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Pre-Proceedings

The 22nd World Conference on Information Security Applications

WISA 2021

August 11(Wed)~August 13(Fri), 2021, Seoul, Korea

MAISON GLAD, Jeju Island, Korea
hybrid (on-off mix) conference

Hosted by: Korea Institute of Information Security & Cryptology

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The 22nd World Conference on Information Security Applications

WISA 2021

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Keynotes

Keynotes 1

Keynote 1: Ross Anderson (Univ. of Cambridge)

Title: Security Engineering and Machine Learning

Date : August 11, 16:00 PM (UTC+09:00)

Abstract

Statistical machine-learning techniques have been used in security applications for over 20 years, starting with spam filtering, fraud engines and intrusion detection. In the process we have become familiar with attacks from poisoning to polymorphism, and issues from redlining to snake oil. The neural network revolution has recently brought many people into ML research who are unfamiliar with this history, so it should surprise nobody that many new products are insecure. In this talk I will describe some recent research projects where we examine whether we should try to make machine-vision systems robust against adversarial samples, or fragile enough to detect them when they appear; whether adversarial samples have constructive uses; how we can do service-denial attacks on neural-network models; on the need to sanity-check outputs; and on the need to sanitise inputs. We need to shift the emphasis from the design of "secure" ML classifiers, to the design of secure systems that use ML classifiers as components.

Biography

Ross Anderson is Professor of Security Engineering at Cambridge University. He is one of the founders of a vigorously-growing new academic discipline, the economics of information security. Ross was also a seminal contributor to the idea of peer-to-peer systems and an inventor of the AES finalist encryption algorithm "Serpent". He also has well-known publications on many other technical security topics including hardware tamper-resistance, emission security, copy-right marking, and the robustness of application programming interfaces (APIs). He is a Fellow of the Royal Society, the Royal Academy of Engineering, the IET and the IMA. He also wrote the standard textbook "Security Engineering-a Guide to Building Dependable Distributed Systems".

Keynotes 2

Keynote 2: Surya Nepal (CSIRO Data61)

Title: Building Trustworthy Deep Neural Networks

Date : August 12, 13:30 PM (UTC+09:00)

Abstract

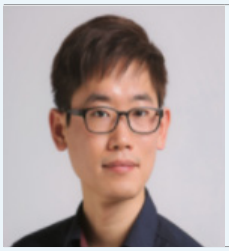
Backdoor attacks insert hidden associations or triggers to the deep learning models to override correct inference such as classification and make the system perform maliciously according to the attacker-chosen target while behaving normally in the absence of the trigger. As a new and rapidly evolving realistic attack, it could result in dire consequences, especially considering that the backdoor attack surfaces are broad. This talk first provides a brief overview of backdoor attacks, and then present countermeasures towards building trustworthy deep neural networks.

Biography

Dr Surya Nepal is a Senior Principal Research Scientist at CSIRO Data61. He currently leads the distributed systems security group comprising 30+ research staff and 50+ postgraduate students. His main research focus is on the development and implementation of technologies in the area of cybersecurity and privacy, and AI and Cybersecurity. He has more than 250 peer-reviewed publications to his credit. He is a member of the editorial boards of IEEE Transactions on Service Computing, ACM Transactions on Internet Technology, IEEE Transactions on Dependable and Secure Computing, and Frontiers of Big Data- Security Privacy, and Trust. He is currently a deputy research director of Cybersecurity Cooperative Research Centre (CRC), a national initiative in Australia.

Invited talks

Invited talks 1



Invited Talk 1: Yonghwi Kwon (Virginia Univ.)

Title: Program Analysis for Security

Date : August 12, 11:00AM (UTC+09:00)

Abstract

Program analysis is the automated process of analyzing the behavior of computer programs both statically and dynamically. Over the years, we have seen various applications of program analysis, including malware analysis, vulnerability analysis, software testing, etc. As we virtually live with computer systems, the importance of secure and correct programs and program analysis techniques improve those properties. In this talk, I will present two recent projects of program analysis solving security problems: malware analysis and swarm security. First, I will present the difficulties in web-server-based malware analysis techniques and our solution to effectively expose malicious behaviors. We propose a novel concept of cooperative counter-factual executions. Second, we will discuss how the concept of counter-factual causality can be used in the context of robotics. We introduce a testing technique that can effectively and efficiently test swarm robotics, finding and fixing configuration bugs in swarm algorithms.

Biography

Yonghwi Kwon is an assistant professor of computer science at the University of Virginia. He is broadly interested in solving system security problems via program analysis. He is a recipient of the two ACM Distinguished Paper Award in 2019 and 2013, NSF CRII Award in 2018, Maurice H. Halstead Memorial Award in 2017, IEEE/ACM Automated Software Engineering (ASE) Best Paper Award in 2013.

Invited talks 2

Invited Talk 2: Yang Zhang (CISPA)

Title: Quantifying Privacy Risks of Machine Learning Models

Date : August 13, 09:00 AM (UTC+09:00)

Abstract

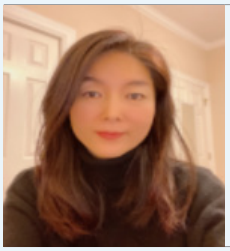
Machine learning has made tremendous progress during the past decade. While continuing to improve our daily lives, recent research shows that machine learning models are vulnerable to various privacy attacks. In this talk, I'll cover our two recent works on quantifying the privacy risks of machine learning models. First, I will talk about some recent development of membership inference, including membership inference with only labels and attacks against machine unlearning. Second, I will present our work on the first link stealing attacks against graph neural networks.

Biography

Yang Zhang is a faculty member at CISPA Helmholtz Center for Information Security, Germany. Previously, he was a group leader at CISPA. He obtained his Ph.D. degree from University of Luxembourg in November 2016. Yang's research interests lie at the intersection of privacy and machine learning. Over the years, he has published multiple papers at top venues in computer science, including WWW, CCS, NDSS, and USENIX Security. His work has received NDSS 2019 distinguished paper award. Yang has served in the technical program committee of USENIX Security 2022 2021, ACM CCS 2021 2020 2019, WWW 2021 2020, and PETS 2022 2021 2020.

Invited talks

Invited talks 3



Invited Talk 3: Eun Jung Kim (Texas A&M Univ.)

Title: Preventing Cache Leakage from Spectre and Meltdown Attacks

Date : August 13, 10:00 AM (UTC+09:00)

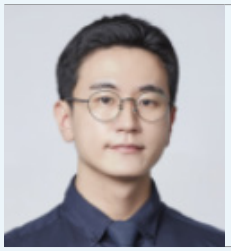
Abstract

Recently the Spectre and Meltdown vulnerabilities have shaken the computing industry to its core, showing that security is not only a software problem, but that the vulnerabilities exist in the design of modern processors and allow for sensitive information such as passwords and e-mail contents to be read from memory. These attacks take advantage of high performance hardware design features known as Speculative Execution and Branch Prediction. In this talk, I will first introduce these attack examples and I will then discuss an idea to build next generation CPUs to enable secure speculation without sacrificing performance.

Biography

Eun Jung Kim is an associate professor in the Department of Computer Science & Engineering, Texas A&M University, where she has been since 2003. Her research interests include computer architecture, parallel/distributed systems, low-power design, secure computing, performance evaluation, and fault tolerant computing. She is serving as associated editors for IEEE transactions on Computer and IEEE Computer Architecture Letter. She has served as program committee chairs/members for top-tier conferences in the Computer Architecture area. She has published more than 70 scientific papers in leading refereed journals, conferences and book chapters. She has graduated 11 Ph.D. students and 17 M.S. since joining Texas A&M. Dr. Kim received the NSF CAREER Award in 2009. She is a member of the IEEE Computer Society and the ACM.

Tutorials 1



Tutorial 1: Daehee Jang (Sungshin W. Univ.)

Title: OS Command Injection Exercise

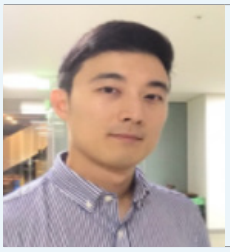
Date : August 11, 10:00 AM (UTC+09:00)

Abstract

IoT devices and web applications often provide services by utilizing its underlying OS commands instead of implementing the whole service from scratch. For example, the majority of modern Wi-Fi routers provide network ping service for users to check if their network setup is correct; and its implementation is built on top of existing Linux `ping` command instead of re-implementing the entire ICMP protocol. Re-using OS commands has the benefit of providing fast/accurate service development with minimal engineering effort. However, improper data sanitization exposes such service to OS command injection which is a serious yet easy-to-overlook security flaw. Exploiting OS command injection is way too easy compared to other system exploitation techniques; however, its security impact is high. In this tutorial, I will demonstrate advanced OS command injection techniques against common bash shells and explain how we can bypass various filters/restrictions. Also I will provide a docker-based platform as a small series of CTF/Wargame challenges to practice such exploitation techniques as a lab exercise.

Tutorials

Tutorials 2



Tutorial 2: Hojoon Lee (Sungkyunkwan Univ.)

Title: Isolating and Protecting Sensitive Program Components with Intel SGX

Date : August 12, 16:00 PM (UTC+09:00)

Abstract

Ensuring confidentiality and integrity of sensitive workloads is becoming increasingly more difficult with today's computing systems. Modern software is growing more and more complex and inevitably contains bugs. The presence of vulnerabilities in user programs and even operating system kernels render the protection of secrets a daunting challenge. Trusted Execution Environments (TEEs) ensures confidentiality and integrity of sensitive program code and data by constructing a safe and isolated execution compartment within the system by leveraging hardware support for isolation in modern architectures.

Intel has introduced Software Guard eXtension (SGX) in its processor architecture to provide secure enclaves for protecting program secrets. This tutorial will discuss the security model, design patterns, and applications of SGX. Then, we will write a simple SGX-protected program together to provide a hands-on experience with trusted execution environments.

Program

DAY 1 August 11 (Wednesday), 2021

10:00 ~ 12:00	**Tutorial 1: OS Command Injection Exercise** Daehee Jang (Sungshin W. Univ.)
12:00 ~ 14:00	Lunch Break
14:00 ~ 15:00	**Session 1 (Crystal Hall I)** **LOM: Lightweight classifier for obfuscation methods** Jeong-Woo Kim (Chungnam National University), Seoyeon Kang (Chungnam National University), Eun-Sun Cho (Chungnam National University) and Joon-Young Paik (Tiangong University) **A Method for Collecting Vehicular Network Data for Enhanced Anomaly Detection** Samuel De La Motte (University of Western Australia) and Jin Hong (University of Western Australia) **Unsupervised Driver Behavior Profiling leveraging Recurrent Neural Networks** Young Ah Choi (Korea University), Kyung Ho Park (SOCAR), Eunji Park (Korea University) and Huy Kang Kim (Korea University) **Session 2 (Crystal Hall II)** **Quantum Cryptanalysis Landscape of Shor's Algorithm for Elliptic Curve Discrete Logarithm Problem** Harashta Tatimma Larasati (Pusan National University) and Howon Kim (Pusan National University) **Anonymous IBE from PEKS : A Generic Construction** Hyun Sook Rhee (Samsung Electronics) and Dong Hoon Lee (Korea University) **Secure Computation of Shared Secrets and Its Applications** Xin Liu (University of Wollongong), Willy Susilo (University of Wollongong) and Joonsang Baek (University of Wollongong)
15:00 ~ 16:00	Break Time
16:00 ~ 17:00	**Keynote 1: Security Engineering and Machine Learning** Ross Anderson (Cambridge Univ.)

Program

DAY 2 August 12 (Thursday), 2021

09:30 ~ 10:30	**Session 3 (Crystal Hall I)** **Adaptive Network Security Service Orchestraction based on SDN/NFV** Priyatham Ganta (San Jose State University), Kicho Yu (Northeastern University), Dharma Dheeraj Chintala (San Jose State University) and Younghee Park (San Jose State University) **A General Framework for Matching Pattern Hiding in Deep Packet Inspection** Jinghang Wen (Jinan University), Jianan Liu (Jinan University), Jian Weng (Jinan University), Jiasi Weng (Jinan University) and Axin Wu (Jinan University) **A Privacy-Preserving Payment Model for EV Charging** Jane Kim (Hanyang University), Soojin Lee (Hanyang University) and Seung-Hyun Seo (Hanyang University) **Session 4 (Crystal Hall II)** **Measuring Healthcare Data Breaches** Mohammed Alkinoon (University of Central Florida), Sung Choi Yoo (University of Central Florida) and David Mohaisen (University of Central Florida) **BadASLR: Exceptional cases of ASLR aiding Exploitation** Daehee Jang (Sungshin W. University) **Quantitative Analysis on Attack Capacity in Meltdown-type Attacks** Seokmin Lee (Kwangwoon University), Taehun Kim (Korea University) and Youngjoo Shin (Korea University)
10:30 ~ 11:00	Break Time
11:00 ~ 12:00	**Invited Talk 1: Program Analysis for Security** Yonghwi Kwon (Virginia Univ.)
12:00 ~ 13:30	Lunch Break

Program

DAY 2 August 12 (Thursday), 2021

13:30 ~ 14:30	**Keynote 2: Building Trustworthy Deep Neural Networks** Surya Nepal (CSIRO Data61)
14:30 ~ 15:30	**Session 5 (Crystal Hall I)** **On the robustness of intrusion detection systems for vehicles against adversarial attacks** Jeongseok Choi (Sungkyunkwan University) and Hyoungshick Kim (Sungkyunkwan University) **A Framework for Generating Evasion Attacks for Machine Learning based Network Intrusion Detection Systems** Raymond Mogg (The University of Queensland), Simon Yusuf Enoch (The University of Queensland) and Dan Kim (The University of Queensland) **HAT: Hybrid Adversarial Training for Simultaneous Training of Deep Learning Model and Denoising Network** Gwonsang Ryu (Soongsil University) and Daeseon Choi (Soongsil University) **Session 6 (Crystal Hall II)** **Pattern Matching over Encrypted Data with a Short Ciphertext** Jongkil Kim (University of Wollongong), Willy Susilo (University of Wollongong), Joonsang Baek (University of Wollongong), Intae Kim (University of Wollongong) and Yang-Wai Chow (University of Wollongong) **Efficient adaptation of TFHE for high end-to-end throughput** Kang Hoon Lee (Korea University) and Ji Won Yoon (Korea University) **AnyTRNG: Generic, High-throughput, Low-area True Random Number Generator based on Synchronous Edge Sampling** Asep Muhamad Awaludin (Pusan National University), Derry Pratama (Pusan National University) and Howon Kim (Pusan National University)
15:30 ~ 16:00	Break Time
16:00 ~ 18:00	**Tutoriral 2: Isolating and Protecting Sensitive Program Components with Intel SGX** Hojoon Lee (Sungkyunkwan Univ.)
18:00 ~ 19:30	Banquet
19:30 ~ 20:00	Best Paper Award

Program

DAY 3 August 13 (Friday), 2021

09:00 ~ 10:00	**Invited Talk 2: Quantifying Privacy Risks of Machine Learning Models** Yang Zhang (CSIRO Data61)
10:00 ~ 11:00	**Invited Talk 3: Preventing Cache Leakage from Spectre and Meltdown Attacks** Eun Jung Kim (Texas A&M Univ.)
11:00 ~ 12:00	**Session 7 (Crystal Hall I)** **Echo-Guard : Acoustic-based Anomaly Detection System for Smart Manufacturing Environments** Chang-Bae Seo (Hanyang University), Gyuseop Lee (Hanyang University), Yeonjoon Lee (Hanyang University) and Seung-Hyeon Seo (Hanyang University) **Research on improvement of anomaly detection performance in industrial control systems** Sungho Bae (Hoseo University), Chanwoong Hwang (Hoseo University) and Taejin Lee (Hoseo University) **ARMed Frodo: FrodoKEM on 64-bit ARMv8 Processors** Hyeokdong Kwon (Hansung University), Kyoungbae Jang (Hansung University), Hyunjun Kim (Hansung University), Hyunji Kim (Hansung University), Minjoo Sim (Hansung University), Siwoo Eum (Hansung University), Wai-Kong Lee (Gachon University) and Hwajeong Seo (Hansung University) **Session 8 (Crystal Hall II)** **Masked Implementation of PIPO Block Cipher on 8-bit AVR Microcontrollers** Hyunjun Kim (Hansung University), Minjoo Sim (Hansung University), Eum Si Woo (Hansung University), Kyoungbae Jang (Hansung University), Gyeong Ju Song (Hansung University), Hyunji Kim (Hansung University), Hyeokdong Kwon (Hansung University), Wai-Kong Lee (Gachon University) and Hwajeong Seo (Hansung University) **Parallel Implementation of PIPO Block Cipher on 32-bit RISC-V Processor** Yujin Kwak (Kookmin University), Youngbeom Kim (Kookmin University) and Seog Chung Seo (Kookmin University) **No Silver Bullet: Optimized Montgomery Multiplication on Various 64-bit ARM Platforms** Hwajeong Seo (Hansung University), Pakize Sanal (Florida Atlantic University), Wai-Kong Lee (Gachon University) and Reza Azarderakhsh (Florida Atlantic University)

Registration

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At least one author of each paper/poster must register until August 2, 2021 (UTC+09:00).
Click on the registration page link: https://kiisc.or.kr/payment/pay/64
There is no author registration option. Authors are required to register via Online Attendance (Student) or Online Attendance (General Participant).
The online registration fee will cover (a) the access to the online conference and (b) the access to the online proceedings.
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	General Participants	700,000 won
Online Attendance	-	150,000 won ($140 USD)

(Offline) Registration includes online proceedings, 2 Lunches, 1 Banquet during the conference.
(Online) Registration only includes online proceedings during the conference.

Registration Policy

At least one presenter per accepted paper, poster, or demo must register for the conference.
We are unable to offer refunds, cancellations, or substitutions for any registrations for this event.

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