

## Earlence T. Fernandes

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CONTACT INFORMATION	CSE 358 Paul Allen Center 185 E Stevens Way NE Seattle, WA 98109, USA	(734) 709-4334 earlence@cs.washington.edu earlence.com
RESEARCH INTERESTS	Cyber-Physical Systems/IoT Security (Smart Homes), Adversarial Machine Learning, Operating Systems Security (Mobile Systems), Entity Extraction Algorithms.	
EDUCATION	<b>University of Michigan</b> , Ann Arbor, MI Ph.D., Computer Science and Engineering, April 2017 <ul style="list-style-type: none"><li>• Advisor: Prof. Atul Prakash</li><li>• Committee: Prof. Z. Morley Mao, Prof. J. Alex Halderman, Prof. Florian Schaub</li><li>• Thesis: Securing Personal IoT Platforms Through Systematic Analysis and Design</li></ul> M.S.E., Computer Science and Engineering, May 2014  <b>University of Pune</b> , India B.E. (Bachelor of Engineering, Computer Engineering), 9 <sup>th</sup> rank out of ~2000 students, June 2009	
RESEARCH EXPERIENCE	<b>University of Washington</b> , Seattle, WA <i>Research Associate with Prof. Tadayoshi Kohno</i> IoT/CPS security research.	<b>June 2017 - present</b>
	<b>University of Michigan</b> , Ann Arbor, MI <i>Graduate Student with Prof. Atul Prakash</i> Security analysis and design of IoT programming frameworks, API design for constructing privacy-respecting IoT apps, Mobile systems security.	<b>Aug 2012 - May 2017</b>
	<b>Microsoft Research</b> , Redmond, WA <i>Research Intern with Jaeyeon Jung</i> Security analyses of IoT programming frameworks.	<b>May 2015 - Aug 2015, May 2016 - Aug 2016</b>
	<i>Research Intern with Oriana Riva and Suman Nath</i> Behavioral Analytics for Android and Windows Phone apps.	<b>May 2014 - Aug 2014</b>
	<b>Vrije Universiteit</b> , Amsterdam, The Netherlands <i>Scientific Programmer with Prof. Bruno Crispo and Prof. Mauro Conti</i> Member of the S-Mobile project on Android security – Contextual access control, Lightweight virtualization to support Bring-Your-Own-Device use cases.	<b>Oct 2010 - June 2012</b>
CONFERENCE & WORKSHOP PAPERS	<ol style="list-style-type: none"><li>1. Decentralized Action Integrity for Trigger-Action IoT Platforms. <b>Earlence Fernandes</b>, Amir Rahmati, Jaeyeon Jung, Atul Prakash. <i>22nd Network and Distributed Security Symposium, (NDSS 2018)</i>, San Diego, CA, February 2018.</li><li>2. Robust Physical-World Attacks on Deep Learning Models. Ivan Evtimov, Kevin Eykholt, Earlence Fernandes, Tadayoshi Kohno, Bo Li, Atul Prakash, Amir Rahmati, Dawn Song (alphabetical order). arXiv Preprint July 2017 (arXiv:1707.08945).</li><li>3. Securing Trigger-Action Platforms. <b>Earlence Fernandes</b>, Amir Rahmati, Jaeyeon Jung, Atul Prakash. <i>2017 USENIX Summit on Hot Topics in Security, (HotSec 2017)</i>, Vancouver, BC, August 2017 (arXiv:1707.00405).</li></ol>	

4. Support for Security and Safety of Programmable IoT Systems.  
Alex Gyori, **Earlence Fernandes**, Amir Rahmati, Atul Prakash, Darko Marinov. *ISSTA 2017 Workshop on Testing Embedded and Cyber-Physical Systems*, (TECPS 2017), Santa Barbara, CA, July 2017.
5. Heimdall: A Privacy-Respecting Implicit Preference Collection Framework.  
Amir Rahmati, **Earlence Fernandes**, Kevin Eykholt, Xinheng Chen, Atul Prakash. *15th ACM International Conference on Mobile Systems, Applications, and Services*, (MobiSys 2017), Niagara Falls, NY, June 2017, Acceptance Rate: 18%.
6. ContextIoT: Towards Providing Contextual Integrity to Appified IoT Platforms.  
Yunhan Jack Jia, Qi Alfred Chen, Shiqi Wang, Amir Rahmati, **Earlence Fernandes**, Z. Morley Mao, Atul Prakash. *21st Network and Distributed Security Symposium*, (NDSS 2017), San Diego, CA, Feb 2017, Acceptance Rate: 16%.
7. Applying the Opacified Computation Model to Enforce Information Flow Policies in IoT Applications.  
Amir Rahmati, **Earlence Fernandes**, and Atul Prakash. *1st IEEE Cybersecurity Development Conference*, (SecDev 2016), Boston, MA, Nov 2016, Acceptance Rate: 38.6%.
8. Appstract: On-The-Fly App Content Semantics With Better Privacy.  
**Earlence Fernandes**, Oriana Riva, and Suman Nath. *22nd Annual Intl. Conf. on Mobile Computing and Networking*, (MobiCom 2016), New York, NY, Oct 2016, Acceptance Rate: 14%.
9. FlowFence: Practical Data Protection for Emerging IoT Application Frameworks.  
**Earlence Fernandes**, Justin Paupore, Amir Rahmati, Daniel Simionato, Mauro Conti, Atul Prakash. *25th USENIX Security Symposium*, (USENIX Sec 2016), Austin, TX, Aug 2016, Acceptance Rate: 15.4%.
10. Security Analysis of Emerging Smart Home Applications.  
**Earlence Fernandes**, Jaeyeon Jung, Atul Prakash. *37th IEEE Symposium on Security and Privacy*, (S&P 2016), San Jose, CA, May 2016, Acceptance Rate: 13.3%.  
**Distinguished Practical Paper Award.**
11. Android UI Deception Revisited: Attacks and Defenses.  
**Earlence Fernandes**, Qi Chen, Justin Paupore, Georg Essl, J. Alex Halderman, Z. Morley Mao, Atul Prakash. *20th Intl. Conf. on Financial Cryptography and Data Security*, (FC 2016), Barbados, February 2016, Acceptance Rate: 26%.
12. Decomposable Trust for Android Applications.  
**Earlence Fernandes**, Ajit Aluri, Alexander Crowell, Atul Prakash. *45th Annual IEEE/IFIP Intl. Conf. on Dependable Systems and Networks*, (DSN 2015), Rio de Janeiro, Brazil, June 2015, Acceptance Rate: 21.8%.
13. My OS ought to know me better: In-app Behavioral Analytics as an OS service.  
**Earlence Fernandes**, Oriana Riva, Suman Nath. *15th Workshop on Hot Topics in Operating Systems*, (HotOS XV), Kartause Ittingen, Switzerland, May 2015, Acceptance Rate: 31.8%.
14. Practical Always-On Taint Tracking on Mobile Devices.  
Justin Paupore, **Earlence Fernandes**, Sankardas Roy, Xinming Ou, Atul Prakash. *15th Workshop on Hot Topics in Operating Systems*, (HotOS XV), Kartause Ittingen, Switzerland, May 2015, Acceptance Rate: 31.8%.
15. OASIS: Operational Access Sandboxes for Information Security.  
Mauro Conti, **Earlence Fernandes**, Justin Paupore, Atul Prakash, Daniel Simionato. (alphabetical order) *4th ACM CCS Workshop on Security and Privacy in Smartphones and Mobile Devices*, (SPSM 2014), Scottsdale, AZ, Nov 2014.
16. Beyond Instruction Level Taint Propagation.  
Beng Heng Ng, **Earlence Fernandes**, Ajit Aluri, David Velazquez, James Yang, Atul Prakash.

6th ACM European Workshop on Systems Security, (**EuroSec 2013**), Prague, Czech Republic, Apr 2013.

17. MOSES: Supporting Operation Modes on Smartphones.  
Giovanni Russello, Mauro Conti, Bruno Crispo, **Earlence Fernandes**. *17th ACM Symposium on Access Control Models and Technologies*, (**SACMAT 2012**), Newark, NJ, Jun 2012, Acceptance Rate: 26%.
18. YAASE: Yet Another Android Security Extension.  
Giovanni Russello, Bruno Crispo, **Earlence Fernandes**, Yury Zhauniarovich. *3rd IEEE Intl. Conf. on Privacy, Security, Risk and Trust*, (**PASSAT 2011**), Boston, MA, Oct 2011.

JOURNALS/COLUMNS  
/PREPRINTS

1. IFTTT vs. Zapier: A Comparative Study of Trigger-Action Programming Frameworks.  
Amir Rahmati, **Earlence Fernandes**, Kevin Eykholt, Atul Prakash. arXiv Preprint Sep 2017 (arXiv:1709.02788).
2. Internet of Things Security Research: A Rehash of Old Ideas or New Intellectual Challenges?  
**Earlence Fernandes**, Amir Rahmati, Kevin Eykholt, Atul Prakash. *IEEE Security and Privacy: Systems Attacks and Defenses*, (**S&P Magazine 2017**), (arXiv:1705.08522)
3. The Security Implications of Permission Models in Smart Home Application Frameworks.  
**Earlence Fernandes**, Amir Rahmati, Jaeyeon Jung, Atul Prakash. *IEEE Security and Privacy Volume 15 Issue 2*, (**S&P Magazine 2017**).
4. MOSES: Supporting and Enforcing Security Profiles on Smartphones.  
Yury Zhauniarovich, Giovanni Russello, Mauro Conti, Bruno Crispo, **Earlence Fernandes**. *IEEE Transactions on Dependable and Secure Computing*, (**TDSC 2014**).
5. FM 99.9 Radio Virus: Exploiting FM Radio Broadcasts for Malware Deployment.  
**Earlence Fernandes**, Bruno Crispo, Mauro Conti. *IEEE Transactions on Information Forensics and Security*, (**TIFS 2013**).
6. CRePE: A system for enforcing fine-grained Context-related Policies on Android.  
Mauro Conti, Bruno Crispo, **Earlence Fernandes**, Yury Zhauniarovich. *IEEE Transactions on Information Forensics and Security*, (**TIFS 2012**).

BOOKS

1. Instant Android Systems Development, **Earlence Fernandes**, *Packt Publishers, UK, 2013*.

PATENTS

- A Framework For Privacy-Respecting Implicit Data Collection.  
Atul Prakash, Amir Rahmati, **Earlence Fernandes**, Kevin Eykholt. *U.S. Patent Filing Reel 043410/0797*
- System and Method for Extracting and Sharing Application-Related User Data.  
Oriana Riva, Suman Nath, Doug Burger, **Earlence Fernandes**. *U.S. Patent 14/734,991*
- De-siloing Applications for Personalization and Task Completion Services.  
Oriana Riva, Suman Nath, Doug Burger, **Earlence Fernandes**. *U.S. Patent 14/618,854*

MISCELLANY

- tr- Per-App Profiles with AppFork: The Security of Two Phones with the Convenience of One.  
Temitope Oluwafemi, **Earlence Fernandes**, Oriana Riva, Franziska Roesner, Suman Nath, Tadayoshi Kohno. *Microsoft Research Technical Report, MSR-TR-2014-153, December 2014*.
- tr- TIVOS: Trusted Visual I/O Paths for Android.  
**Earlence Fernandes**, Qi Alfred Chen, Justin Paupore, Georg Essl, J. Alex Halderman, Z. Morley Mao, Atul Prakash. *University of Michigan, Technical Report CSE-TR-586-14*.
- invited- The confinement problem: 40 years later.  
Alexander Crowell, Beng Heng Ng, **Earlence Fernandes**, Atul Prakash. *JIPS 9, 2013*.
- poster- Anception: Hybrid Virtualization for Android Applications.  
**Earlence Fernandes**, Ajit Aluri, Alexander Crowell, Atul Prakash. *USENIX Security, 2013*.

poster- Demonstrating the effectiveness of MOSES for separation of execution modes.  
Giovanni Russello, Mauro Conti, Bruno Crispo, **Earlence Fernandes**, Yury Zhauniarovich.  
*ACM CCS, 2012.*

#### HONORS AND AWARDS

- IEEE S&P 2016 Distinguished Practical Paper Award.
- U.S. Qualcomm Innovation Fellowship Finalist (with Alex Gyori of UIUC).
- Travel Grants: USENIX Security 2013 Google Travel Grant, IEEE DSN 2015, Rackham Travel Grant (2015-2016), FC 2016, IEEE S&P 2016, MobiCom 2016, IEEE SECDEV 2016.
- UMich PhD Fellowship 2012.

#### INVITED TALKS

- “Computer Security and Privacy for the Physical World,” Nov 2017 **Keynote** at IoT Security and Privacy Workshop co-located with CCS 2017, and Sep 2017 invited talk at University of California Berkeley, USA (Host: Prof. Dawn Song).
- “Robust Physical-World Attacks on Deep Learning Models,” Sep 2017, Stanford University, USA.
- “IoT Security: What, Why, and How,” May 2017, IEEE Mobile Security Technologies (MoST) workshop affiliated with IEEE S&P 2017, San Jose, CA, USA.
- “Securing IoT Platforms through Systematic Analysis and Design,” Nov 2016, University of Illinois at Urbana-Champaign, USA (Host: Prof. Darko Marinov).
- “Modern Cyber-Physical Systems Security: Attacks and Defenses,” Aug 2016, University of Washington, Seattle, USA (Host: Prof. Yoshi Kohno).
- “FlowFence: Practical Data Protection for Emerging IoT Application Frameworks,” Aug 2016, Microsoft Research, Redmond, USA.
- “Security Analysis of Emerging Smart Home Applications,” May 2016, CMU Silicon Valley, USA (Host: Prof. Patrick Tague).
- “Towards a Safer IoE: Detecting and Correcting Abnormal Interactions between Things in Smart Homes,” Mar 2016, University of Illinois at Urbana-Champaign, and Qualcomm Research, San Diego, USA.
- “SmartThings Security Analysis,” Aug 2015, Microsoft Research, Redmond, USA.
- “Appstract: On-device behavioral analytics,” Aug 2014, Microsoft Research, Redmond, USA.
- “Trusted Visual I/O Paths,” Aug 2014, Microsoft Research, Redmond, USA.

#### ACADEMIC SERVICE

- PC Member for: USENIX Security 2018, Machine Learning and Computer Security Workshop 2017 (co-located with NIPS 2017), IoT S&P 2017 (co-located with CCS 2017), SafeThings 2017 (co-located with SenSys 2017), SecureComm 2017, IEEE MoST 2017 (co-located with S&P 2017), IEEE Security and Privacy (S&P) 2017 Shadow Committee, SecCPS Workshop 2017 (co-located with IEEE HASE 2017), SEMS 2017 (co-located with Euro S&P 2017), ICISS 2014-2016.
- External Reviewer for: USENIX Security 2017, ACM WiSec 2017, IEEE Transactions on Mobile Computing 2017, CHI 2017, NDSS 2017, IEEE DSN 2016, DIMVA 2015, IEEE Transactions on Computers 2013.
- Publicity Co-Chair: Workshop on Security for Embedded and Mobile Systems (SEMS; co-located with EuroSP 2017).
- Panelist: Security at University of Michigan IT (SUMIT) conference 2016.

#### MENTORING EXPERIENCE

- Jeremy Workman, Purdue University (Fort Wayne Campus), Bachelor Thesis Technical Advisor (“Implementation of Mobile VoIP using Wireless Broadband,” Main Advisors: Paul Lin and Gary Steffen).
- Zhi Qian Seah, University of Michigan, Bachelor Thesis Technical Advisor (“Partitioning the Android System Services,” Main Advisor: Atul Prakash).

#### TEACHING EXPERIENCE

- Primary Instructor for EECS 588 (at Michigan): Graduate course in Computer and Network Security.

PRESS COVERAGE Much of my work has been covered in the media: Wired, Schneier on Security, The Verge, Gizmodo, Ars Technica, CNET, Mashable, Detroit Free Press, ZDNet, Yahoo News, Reddit, Popular Mechanics, and the International Business Times. For more details, please visit: <https://iotsecurity.eecs.umich.edu>