Aravind Machiry

Affiliation Assistant Professor, Department of Electrical and Computer Engineering, Purdue University.

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Research Interests My research focuses on various aspects of system security, such as vulnerability detection, mobile security, trusted execution environments, static and dynamic analysis of source code, and binaries. I am also interested in developing novel static/dynamic program analysis techniques for system security problems. My research resulted in various Open-source security tools and several Common Vulnerability Exposures (CVEs) in critical system software such as kernel drivers and bootloaders.

Positions & Education

Assistant Professor (PurS3 Lab) Jan 2021-Present
Department of Electrical and Computer Engineering
Purdue University, West Lafayette, USA

Postdoctoral Researcher Aug 2020-Dec 2020
University of Pennsylvania, Philadelphia, PA, USA
Advisor: Mayur Naik

Ph.D in Computer Science Sep 2014- Aug 2020
University of California, Santa Barbara, USA
Advisors: Christopher Kruegel and Giovanni Vigna
Thesis: Securing smart devices from the bottom-up
Supported by:
Symantec Research Labs Graduate Fellowship
UCSB Graduate Division Dissertation Fellowship

Visiting Researcher Jul 2019-Sep 2019
University of Maryland, College Park, USA
Advisor: Micheal Hicks
Project: Automatically converting legacy code to Checked C

Research Intern Jul 2018-Sep 2018
Symantec Research Labs (SRL), LA, USA
Advisor: Daniel Marino
Project: Interactive static vulnerability detection

Graduate Research Assistant Sep 2014-Present
University of California, Santa Barbara, USA
Advisors: Giovanni Vigna, and Christopher Kruegel

Software Security Engineer 2013-2014
Qualcomm, R&D, USA
Project: Static type checkers to find multiple address space vulnerabilities

M.S in Information Security 2011-2013
Georgia Institute of Technology, Atlanta, USA
Advisor: Mayur Naik
Thesis: Dynodroid: Automated testing of Smartphone Apps

Publications

[37] J. Majors, E. Barsallo Yi, A. Maji, D. Wu, S. Bagchi, **Aravind Machiry**. "Security Properties of Virtual Remotes and SPOOKing their violations." *Proceedings of the ACM ASIA Conference on Computer and Communications Security (**AsiaCCS**)*, **2023**

[36] M. Busch, M. Payer, **Aravind Machiry**, C. Kruegel, G. Vigna, C. Spensky. "TEEzz: Fuzzing Trusted Applications on COTS Android Devices." *Proceedings of the 44nd IEEE Symposium on Security and Privacy*

*(**S&P**)*, **2023**

[35] V. Singhal, A. Pillai, C. Saumya, M. Kulkarni, **Aravind Machiry**. "Cornucopia: A Framework for Feedback Guided Generation of Binaries." *Proceedings of the 37th ACM International Conference on Automated Software Engineering (**ASE**)*, **2022**

[34] I. Koishybayev, A. Nahapetyan, R. Zachariah, S. Muralee, B. Reaves, A. Kapravelos, **Aravind Machiry**. "Characterizing the Security of Github CI Workflows." *Proceedings of the 31st USENIX Security Symposium (**USENIX Security**)*, **2022**

[33] D. Das, P. Bose, **Aravind Machiry**, S. Mariani, Y. Shoshitaishvili, C. Kruegel and G. Vigna. "Hybrid Pruning: Towards A Precise Static Analysis." *Proceedings of the 16th International Conference on Detection of Intrusions and Malware, and Vulnerability Assessment (**DIMVA**)*, **2022**

[32] P. Pashakhanloo, **Aravind Machiry**, H. Choi, A. Canino, K. Heo, I. Lee, M. Naik. "PacJam: Securing Dependencies Continuously via Package-Oriented Debloating." *Proceedings of the ACM ASIA Conference on Computer and Communications Security (**AsiaCCS**)*, **2022**

[31] **Aravind Machiry**, J. Kastner, M. McCutchen, A. Eline, K. Headley, M. Hicks. "C to Checked C by 3C." *Proceedings of the Object-oriented Programming, Systems, Languages, and Applications (**OOPSLA**)*, **2022**. Won **Distinguished Paper Award**.

[30] D. Quarta, M. Ianni, **Aravind Machiry**, Y. Fratantonio, E. Gustafson, D. Balzarotti, M. Lindorfer, C. Kruegel, and G. Vigna. "Tarnhelm: Isolated, Transparent and Confidential Execution of Arbitrary Code in ARM's TrustZone." *Proceedings of the ACM Workshop on Research on Offensive and Defensive Techniques in the Context of Man At The End Attacks (**CheckMate**)*, **2021**

[29] C. Garg, **Aravind Machiry**, A. Continella, C. Kruegel, and G. Vigna. "Toward a Secure Crowdsourced Location Tracking System." *Proceedings of the ACM Conference on Security and Privacy in Wireless and Mobile Networks (**WiSec**)*, **2021**

[28] Z. Li, **Aravind Machiry**, B. Chen, M. Naik, K. Wang, and L. Song. "ARBITRAR: User-Guided API Misuse Detection." *Proceedings of the 42nd IEEE Symposium on Security and Privacy (**S&P**)*, **2021**

[27] C. Spensky, **Aravind Machiry**, N. Burow, H. Okhravi, R. Housley, Z. Gu, H. Jamjoom, C. Kruegel, and G. Vigna. "Glitching Demystified: Analyzing Control-flow-based Glitching Attacks and Defenses." *Proceedings of the 51st International Conference on Dependable Systems and Networks (**DSN**)*, **2021**

[26] N. Redini, A. Continella, D. Das, G.De Pasquale, N. Spahn, **Aravind Machiry**, A. Bianchi, C. Kruegel, and G. Vigna. "DIANE: Identifying Fuzzing Triggers in Apps to Generate Under-constrained Inputs for IoT Devices." *Proceedings of the 42nd IEEE Symposium on Security and Privacy (**S&P**)*, **2021**

[25] D. Meng, M. Guerriero, **Aravind Machiry**, H. Aghakhani, P. Bose, A. Continella, C. Kruegel and G. Vigna. "Bran: Reduce Vulnerability Search Space in Large Open Source Repositories by Learning Bug Symptoms." *Proceedings of the ACM ASIA Conference on Computer and Communications Security (**AsiaCCS**)*, **2021**

[24] C. Spensky, **Aravind Machiry**, N. Redini, C. Unger, G. Foster, E. Balsband, H. Okhravi, C. Kruegel and G. Vigna. "Conware: Automated Modeling of Hardware Peripherals." *Proceedings of the ACM ASIA Conference on Computer and Communications Security (**AsiaCCS**)*, **2021**

[23] C. Salls, **Aravind Machiry**, A. Doupe, Y. Shoshitaishvili, C. Kruegel, and G. Vigna. "Exploring Abstraction Functions in Fuzzing." *Proceedings of the 2020 IEEE Conference on Communications and Network Security (**CNS**)*, **2020**

[22] C. Spensky, **Aravind Machiry**, M. Busch, K. Leach, R. Housley, C. Kruegel, and G. Vigna. "TRUST.IO: Protecting Physical Interfaces on Cyber-physical Systems." *Proceedings of the 2020 IEEE Conference on Communications and Network Security (**CNS**)*, **2020**

[21] **Aravind Machiry**, N. Redini, E. Cammellini, C. Kruegel and G. Vigna. "SPIDER: Enabling Fast Patch Propagation in Related Software Repositories." *Proceedings of the 41st IEEE Symposium on Security and Privacy (**S&P**)*, **2020**

[20] N. Redini, **Aravind Machiry**, R. Wang, C. Spensky, A. Continella Y. Shoshitaishvili, C. Kruegel and G. Vigna. "KARONTE: Detecting Insecure Multi-binary Interactions in Embedded Firmware." *Proceedings of the 41st IEEE Symposium on Security and Privacy (**S&P**)*, **2020**

[19] **Aravind Machiry**, H. Touma, R. Chen, M. Hicks. "(POSTER) Automated conversion of legacy code to Checked C." *Proceedings of the IEEE Secure Development Conference (**SecDev**)*, **2019**

[18] E. Gustafson, M. Muench, C. Spensky, N. Redini, **Aravind Machiry**, Y. Fratantonio, D. Balzarotti, A. Francillon, Y. E. Choe, C. Kruegel, G. Vigna. "Toward the Analysis of Embedded Firmware through Automated Re-hosting." *Proceedings of the 22nd International Symposium on Research in Attacks, Intrusions and Defenses (**RAID**)*, **2019**

[17] N. Redini, R. Wang, **Aravind Machiry**, Y. Shoshitaishvili, C. Kruegel and G. Vigna. "BinTrimmer: Towards Static Binary Debloating Through Abstract Interpretation." *Proceedings of the 16th International Conference on Detection of Intrusions and Malware, and Vulnerability Assessment (**DIMVA**)*, **2019**

[16] **Aravind Machiry**, N. Redini, E. Gustafson, H. Aghakhani, C. Kruegel and G. Vigna. "Detecting Deceptive Reviews using Generative Adversarial Networks." *Proceedings of the 2nd Binary Analysis Research Workshop (**BAR**)*, **2019**.

[15] **Aravind Machiry**, N. Redini, E. Gustafson, Y. Fratantonio, Y. E. Choe, C. Kruegel and G. Vigna. "Using Loops For Malware Classification Resilient to Feature-unaware Perturbations." *Proceedings of the 34th Annual Application Security Application Conference (**ACSAC**)*, **2018**

[14] H. Aghakhani, **Aravind Machiry**, S. Nilizadeh, C. Kruegel and G. Vigna. "Detecting Deceptive Reviews using Generative Adversarial Networks." *Proceedings of the 1st Deep Learning and Security Workshop (**DLS**)*, **2018**.

[13] A. Bianchi, Y. Fratantonio, **Aravind Machiry**, C. Kruegel, G. Vigna, S. Chung, W. Lee. "Broken Fingers: On the Usage of the Fingerprint API in Android." *Proceedings of the ISOC Network and Distributed System Security Symposium (**NDSS**)*, **2018**.

[12] A. Bianchi, K. Borgolte, J. Corbetta, F. Disperati, A. Dutcher, J. Grosen, P. Grosen, **Aravind Machiry**, C. Salls, N. Stephens, G. Vigna, R. Wang (Authors listed alphabetically). "Mechanical Phish: Resilient Autonomous Hacking." *IEEE Security & Privacy Magazine - **SPSI: Hacking without Humans 2018***.

[11] N. Redini, **Aravind Machiry**, D. Das, Y. Fratantonio, A. Bianchi, E. Gustafson, Y. Shoshitaishvili, C. Kruegel, G. Vigna. "BootStomp: On the Security of Bootloaders in Mobile Devices." *Chaos Communication Congress (**34C3**)*, **2017**.

[10] J. Corina, **Aravind Machiry**, C. Salls, Y. Shoshitaishvili, Shuang Hao, C. Kruegel, and G. Vigna. "DIFUZZING Android Kernel Drivers." *Black Hat Europe London, UK December (**BH EU**)*, **2017**.

[9] J. Corina, **Aravind Machiry**, C. Salls, Y. Shoshitaishvili, Shuang Hao, C. Kruegel, and G. Vigna. "DIFUZE: Interface Aware Fuzzing for Kernel Drivers." *Proceedings of the 24th ACM Conference on Computer and Communications Security (**CCS**)*, **2017**. Finalist for **CSAW Applied Research Competition**.

[8] **Aravind Machiry**, C. Spensky, J. Corina, N. Stephens, C. Kruegel, G. Vigna. "DR.CHECKER: A Soundy Analysis for Linux Kernel Drivers." *Proceedings of the 26th USENIX Security Symposium (**USENIX Security**)*, **2017**. Runner up for **Facebook Internet Defense Prize**

[7] N. Redini, **Aravind Machiry**, D. Das, Y. Fratantonio, A. Bianchi, E. Gustafson, Y. Shoshitaishvili, C. Kruegel, G. Vigna. "BootStomp: On the Security of Bootloaders in Mobile Devices." *Proceedings of the 26th USENIX Security Symposium (**USENIX Security**)*, **2017**.

[6] **Aravind Machiry**, E. Gustafson, C. Spensky, C. Salls, N. D. Stephens, R. Wang, A. Bianchi, Y. E. Choe, C. Kruegel, G. Vigna. "BOOMERANG: Exploiting the Semantic Gap in Trusted Execution Environments." *Proceedings of the ISOC Network and Distributed System Security Symposium (**NDSS**)*, **2017**.

[5] R. Wang, Y. Shoshitaishvili, A. Bianchi, **Aravind Machiry**, J. Grosen, P. Grosen, C. Kruegel, G. Vigna. "Ramblr: Making Reassembly Great Again." *Proceedings of the ISOC Network and Distributed System Security Symposium (**NDSS**)*, **2017**. Won **Distinguished Paper Award**.

[4] A. Bianchi, K. Borgolte, J. Corbetta, F. Disperati, A. Dutcher, J. Grosen, P. Grosen, **Aravind Machiry**, C. Salls, N. Stephens, G. Vigna, R. Wang (Authors listed alphabetically). "Cyber Grand Shellphish." ***Phrack***, **2017**.

[3] Y. Fratantonio, **Aravind Machiry**, A. Bianchi, C. Kruegel, G. Vigna. "CLAPP: Characterizing Loops in Android Applications." *Proceedings of the ACM Symposium on Foundations of Software Engineering (**FSE**)*, **2015**.

[2] Y. Fratantonio, **Aravind Machiry**, A. Bianchi, C. Kruegel, G. Vigna. "CLAPP: Characterizing Loops in Android Applications (Invited Talk)." *Proceedings of the International Workshop on Software Development Lifecycle for Mobile (**DeMobile**)*, **2015**.

[1] **Aravind Machiry**, R. Tahiliani, M. Naik. "Dynodroid: An Input Generation System for Android Apps." *Proceedings of the ACM Symposium on Foundations of Software Engineering (**FSE**)*, **2013**. Won **Distinguished Artifact Award**.

Talks

- Unleashing D on Android Kernel Drivers — Nullcon 2018
- Piston: Uncooperative Remote Runtime Patching — ACSAC 2018
- Cyber Grand Shellphish — DEFCON, USA, 2016
- Million Dollar Baby: Towards ANGRly conquering DARPA CGC — Nullcon 2016

Honors & Awards

- **Distinguished Paper Award** for 3c — OOPSLA 2022
- **CS Outstanding Dissertation Award** — UCSB 2020
- **CSAW Applied Research** Finalist for DIFUZE — CSAW 2017
- **Internet Defense Prize** Runner up for DR.CHECKER — USENIX Security 2017
- **Distinguished Paper Award** for Ramblr — NDSS 2017
- **Best Paper Award Award** for CLAPP — Grad Workshop 2016
- **Distinguished Artifact Award** for Dynodroid — FSE 2013
- **College of Computing MS Research award** — 2013

Professional Activities

Conferences

- Program Chair — BAR, ISOC NDSS 2023, 2022
- Program Committee Member — EuroSec 2023, 2022
- Program Committee Member — RAID 2022
- Program Committee Member — ACM MIDDLEWARE 2022
- Program Committee Member — IEEE DSC 2022
- Program Committee Member — ACM AsiaCCS 2023, 2022
- Reviewer — BAR, NDSS 2018
- Program Committee Member, Shadow PC — S&P 2018
- External Reviewer — USENIX 2017
- External Reviewer — NDSS 2016

Journals

- Reviewer, Artificial Intelligence Review — 2018
- Reviewer, Journal of Information Security and Applications — 2018
- Reviewer, Journal of Information and Software Technology — 2017

Teaching

ECE 46900 - Operating Systems Engineering, Purdue University — Sp'2022, Sp'2021
ECE 69500 - Holistic Software Security, Purdue University — Fa'2022, Fa'2021

References

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Giovanni Vigna
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Michael Hicks
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Antonio Bianchi
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Yan Shoshitaishvili
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