responsibilities 5647
Alan F. Luo, Noel Warford, and Samuel Dooley, *University of Maryland*; Rachel Greenstadt, *New York University*; Michelle L. Mazurek, *University of Maryland*; Nora McDonald, *George Mason University*

Problematic Advertising and its Disparate Exposure on Facebook. 5665
Muhammad Ali, *Northeastern University*; Angelica Goetzen, *Max Planck Institute for Software Systems*; Alan Mislove, *Northeastern University*; Elissa M. Redmiles, *Max Planck Institute for Software Systems*; Piotr Sapiiezynski, *Northeastern University*

One Size Does not Fit All: Quantifying the Risk of Malicious App Encounters for Different Android User Profiles .. 5683
Savino Dambra, Leyla Bilge, and Platon Kotzias, *Norton Research Group*; Yun Shen, *NetApp*; Juan Caballero, *IMDEA Software Institute*

Routing and VPNs

How Effective is Multiple-Vantage-Point Domain Control Validation? 5701
Grace H. Cimaszewski, Henry Birge-Lee, Liang Wang, Jennifer Rexford, and Prateek Mittal, *Princeton University*

Bypassing Tunnels: Leaking VPN Client Traffic by Abusing Routing Tables. 5719
Nian Xue, *New York University*; Yashaswi Malla, Zihang Xia, and Christina Pöpper, *New York University Abu Dhabi*; Mathy Vanhoef, *imec-DistriNet, KU Leuven*

Back to School: On the (In)Security of Academic VPNs 5737
Ka Lok Wu, *The Chinese University of Hong Kong*; Man Hong Hue, *The Chinese University of Hong Kong and Georgia Institute of Technology*; Ngai Man Poon, *The Chinese University of Hong Kong*; Kin Man Leung, *The University of British Columbia*; Wai Yin Po, Kin Ting Wong, Sze Ho Hui, and Sze Yiu Chau, *The Chinese University of Hong Kong*

FABRID: Flexible Attestation-Based Routing for Inter-Domain Networks 5755
Cyrill Krähenbühl, Marc Wyss, and David Basin, *ETH Zürich*; Vincent Lenders, *armasuisse*; Adrian Perrig, *ETH Zürich*; Martin Strohmeier, *armasuisse*

“All of them claim to be the best”: Multi-perspective study of VPN users and VPN providers 5773
Reethika Ramesh, *University of Michigan*; Anjali Vyas, *Cornell Tech*; Roya Ensafi, *University of Michigan*

Embedded Systems and Firmware

Greenhouse: Single-Service Rehosting of Linux-Based Firmware Binaries in User-Space Emulation. 5791
Hui Jun Tay, Kyle Zeng, Jayakrishna Menon Vadayath, Arvind S Raj, Audrey Dutcher, Tejesh Reddy, Wil Gibbs, Zion Leonahenahe Basque, Fangzhou Dong, Zack Smith, Adam Doupé, Tiffany Bao, Yan Shoshitaishvili, and Ruoyu Wang, *Arizona State University*

FuncTeller: How Well Does eFPGA Hide Functionality? 5809
Zhaokun Han, *Texas A&M University*; Mohammed Shayan, *The University of Texas at Dallas*; Aneesh Dixit, *Texas A&M University*; Mustafa Shihab and Yiorgos Makris, *The University of Texas at Dallas*; Jeyavijayan (JV) Rajendran, *Texas A&M University*

ACFA: Secure Runtime Auditing & Guaranteed Device Healing via Active Control Flow Attestation 5827
Adam Caulfield, *Rochester Institute of Technology*; Norrathep Rattanavipanon, *Prince of Songkla University, Phuket Campus*; Ivan De Oliveira Nunes, *Rochester Institute of Technology*

Fuzz The Power: Dual-role State Guided Black-box Fuzzing for USB Power Delivery 5845
Kyungtae Kim and Sungwoo Kim, *Purdue University*; Kevin R. B. Butler, *University of Florida*; Antonio Bianchi, Rick Kennell, and Dave (Jing) Tian, *Purdue University*

The Impostor Among US(B): Off-Path Injection Attacks on USB Communications 5863
Robert Dumitru, *The University of Adelaide and Defence Science and Technology Group*; Daniel Genkin, *Georgia Tech*; Andrew Wabnitz, *Defence Science and Technology Group*; Yuval Yarom, *The University of Adelaide*

Attacks on Cryptography

A comprehensive, formal and automated analysis of the EDHOC protocol 5881
Charlie Jacomme, *Inria Paris*; Elise Klein, Steve Kremer, and Maïwenn Racouchot, *Inria Nancy and Université de Lorraine*

Hash Gone Bad: Automated discovery of protocol attacks that exploit hash function weaknesses 5899
Vincent Cheval, *Inria Paris*; Cas Cremers and Alexander Dax, *CISPA Helmholtz Center for Information Security*; Lucca Hirschi, *Inria & LORIA*; Charlie Jacomme, *Inria Paris*; Steve Kremer, *Université de Lorraine, LORIA, Inria Nancy Grand-Est*

How fast do you heal? A taxonomy for post-compromise security in secure-channel establishment 5917
Olivier Blazy, *LIX, CNRS, Inria, École Polytechnique, Institut Polytechnique de Paris, France*; Ioana Boureanu, *University of Surrey, Surrey Centre for Cyber Security, UK*; Pascal Lafourcade, *LIMOS, University of Clermont Auvergne, France*; Cristina Onete, *XLIM, University of Limoges, France*; Léo Robert, *LIMOS, University of Clermont Auvergne, France*

Automated Analysis of Protocols that use Authenticated Encryption: How Subtle AEAD Differences can impact Protocol Security 5935
Cas Cremers, *CISPA Helmholtz Center for Information Security*; Alexander Dax, *CISPA Helmholtz Center for Information Security and Saarland University*; Charlie Jacomme, *Inria Paris*; Mang Zhao, *CISPA Helmholtz Center for Information Security and Saarland University*

High Recovery with Fewer Injections: Practical Binary Volumetric Injection Attacks against Dynamic Searchable Encryption 5953
Xianglong Zhang and Wei Wang, *Huazhong University of Science and Technology*; Peng Xu, *Huazhong University of Science and Technology and Hubei Key Laboratory of Distributed System Security*; Laurence T. Yang, *Huazhong University of Science and Technology and St. Francis Xavier University*; Kaitai Liang, *Delft University of Technology*

Cloud Insecurity

Cross Container Attacks: The Bewildered eBPF on Clouds 5971
Yi He and Roland Guo, *Tsinghua University and BNRist*; Yunlong Xing, *George Mason University*; Xijia Che, *Tsinghua University and BNRist*; Kun Sun, *George Mason University*; Zhuotao Liu, Ke Xu, and Qi Li, *Tsinghua University*

DScope: A Cloud-Native Internet Telescope 5989
Eric Pauley, Paul Barford, and Patrick McDaniel, *University of Wisconsin–Madison*

Credit Karma: Understanding Security Implications of Exposed Cloud Services through Automated Capability Inference 6007
Xueqiang Wang, *University of Central Florida*; Yuqiong Sun, *Meta*; Susanta Nanda, *ServiceNow*; XiaoFeng Wang, *Indiana University Bloomington*

Detecting Multi-Step IAM Attacks in AWS Environments via Model Checking 6025
Ilia Shevrin, *Citi*; Oded Margalit, *Ben-Gurion University*

Remote Direct Memory Introspection 6043
Hongyi Liu, Jiarong Xing, and Yibo Huang, *Rice University*; Danyang Zhuo, *Duke University*; Srinivas Devadas, *Massachusetts Institute of Technology*; Ang Chen, *Rice University*

More Web and Mobile Security

Auditing Framework APIs via Inferred App-side Security Specifications 6061
Parjanya Vyas, Asim Waheed, Yousra Aafer, and N. Asokan, *University of Waterloo*

WHIP: Improving Static Vulnerability Detection in Web Application by Forcing tools to Collaborate 6079
Feras Al-Kassar, *EURECOM*; Luca Compagna, *SAP Security Research*; Davide Balzarotti, *EURECOM*

SQRL: Grey-Box Detection of SQL Injection Vulnerabilities Using Reinforcement Learning 6097
Salim Al Wahaibi, Myles Foley, and Sergio Maffei, *Imperial College London*

Hiding in Plain Sight: An Empirical Study of Web Application Abuse in Malware 6115
Mingxuan Yao, *Georgia Institute of Technology*; Jonathan Fuller, *United States Military Academy*; Ranjita Pai Kasturi, Saumya Agarwal, Amit Kumar Sikder, and Brendan Saltaformaggio, *Georgia Institute of Technology*

Bilingual Problems: Studying the Security Risks Incurred by Native Extensions in Scripting Languages 6133
Cristian-Alexandru Staicu, *CISPA Helmholtz Center for Information Security*; Sazzadur Rahaman, *University of Arizona*; Ágnes Kiss and Michael Backes, *CISPA Helmholtz Center for Information Security*

Networks and Security

Did the Shark Eat the Watchdog in the NTP Pool? Deceiving the NTP Pool's Monitoring System 6151
Jonghoon Kwon, *ETH Zürich*; Jeonggyu Song and Junbeom Hur, *Korea University*; Adrian Perrig, *ETH Zürich*

Device Tracking via Linux's New TCP Source Port Selection Algorithm 6167
Moshe Kol, Amit Klein, and Yossi Gilad, *Hebrew University of Jerusalem*

Temporal CDN-Convex Lens: A CDN-Assisted Practical Pulsing DDoS Attack 6185
Run Guo, *Tsinghua University*; Jianjun Chen, *Tsinghua University and Zhongguancun Laboratory*; Yihang Wang and Keran Mu, *Tsinghua University*; Baojun Liu, *Tsinghua University and Zhongguancun Laboratory*; Xiang Li, *Tsinghua University*; Chao Zhang, *Tsinghua University and Zhongguancun Laboratory*; Haixin Duan, *Tsinghua University and Zhongguancun Laboratory and QI-ANXIN Technology Research Institute*; Jianping Wu, *Tsinghua University and Zhongguancun Laboratory*

An Efficient Design of Intelligent Network Data Plane 6203
Guangmeng Zhou, *Tsinghua University*; Zhuotao Liu, *Tsinghua University and Zhongguancun Laboratory*; Chuanpu Fu, *Tsinghua University*; Qi Li and Ke Xu, *Tsinghua University and Zhongguancun Laboratory*

Glowing in the Dark: Uncovering IPv6 Address Discovery and Scanning Strategies in the Wild 6221
Hamas Bin Tanveer, *The University of Iowa*; Rachee Singh, *Microsoft and Cornell University*; Paul Pearce, *Georgia Tech*; Rishab Nithyanand, *University of Iowa*

Arming and Disarming ARM

Oops...! I Glitched It Again! How to Multi-Glitch the Glitching-Protections on ARM TrustZone-M 6239
Xhani Marvin Saß, Richard Mitev, and Ahmad-Reza Sadeghi, *Technical University of Darmstadt*

SHELTER: Extending Arm CCA with Isolation in User Space 6257
Yiming Zhang, *Southern University of Science and Technology and The Hong Kong Polytechnic University*; Yuxin Hu, *Southern University of Science and Technology*; Zhenyu Ning, *Hunan University and Southern University of Science and Technology*; Fengwei Zhang, *Southern University of Science and Technology*; Xiapu Luo, *The Hong Kong Polytechnic University*; Haoyang Huang, *Southern University of Science and Technology*; Shoumeng Yan and Zhengyu He, *Ant Group*

Hot Pixels: Frequency, Power, and Temperature Attacks on GPUs and Arm SoCs 6275
Hritvik Taneja, Jason Kim, and Jie Jeff Xu, *Georgia Tech*; Stephan van Schaik, *University of Michigan*; Daniel Genkin, *Georgia Tech*; Yuval Yarom, *Ruhr University Bochum*

SPECTREM: Exploiting Electromagnetic Emanations During Transient Execution 6293
Jesse De Meulemeester, Antoon Purnal, Lennert Wouters, Arthur Beckers, and Ingrid Verbauwhede, *COSIC, KU Leuven*

ARMore: Pushing Love Back Into Binaries	6311
Luca Di Bartolomeo, Hossein Moghaddas, and Mathias Payer, <i>EPFL</i>	
More ML Attacks and Defenses	
Secure Floating-Point Training	6329
Deevashwer Rathee, <i>University of California, Berkeley</i> ; Anwesh Bhattacharya, Divya Gupta, and Rahul Sharma, <i>Microsoft Research</i> ; Dawn Song, <i>University of California, Berkeley</i>	
NeuroPots: Realtime Proactive Defense against Bit-Flip Attacks in Neural Networks	6347
Qi Liu, <i>Lehigh University</i> ; Jieming Yin, <i>Nanjing University of Posts and Telecommunications</i> ; Wujie Wen, <i>Lehigh University</i> ; Chengmo Yang, <i>University of Delaware</i> ; Shi Sha, <i>Wilkes University</i>	
FedVal: Different good or different bad in federated learning	6365
Viktor Valadi, <i>AI Sweden</i> ; Xinchu Qiu, Pedro Porto Buarque de Gusmão, and Nicholas D. Lane, <i>University of Cambridge</i> ; Mina Alibeigi, <i>University of Cambridge and Zenseact AB</i>	
Gradient Obfuscation Gives a False Sense of Security in Federated Learning	6381
Kai Yue, <i>North Carolina State University</i> ; Richeng Jin, <i>Zhejiang University</i> ; Chau-Wai Wong, Dror Baron, and Huaiyu Dai, <i>North Carolina State University</i>	
FREEAGLE: Detecting Complex Neural Trojans in Data-Free Cases	6399
Chong Fu, Xuhong Zhang, and Shouling Ji, <i>Zhejiang University</i> ; Ting Wang, <i>Pennsylvania State University</i> ; Peng Lin, <i>Chinese Aeronautical Establishment</i> ; Yanghe Feng, <i>National University of Defense Technology</i> ; Jianwei Yin, <i>Zhejiang University</i>	
Cryptography for Privacy	
Prime Match: A Privacy-Preserving Inventory Matching System	6417
Antigoni Polychroniadou, <i>J.P. Morgan</i> ; Gilad Asharov, <i>Bar-Ilan University</i> ; Benjamin Diamond, Tucker Balch, Hans Buehler, Richard Hua, Suwen Gu, Greg Gimler, and Manuela Veloso, <i>J.P. Morgan</i>	
Squirrel: A Scalable Secure Two-Party Computation Framework for Training Gradient Boosting Decision Tree	6435
Wen-jie Lu and Zhicong Huang, <i>Alibaba Group</i> ; Qizhi Zhang, <i>Ant Group</i> ; Yuchen Wang, <i>Alibaba Group</i> ; Cheng Hong, <i>Ant Group</i>	
Eos: Efficient Private Delegation of zkSNARK Provers	6453
Alessandro Chiesa, <i>UC Berkeley and EPFL</i> ; Ryan Lehmkuhl, <i>MIT</i> ; Pratyush Mishra, <i>Aleo and University of Pennsylvania</i> ; Yinuo Zhang, <i>UC Berkeley</i>	
Machine-checking Multi-Round Proofs of Shuffle: Terelius-Wikstrom and Bayer-Groth	6471
Thomas Haines, <i>Australian National University</i> ; Rajeev Gore, <i>Polish Academy of Science</i> ; Mukesh Tiwari, <i>University of Cambridge</i>	
TAP: Transparent and Privacy-Preserving Data Services	6489
Daniel Reijnders and Aung Maw, <i>Singapore University of Technology and Design</i> ; Zheng Yang, <i>Southwest University</i> ; Tien Tuan Anh Dinh and Jianying Zhou, <i>Singapore University of Technology and Design</i>	
Vulnerabilities and Threat Detection	
Trojan Source: Invisible Vulnerabilities	6507
Nicholas Boucher, <i>University of Cambridge</i> ; Ross Anderson, <i>University of Cambridge and University of Edinburgh</i>	
Cheesecloth: Zero-Knowledge Proofs of Real World Vulnerabilities	6525
Santiago Cuéllar, Bill Harris, James Parker, and Stuart Pernsteiner, <i>Galois, Inc.</i> ; Eran Tromer, <i>Columbia University</i>	
VISCAN: Discovering 1-day Vulnerabilities in Reused C/C++ Open-source Software Components Using Code Classification Techniques	6541
Seunghoon Woo, Eunjin Choi, Heejo Lee, and Hakjoo Oh, <i>Korea University</i>	
VulChecker: Graph-based Vulnerability Localization in Source Code	6557
Yisroel Mirsky, <i>Ben-Gurion University of the Negev</i> ; George Macon, <i>Georgia Tech Research Institute</i> ; Michael Brown, <i>Georgia Institute of Technology</i> ; Carter Yagemann, <i>Ohio State University</i> ; Matthew Pruett, Evan Downing, Sukarno Mertoguno, and Wenke Lee, <i>Georgia Institute of Technology</i>	

DISTDET: A Cost-Effective Distributed Cyber Threat Detection System 6575
Feng Dong, *School of Cyber Science and Engineering, Huazhong University of Science and Technology / Sangfor Technologies Inc.*; Liu Wang and Xu Nie, *Beijing University of Posts and Telecommunications*; Fei Shao, *Case Western Reserve University*; Haoyu Wang, *School of Cyber Science and Engineering, Huazhong University of Science and Technology*; Ding Li, *Key Laboratory of High-Confidence Software Technologies (MOE), School of Computer Science, Peking University*; Xiapu Luo, *The Hong Kong Polytechnic University*; Xusheng Xiao, *Arizona State University*

Automated Analysis of Deployed Systems

Automated Security Analysis of Exposure Notification Systems 6593
Kevin Morio and Ilkan Esiyok, *CISPA Helmholtz Center for Information Security*; Dennis Jackson, *Mozilla*; Robert Künnemann, *CISPA Helmholtz Center for Information Security*

Formal Analysis of SPDM: Security Protocol and Data Model version 1.2 6611
Cas Cremers, Alexander Dax, and Aurora Naska, *CISPA Helmholtz Center for Information Security*

One Size Does Not Fit All: Uncovering and Exploiting Cross Platform Discrepant APIs in WeChat 6629
Chao Wang, Yue Zhang, and Zhiqiang Lin, *The Ohio State University*

The Most Dangerous Codec in the World: Finding and Exploiting Vulnerabilities in H.264 Decoders 6647
Willy R. Vasquez, *The University of Texas at Austin*; Stephen Checkoway, *Oberlin College*; Hovav Shacham, *The University of Texas at Austin*

Are You Spying on Me? Large-Scale Analysis on IoT Data Exposure through Companion Apps 6665
Yuhong Nan, *Sun Yat-sen University*; Xueqiang Wang, *University of Central Florida*; Luyi Xing and Xiaojing Liao, *Indiana University Bloomington*; Ruoyu Wu and Jianliang Wu, *Purdue University*; Yifan Zhang and XiaoFeng Wang, *Indiana University Bloomington*

Manipulation, Influence, and Elections

Strategies and Vulnerabilities of Participants in Venezuelan Influence Operations 6683
Ruben Recabarren, Bogdan Carbutar, Nestor Hernandez, and Ashfaq Ali Shafin, *Florida International University*

TRIDENT: Towards Detecting and Mitigating Web-based Social Engineering Attacks 6701
Zheng Yang, Joey Allen, and Matthew Landen, *Georgia Institute of Technology*; Roberto Perdisci, *Georgia Tech and University of Georgia*; Wenke Lee, *Georgia Institute of Technology*

Fact-Saboteurs: A Taxonomy of Evidence Manipulation Attacks against Fact-Verification Systems 6719
Sahar Abdelnabi and Mario Fritz, *CISPA Helmholtz Center for Information Security*

Reversing, Breaking, and Fixing the French Legislative Election E-Voting Protocol 6737
Alexandre Debant and Lucca Hirschi, *Université de Lorraine, Inria, CNRS, France*

PROVIDENCE: a Flexible Round-by-Round Risk-Limiting Audit 6753
Oliver Broadrick and Poorvi Vora, *The George Washington University*; Filip Zagórski, *University of Wroclaw and Votifica*

Side Channel Attacks

NVLeak: Off-Chip Side-Channel Attacks via Non-Volatile Memory Systems 6771
Zixuan Wang, *UC San Diego*; Mohammadkazem Taram, *Purdue University and UC San Diego*; Daniel Moghimi, *UT Austin and UC San Diego*; Steven Swanson, Dean Tullsen, and Jishen Zhao, *UC San Diego*

Cipherfix: Mitigating Ciphertext Side-Channel Attacks in Software 6789
Jan Wichelmann, Anna Pätschke, Luca Wilke, and Thomas Eisenbarth, *University of Lübeck*

Side-Channel Attacks on Optane Persistent Memory 6807
Sihang Liu, *University of Virginia*; Suraj Kanniwadi, *Cornell University*; Martin Schwarzl, Andreas Kogler, and Daniel Gruss, *Graz University of Technology*; Samira Khan, *University of Virginia*

PSPRAY: Timing Side-Channel based Linux Kernel Heap Exploitation Technique 6825
Yoochan Lee and Jinhan Kwak, *Seoul National University*; Junesoo Kang and Yuseok Jeon, *UNIST*; Byoungyoung Lee, *Seoul National University*

CIPHERH: Automated Detection of Ciphertext Side-channel Vulnerabilities in Cryptographic Implementations . . . 6843
Sen Deng, *Southern University of Science and Technology*; Mengyuan Li, *The Ohio State University*; Yining Tang, *Southern University of Science and Technology*; Shuai Wang, *Hong Kong University of Science and Technology*; Shoumeng Yan, *The Ant Group*; Yinqian Zhang, *Southern University of Science and Technology*

Transportation and Infrastructure

ICSPatch: Automated Vulnerability Localization and Non-Intrusive Hotpatching in Industrial Control Systems using Data Dependence Graphs. 6861
Prashant Hari Narayan Rajput, *NYU Tandon School of Engineering*; Constantine Dourmanidis and Michail Maniatakos, *New York University Abu Dhabi*

Access Denied: Assessing Physical Risks to Internet Access Networks. 6877
Alexander Marder, *CAIDA / UC San Diego*; Zesen Zhang, *UC San Diego*; Ricky Mok and Ramakrishna Padmanabhan, *CAIDA / UC San Diego*; Bradley Huffaker, *CAIDA / UC San Diego*; Matthew Luckie, *University of Waikato*; Alberto Dainotti, *Georgia Tech*; kc claffy, *CAIDA / UC San Diego*; Alex C. Snoeren and Aaron Schulman, *UC San Diego*

ZBCAN: A Zero-Byte CAN Defense System. 6893
Khaled Serag, Rohit Bhatia, Akram Faqih, and Muslum Ozgur Ozmen, *Purdue University*; Vireshwar Kumar, *Indian Institute of Technology, Delhi*; Z. Berkay Celik and Dongyan Xu, *Purdue University*

RIDAS: Real-time identification of attack sources on controller area networks 6911
Jiwoo Shin and Hyunghoon Kim, *Soongsil University*; Seyoung Lee, Wonsuk Choi, and Dong Hoon Lee, *Korea University*; Hyo Jin Jo, *Soongsil University*

That Person Moves Like A Car: Misclassification Attack Detection for Autonomous Systems Using Spatiotemporal Consistency. 6929
Yanmao Man, *University of Arizona*; Raymond Muller, *Purdue University*; Ming Li, *University of Arizona*; Z. Berkay Celik, *Purdue University*; Ryan Gerdes, *Virginia Tech*

Language-Based Security

TRUST: A Compilation Framework for In-process Isolation to Protect Safe Rust against Untrusted Code 6947
Inyoung Bang and Martin Kayondo, *Seoul National University*; Hyungon Moon, *UNIST (Ulsan National Institute of Science and Technology)*; Yunheung Paek, *Seoul National University*

Jinn: Hijacking Safe Programs with Trojans 6965
Komail Dharsee and John Criswell, *University of Rochester*

ARGUS: A Framework for Staged Static Taint Analysis of GitHub Workflows and Actions 6983
Siddharth Muralee, *Purdue University*; Igibek Koishybayev, Aleksandr Nahapetyan, Greg Tystahl, and Brad Reaves, *North Carolina State University*; Antonio Bianchi, *Purdue University*; William Enck and Alexandros Kapravelos, *North Carolina State University*; Aravind Machiry, *Purdue University*

McFIL: Model Counting Functionality-Inherent Leakage 7001
Maximilian Zinkus, Yinzhi Cao, and Matthew D. Green, *Johns Hopkins University*

Extracting Protocol Format as State Machine via Controlled Static Loop Analysis. 7019
Qingkai Shi, Xiangzhe Xu, and Xiangyu Zhang, *Purdue University*

Browsers

Isolated and Exhausted: Attacking Operating Systems via Site Isolation in the Browser 7037
Matthias Gierlings, Marcus Brinkmann, and Jörg Schwenk, *Ruhr University Bochum*

Extending a Hand to Attackers: Browser Privilege Escalation Attacks via Extensions 7055
Young Min Kim and Byoungyoung Lee, *Seoul National University*

RøB: Ransomware over Modern Web Browsers 7073
Harun Oz, Ahmet Aris, and Abbas Acar, *Cyber-Physical Systems Security Lab, Florida International University*; Güliz Seray Tuncay, *Google*; Leonardo Babun and Selcuk Uluagac, *Cyber-Physical Systems Security Lab, Florida International University*

Pool-Party: Exploiting Browser Resource Pools for Web Tracking 7091
Peter Snyder, *Brave Software*; Soroush Karami, *University of Illinois at Chicago*; Arthur Edelstein, *Brave Software*;
Benjamin Livshits, *Imperial College London*; Hamed Haddadi, *Brave Software and Imperial College of London*

Checking Passwords on Leaky Computers: A Side Channel Analysis of Chrome’s Password Leak Detect Protocol .. 7107
Andrew Kwong, *UNC Chapel Hill*; Walter Wang, *University of Michigan*; Jason Kim, *Georgia Tech*; Jonathan Berger,
Bar Ilan University; Daniel Genkin, *Georgia Tech*; Eyal Ronen, *Tel Aviv University*; Hovav Shacham, *UT Austin*;
Riad Wahby, *CMU*; Yuval Yarom, *Ruhr University Bochum*

Speculation Doesn’t Pay

Ultimate SLH: Taking Speculative Load Hardening to the Next Level 7125
Zhiyuan Zhang, *The University of Adelaide*; Gilles Barthe, *MPI-SP and IMDEA Software Institute*;
Chitchanok Chuengsatiansup, *The University of Melbourne*; Peter Schwabe, *MPI-SP and Radboud University*;
Yuval Yarom, *The University of Adelaide*

Speculation at Fault: Modeling and Testing Microarchitectural Leakage of CPU Exceptions 7143
Jana Hofmann, *Azure Research, Microsoft*; Emanuele Vannacci, *Vrije Universiteit Amsterdam*; Cédric Fournet,
Boris Köpf, and Oleksii Oleksenko, *Azure Research, Microsoft*

PROSPECT: Provably Secure Speculation for the Constant-Time Policy 7161
Lesly-Ann Daniel, Marton Bognar, and Job Noorman, *imec-DistriNet, KU Leuven*; Sébastien Bardin, *CEA, LIST*,
Université Paris Saclay; Tamara Rezk, *INRIA, Université Côte d’Azur, Sophia Antipolis*; Frank Piessens, *imec-DistriNet*,
KU Leuven

Downfall: Exploiting Speculative Data Gathering 7179
Daniel Moghimi, *UCSD*

Facing the Facts

FACE-AUDITOR: Data Auditing in Facial Recognition Systems 7195
Min Chen, *CISPA Helmholtz Center for Information Security*; Zhikun Zhang, *CISPA Helmholtz Center for*
Information Security and Stanford University; Tianhao Wang, *University of Virginia*; Michael Backes and
Yang Zhang, *CISPA Helmholtz Center for Information Security*

UnGANable: Defending Against GAN-based Face Manipulation 7213
Zheng Li, *CISPA Helmholtz Center for Information Security*; Ning Yu, *Salesforce Research*; Ahmed Salem,
Microsoft Research; Michael Backes, Mario Fritz, and Yang Zhang, *CISPA Helmholtz Center for Information Security*

Fairness Properties of Face Recognition and Obfuscation Systems 7231
Harrison Rosenberg, *University of Wisconsin–Madison*; Brian Tang, *University of Michigan*; Kassem Fawaz and
Somesh Jha, *University of Wisconsin–Madison*

GlitchHiker: Uncovering Vulnerabilities of Image Signal Transmission with IEMI 7249
Qinhong Jiang, Xiaoyu Ji, Chen Yan, Zhixin Xie, Haina Lou, and Wenyuan Xu, *Zhejiang University*

More Hardware Side Channels

(M)WAIT for It: Bridging the Gap between Microarchitectural and Architectural Side Channels 7267
Ruiyi Zhang, *CISPA Helmholtz Center for Information Security*; Taehyun Kim, *Independent*; Daniel Weber and
Michael Schwarz, *CISPA Helmholtz Center for Information Security*

Collide+Power: Leaking Inaccessible Data with Software-based Power Side Channels 7285
Andreas Kogler, Jonas Juffinger, and Lukas Giner, *Graz University of Technology*; Lukas Gerlach, *CISPA Helmholtz*
Center for Information Security; Martin Schwarzl, *Graz University of Technology*; Michael Schwarz, *CISPA Helmholtz*
Center for Information Security; Daniel Gruss and Stefan Mangard, *Graz University of Technology*

INCEPTION: Exposing New Attack Surfaces with Training in Transient Execution 7303
Daniël Trujillo, Johannes Wikner, and Kaveh Razavi, *ETH Zurich*

BunnyHop: Exploiting the Instruction Prefetcher 7321
Zhiyuan Zhang, Mingtian Tao, and Sioli O’Connell, *The University of Adelaide*; Chitchanok Chuengsatiansup,
The University of Melbourne; Daniel Genkin, *Georgia Tech*; Yuval Yarom, *The University of Adelaide*

Deeper Thoughts on Deep Learning

Can a Deep Learning Model for One Architecture Be Used for Others? Retargeted-Architecture Binary Code Analysis 7339
Junzhe Wang, *George Mason University*; Matthew Sharp, *University of South Carolina*; Chuxiong Wu, Qiang Zeng, and Lannan Luo, *George Mason University*

Decompiling x86 Deep Neural Network Executables 7357
Zhibo Liu, Yuanyuan Yuan, and Shuai Wang, *The Hong Kong University of Science and Technology*; Xiaofei Xie, *Singapore Management University*; Lei Ma, *University of Alberta*

AIRS: Explanation for Deep Reinforcement Learning based Security Applications 7375
Jiahao Yu, *Northwestern University*; Wenbo Guo, *Purdue University*; Qi Qin, *ShanghaiTech University*; Gang Wang, *University of Illinois at Urbana-Champaign*; Ting Wang, *The Pennsylvania State University*; Xinyu Xing, *Northwestern University*

Differential Testing of Cross Deep Learning Framework APIs: Revealing Inconsistencies and Vulnerabilities 7393
Zizhuang Deng, Guozhu Meng, Kai Chen, Tong Liu, and Lu Xiang, *SKLOIS, Institute of Information Engineering, Chinese Academy of Sciences, China*; *School of Cyber Security, University of Chinese Academy of Sciences, China*; Chunyang Chen, *Monash University, Australia*

Attacks on Deployed Cryptosystems

Every Signature is Broken: On the Insecurity of Microsoft Office's OOXML Signatures 7411
Simon Rohlmann, Vladislav Mladenov, Christian Mainka, Daniel Hirschberger, and Jörg Schwenk, *Ruhr University Bochum*

Downgrading DNSSEC: How to Exploit Crypto Agility for Hijacking Signed Zones 7429
Elias Heftrig, *ATHENE and Fraunhofer SIT*; Haya Shulman, *ATHENE, Fraunhofer SIT, and Goethe-Universität Frankfurt*; Michael Waidner, *ATHENE, Fraunhofer SIT, and Technische Universität Darmstadt*

Security Analysis of MongoDB Queryable Encryption 7445
Zichen Gui, Kenneth G. Paterson, and Tianxin Tang, *ETH Zurich*

All cops are broadcasting: TETRA under scrutiny 7463
Carlo Meijer, Wouter Bokslag, and Jos Wetzels, *Midnight Blue*

Attacking, Defending, and Analyzing

On the Feasibility of Malware Unpacking via Hardware-assisted Loop Profiling 7481
Binlin Cheng, *Shandong University*; Erika A Leal, *Tulane University*; Haotian Zhang, *The University of Texas at Arlington*; Jiang Ming, *Tulane University*

Multiview: Finding Blind Spots in Access-Deny Issues Diagnosis 7499
Bingyu Shen, Tianyi Shan, and Yuanyuan Zhou, *University of California, San Diego*

Attacks are Forwarded: Breaking the Isolation of MicroVM-based Containers Through Operation Forwarding . . . 7517
Jietao Xiao and Nanzi Yang, *State Key Lab of ISN, School of Cyber Engineering, Xidian University, China*; Wenbo Shen, *Zhejiang University, China*; Jinku Li and Xin Guo, *State Key Lab of ISN, School of Cyber Engineering, Xidian University, China*; Zhiqiang Dong and Fei Xie, *Tencent Security Yunding Lab, China*; Jianfeng Ma, *State Key Lab of ISN, School of Cyber Engineering, Xidian University, China*

AutoFR: Automated Filter Rule Generation for Adblocking 7535
Hieu Le, Salma Elmalaki, and Athina Markopoulou, *University of California, Irvine*; Zubair Shafiq, *University of California, Davis*