

# BYOUNGYOUNG LEE

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## EDUCATION

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**Georgia Institute of Technology**, Atlanta, GA ..... Aug 2016

Ph.D. in Computer Science.

Thesis: Protecting Computer Systems through Eliminating or Analyzing Vulnerabilities

Advisors: Prof. Wenke Lee and Prof. Taesoo Kim

**POSTECH**, Pohang, South Korea ..... May 2011

B.S. and M.S. in Computer Science and Engineering

Advisor: Prof. Jong Kim

## RESEARCH INTERESTS

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Interested in **all computer security and privacy related problems** in general. In particular, my research focus is in **system security**, e.g., designing and implementing secure systems through eliminating vulnerabilities and mitigating attacks.

## HONORS & AWARDS

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**Internet Defense Prize** by Facebook and USENIX (\$100,000 award), 2015 [10]

Qualified for **DARPA Cyber Grand Challenge** (Team Disekt, \$750,000 award), 2015

The third place award by **CSAW Best Applied Research Paper Award**, 2015 [12]

**Vulnerability Bounty Award** by Firefox, Mozilla (\$3,000 award), 2014

**Vulnerability Bounty Award** by Firefox, Mozilla (\$3,000 award), 2013

**Vulnerability Bounty Award** by Chrome, Google (\$3,000 award), 2013

DEFCON 19 CTF<sup>1</sup>, 8th place (Team PLUS@POSTECH). Las Vegas, USA, 2011

DEFCON 17 CTF, 3rd place (Team PLUS@POSTECH). Las Vegas, USA, 2009

KAIST-POSTECH Science War - Hacking Competition. Winner. 2008

DEFCON 14 CTF, 6th place (Team The East Sea). Las Vegas, USA, 2006

Wowhacker Hacking Festival. Supreme Award, 2006

KISA Hacking Defense Competition, Special Prize, 2006

KAIST-POSTECH Science War - Hacking Competition, Winner 2005

POSTECH Undergraduate Research Program Scholarship, 2005

Full undergraduate study scholarship, Korea Science and Engineering Foundation, 2003 – 2009

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<sup>1</sup>DEFCON CTF (Capture The Flag) is the most prestigious hacking competition in the world among more than 200 teams

## PROFESSIONAL EXPERIENCE

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- Purdue University.** West Lafayette, IN ..... Aug 2016 – Current  
Assistant Professor, Department of Computer Science
- Chrome Security Team, Google.** Mountain View, CA ..... May 2014 – Aug 2014  
Software Engineering Intern: worked on detecting runtime bad-casting  
Mentor: Abhishek Arya
- Microsoft Research Redmond, Microsoft.** Redmond, WA ..... May 2012 – Aug 2012  
Research Intern: worked on mapping dynamic data for user-mode crash dump analysis  
Mentors: Marcus Peinado and Weidong Cui
- Georgia Institute of Technology.** Atlanta, GA ..... Aug 2011 – Aug 2016  
Research Assistant

## OPEN SOURCE CONTRIBUTION

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- SGX-Shield.** Enabling ASLR for SGX Programs [3]. Contributor.  
<https://github.com/jaebaek/SGX-Shield>
- LLVM/Clang.** Contributed to Undefined Behavior Sanitizer  
<http://llvm.org>
- Chromium Browser.** Contributed to Security Enhancement Tool  
<http://www.chromium.org>
- CaVer.** Runtime Bad-casting Detection Tool [10]. Lead author.  
<https://github.com/sslab-gatech/caver>
- Morula.** Enhancing weakened Android ASLR [15]. Lead author.  
<https://github.com/lifeasageek/morula>
- TrackMeOrNot.** A web browser enabling selective privacy-sensitive browsing [6]. Developer.  
<https://github.com/wei-meng/trackmeornot>
- DarunGrim.** Patch Analysis and Binary Diffing Tool. Contributor.  
<https://github.com/ohjeongwook/DarunGrim>
- ExploitShop.** 1-day vulnerability analysis project. Lead author.  
<https://exploitshop.wordpress.com>
- LocPriv.** Location Privacy with Location Semantics [16]. Lead author.  
<https://github.com/lifeasageek/locpriv>

## REPORTED SECURITY VULNERABILITIES (SELECTED LIST)

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- CVE-2016-7219: Windows Crypto Driver Information Disclosure Vulnerability (MS16-149)
- CVE-2016-0040: Windows Kernel Elevation of Privilege Vulnerability (MS16-014)
- CVE-2014-1594: Mozilla Firefox Bad casting from BasicThebesLayer to BasicContainerLayer
- WebKit Bug #120633: Partial Information Leakage in Hash Table Implementations (PrivateName)
- CVE-2013-2910: Mozilla Firefox Use-after-free when updating offline cache

CVE-2013-2910: Google Chrome Use-after-free in Web Audio  
CVE-2013-2917: Google Chrome Out of bounds read in Web Audio  
CVE-2013-2918: Google Chrome Use-after-free in DOM  
CVE-2013-2921: Google Chrome Use-after-free in resource loader  
CVE-2012-1139: BDF font overflow on Freetype2

## PUBLICATION

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### Conference Papers

- [1] **HexType: Efficient Detection of Type Confusion Errors for C++ (to appear).**  
Yuseok Jeon, Priyam Biswas, Scott Carr, Byoungyoung Lee, and Mathias Payer.  
In *Proceedings of the 24th ACM Conference on Computer and Communications Security (CCS)*, Dallas, Texas, October 2017.  
Acceptance rate: 18.1% (151 of 836).
- [2] **CAB-Fuzz: Practical Concolic Testing Techniques for COTS Operating Systems.**  
Su Yong Kim, Sangho Lee, Insu Yun, Wen Xu, Byoungyoung Lee, Youngtae Yun, and Taesoo Kim.  
In *Proceedings of the 2017 USENIX Annual Technical Conference (ATC)*, Santa Clara, CA, July 2017.  
Acceptance rate: 21.2% (60 of 283).
- [3] **SGX-Shield: Enabling Address Space Layout Randomization for SGX Programs.**  
Jaebaek Seo, Byoungyoung Lee, Sungmin Kim, Ming-Wei Shih, Insik Shin, Dongsu Han, and Taesoo Kim.  
In *Proceedings of the 2017 Network and Distributed System Security Symposium (NDSS)*, San Diego, CA, February 2017.  
Acceptance rate: 16.1% (68 of 423).
- [4] **Instant OS Updates via Userspace Checkpoint-and-Restart.**  
Sanidhya Kashyap, Changwoo Min, Byoungyoung Lee, Taesoo Kim, and Pavel Emelyanov.  
In *Proceedings of the 2016 USENIX Annual Technical Conference (ATC)*, Denver, CO, June 2016.  
Acceptance rate: 17.7% (47 of 266).
- [5] **HDFI: Hardware-assisted Data-Flow Isolation.**  
Chengyu Song, Hyungon Moon, Monjur Alam, Insu Yun, Byoungyoung Lee, Taesoo Kim, Wenke Lee, and Yunheung Paek.  
In *Proceedings of the 37th IEEE Symposium on Security and Privacy (Oakland)*, San Jose, CA, May 2016.  
Acceptance rate: 13.8% (55 of 400).
- [6] **TrackMeOrNot: Enabling Flexible Control on Web Tracking.**  
Wei Meng, Byoungyoung Lee, Xinyu Xing, and Wenke Lee.  
In *Proceedings of the 25th International Conference on World Wide Web (WWW)*, Montreal, Canada, April 2016.  
Acceptance rate: 15.8% (115 of 727).
- [7] **Enforcing Kernel Security Invariants with Data Flow Integrity.**  
Chengyu Song, Byoungyoung Lee, Kangjie Lu, William R. Harris, Taesoo Kim, and Wenke Lee.  
In *Proceedings of the 2016 Network and Distributed System Security Symposium (NDSS)*, San Diego, CA, February 2016.  
Acceptance rate: 15.4% (60 of 389).
- [8] **ASLR-Guard: Stopping Address Space Leakage for Code Reuse Attacks.**  
Kangjie Lu, Chengyu Song, Byoungyoung Lee, Simon P. Chung, Taesoo Kim, and Wenke Lee.  
In *Proceedings of the 22nd ACM Conference on Computer and Communications Security (CCS)*, Denver,

Colorado, October 2015.  
Acceptance rate: 19.9% (128 of 646).

- [9] **Cross-checking Semantic Correctness: The Case of Finding File System Bugs.**  
Changwoo Min, Sanidhya Kashyap, Byoungyoung Lee, Chengyu Song, and Taesoo Kim.  
In *Proceedings of the 25th ACM Symposium on Operating Systems Principles (SOSP)*, Monterey, CA, October 2015.  
Acceptance rate: 16.1% (30 of 186).
- [10] **Type Casting Verification: Stopping an Emerging Attack Vector.**  
Byoungyoung Lee, Chengyu Song, Taesoo Kim, and Wenke Lee.  
In *Proceedings of the 24th Usenix Security Symposium (Security)*, Washington, DC, August 2015.  
Acceptance rate: 15.7% (67 of 426).  
\* **Internet Defense Prize** by Facebook and USENIX,  
\* Top 10 Finalists by **CSAW Best Applied Research Paper Award**.
- [11] **Understanding Malvertising Through Ad-Injecting Browser Extensions.**  
Xinyu Xing, Wei Meng, Byoungyoung Lee, Udi Weinsberg, Anmol Sheth, Roberto Perdisci, and Wenke Lee.  
In *Proceedings of the 24th International Conference on World Wide Web (WWW)*, Florence, Italy, May 2015.  
Acceptance rate: 14.1% (131 of 929).
- [12] **Preventing Use-after-free with Dangling Pointers Nullification.**  
Byoungyoung Lee, Chengyu Song, Yeongjin Jang, Tielei Wang, Taesoo Kim, Long Lu, and Wenke Lee.  
In *Proceedings of the 2015 Network and Distributed System Security Symposium (NDSS)*, San Diego, CA, February 2015.  
Acceptance rate: 16.9% (51 of 302).  
\* Third place award by **CSAW Best Applied Research Paper Award**.
- [13] **Abusing Performance Optimization Weaknesses to Bypass ASLR.**  
Byoungyoung Lee, Yeongjin Jang, Tielei Wang, Chengyu Song, Long Lu, Taesoo Kim, and Wenke Lee.  
In *2014 BlackHat USA*, Las Vegas, NV, August 2014.
- [14] **Exploiting Unpatched iOS Vulnerabilities for Fun and Profit.**  
Yeongjin Jang, Tielei Wang, Byoungyoung Lee, and Billy Lau.  
In *2014 BlackHat USA*, Las Vegas, NV, August 2014.
- [15] **From Zygote to Morula: Fortifying weakened ASLR on Android.**  
Byoungyoung Lee, Long Lu, Tielei Wang, Taesoo Kim, and Wenke Lee.  
In *Proceedings of the 35th IEEE Symposium on Security and Privacy (Oakland)*, San Jose, CA, May 2014.  
Acceptance rate: 13.1% (44 of 334).
- [16] **Protecting Location Privacy Using Location Semantics.**  
Byoungyoung Lee, Jinoh Oh, Hwanjo Yu, and Jong Kim.  
In *Proceedings of the 17th ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD)*, San Diego, CA, August 2011.  
Acceptance rate: 17.6% (126 of 714).
- [17] **binOb+: A Framework for Potent and Stealthy Binary Obfuscation.**  
Byoungyoung Lee, Yuna Kim, and Jong Kim.  
In *Proceedings of the 5th ACM Symposium on Information, Computer and Communications Security (ASIACCS)*, Beijing, China, April 2010.  
Acceptance rate: 15.1% (25 of 166).

## Journal Papers

- [18] **Toward Engineering a Secure Android Ecosystem: A Survey of Existing Techniques.**  
Meng Xu, Chengyu Song, Yang ji, Ming-Wei Shih, Kangjie Lu, Cong Zheng, Ruian Duan, Yeongjin Jang, Byoungyoung Lee, Chenxiong Qian, Sangho Lee, and Taesoo Kim.  
In *ACM Computing Surveys (CSUR)*, 49(2), August 2016.

## INVITED TALKS

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### **Toward Secure Trusted Computing**

Seoul National University. Seoul, South Korea. Jan 2017

KAIST. Daejeon, South Korea. Dec 2016

### **Protecting Computer Systems through Eliminating or Analyzing Vulnerabilities**

Rice University. Houston, TX. 2016

University of Georgia, Athens, GA. 2016

Arizona State University. Tempe, AZ. 2016

University of Massachusetts, Amherst. Amherst, MA. 2016

Purdue University. West Lafayette, IN. 2016

University of California, Riverside. Riverside, CA. 2016

Georgia Institute of Technology. Atlanta, GA. 2016

### **Abusing Performance Optimization Weaknesses to Bypass ASLR**

KAIST. Daejeon, South Korea. 2014

Seoul National University. Seoul, South Korea. 2014

POSTECH. Pohang, South Korea. 2014

### **Detect Bad-Casting at Runtime with Undefined Behavior Sanitizer**

Google. Mountain View, CA. 2014

### **Identifying Memory Corruption Bugs with Compiler Instrumentation**

National Intelligence Service. Daejeon, South Korea. 2014

National Security Research Institute. Seoul, South Korea. 2014

Power of Community (POC). Seoul, South Korea. 2014

Samsung Electronics. Suwon, South Korea. 2014

### **Mapping Dynamic Data for User-mode Crash Dump Analysis**

Microsoft Research. Redmond, WA. 2011

## TEACHING

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Secure and Trusted Systems (CS 59000), Purdue University, Spring 2017

Software Security (CS 52700), Purdue University, Fall 2016

## PROFESSIONAL ACTIVITIES

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### **Program committee**

ACM Conference on Computer and Communications Security (CCS), 2017

Engineering Secure Software and Systems (ESSoS), 2017

ACM Conference on Computer and Communications Security (CCS), Posters and demo, 2016

### **Reviewer**

ACM Transactions on Privacy and Security (TOPS)

IEEE Transactions on Dependable and Secure Computing (TDSC)

IEEE Transactions on Information Forensics and Security (TIFS)

IEEE European Symposium on Security and Privacy (EuroS&P), 2016

Network and Distributed System Security Symposium (NDSS), 2015 – 2016

USENIX Security Symposium (Security), 2015

ACM Conference on Computer and Communications Security (CCS), 2014 – 2015

European Symposium on Research in Computer Security (ESORICS), 2014 – 2015

IEEE/IFIP International Conference on Dependable Systems and Networks (DSN), 2012

### **Others**

Cyber Security Awareness Week (CSAW) Applied Research Competition, Preliminary Judges, 2016

WCTF Belluminar Beijing, Judges, 2016

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