

FLAVIO TOFFALINI

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My research interest covers many aspects of system security. My Ph.D. background focuses on software security for Trusted Execution Environment.

CURRENT POSITION: ASSISTANT PROFESSOR

Ruhr-Universität Bochum (RUB), Germany
Assistant Professor in Automated Security Analysis

Sep 2024 to Now

FORMER POSITION

École Polytechnique Fédérale de Lausanne (EPFL), Switzerland
PostDoc, supervised by Prof. Mathias Payer
Topic: fuzzing, mitigation, software analysis

Nov 2021 – Aug 2024

EDUCATION

Singapore University of Technology and Design, Singapore
Ph.D., supervisor Prof. Jianying Zhou
Topic: trusted computing, system security
Thesis Title: Challenges, threats, and novel defenses for Trusted Execution Environments

Jan 2017 - Sep 2021

University of Verona, Italy
M.S. in Computer Science and Engineering 108/110, GPA 3,9/4
Supervisor Prof. Damiano Carra
Master thesis topic: Google dorks, Web security

Sep 2012 - Oct 2015

University of Pavia, Italy
B.S. in Computer Engineer 101/110, GPA 3,67/4
Supervisor Prof. Paolo Gamba

Sep 2006 - Dec 2009

ACADEMIC ACTIVITIES

King's College London
Visiting fellow, supervised by Prof. Lorenzo Cavallaro
Topic: trusted computing, system security

*Nov 2019 - Mar 2020
London, UK*

University of Padua
Visiting fellow, supervised by Prof. Mauro Conti
Topic: trusted computing, system security

*Jan 2018 - Aug 2018
Padua, Italy*

University of Verona
Research Assistant, supervised by Prof. Fausto Spoto
Topic: static analysis of Android applications

*Dec 2015 - July 2016
Verona, Italy*

Eurecom
Visiting fellow, supervised by Prof. Davide Balzarotti
Topic: Google dorks, Web security

*April 2015 - July 2015
Biot, France*

TEACHING ACTIVITIES

“Advanced Automatic Testing” (Master Course, Main Instructor) at Ruhr-Universität Bochum, 48 hours

“Seminar in Advanced Automatic Testing” (Master/Bachelor Seminar, Main Instructor) at Ruhr-Universität Bochum, 48 hours

SUPERVISION

PhDs: Currently 1, 2 co-supervised during Post-Doctoral

MSc: Currently 3, 3 successfully completed

BSc: 3 successfully completed

Interns: Currently 1, 1 successfully completed

RESEARCH GRANTS

“Advancing Cybersecurity Through Semantic Bugs in Interpreted Programming Languages” (PI) funded by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) under Germany’s Excellence Strategy - EXC 2092 CASA - 390781972 (approved from 2025 to 2028)

“Hermes–Large Scale Harness Generation for Robust Library Testing” (PI) Individual Research Grants (DFG, German Research Foundation) - TO 1883/1 - (under review, expected from 2026 to 2029)

“Detecting Semantic Bugs in JavaScript Engines” unrestricted grant from Google Research Scholar (\$60,000 USD)

PUBLICATIONS

Conference

- C17 Vanoverloop D., Sanchez A., **Toffalini F.**, Piessens F., Payer M., and Van Bulck J.
“TLBlur: Compiler-assisted automated hardening against controlled channels on off-the-shelf Intel SGX platforms” Proceeding of the 34th USENIX Security Symposium (Usenix SEC 2025)
- C16 Badoux N., **Toffalini F.**, and Payer M.
“Sourcerer: channeling the void” Proceeding of the 22th International Conference of Detection of Intrusions, Malware, and Vulnerability Assessment (DIMVA 2025)
- C15 **Toffalini F.**, Badoux N., Tsinadze Z., and Payer M.
“Liberating libraries through automated fuzz driver generation: Striking a Balance Without Consumer Code” Proceeding of the ACM International Conference on the Foundations of Software Engineering (FSE 2025)
- C14 Zheng H., **Toffalini F.**, Böhme M., and Payer M.
“MendelFuzz: The Return of the Deterministic Stage” Proceeding of the ACM International Conference on the Foundations of Software Engineering (FSE 2025)
- C13 Wachter L., Gremminger J., Wressnegger C., Payer M., and **Toffalini F.**
“DUMPLING: Fine-grained Differential JavaScript Engine Fuzzing” Proceeding of the 32th Network and Distributed System Security Symposium (NDSS 2025) - **Distinguished Paper**

- C12 Badoux N., **Toffalini F.**, Jeon Y., and Payer M.
 “type++: Prohibiting Type Confusion With Inline Type Information” Proceeding of the 32th Network and Distributed System Security Symposium (NDSS 2025) - **Distinguished Paper**
- C11 Srivastava P., **Toffalini F.**, Vorobyov K., Gauthier F., Bianchi A., and Payer M.
 “Crystallizer: A Hybrid Path Analysis Framework To Aid in Uncovering Deserialization Vulnerabilities” Proceeding of the 31st ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE 2023)
- C10 Zheng H., Zhang J., Huang Y., Ren Z., Wang H., Cao C., Zhang Y., **Toffalini F.**, and Payer M.
 “FishFuzz: Throwing Larger Nets to Catch Deeper Bugs” Proceeding of the 32nd USENIX Security Symposium (Usenix SEC 2023)
- C9 Xu J., Di Bartolomeo L., **Toffalini F.**, Mao B., and Payer M.
 “WarpAttack: Bypassing CFI through Compiler-Introduced Double-Fetches” Proceeding of the 44th IEEE Symposium on Security and Privacy (S&P 2023)
- C8 Liu Q., **Toffalini F.**, Zhou Y., and Payer M.
 “ViDeZZO: Dependency-aware Virtual Device Fuzzing” Proceeding of the 44th IEEE Symposium on Security and Privacy (S&P 2023)
- C7 **Toffalini F.**, Payer M., Zhou J., and Cavallaro L.
 “Designing a Provenance Analysis for SGX Enclaves” Proceeding of the 38th Annual Computer Security Applications Conference (ACSAC 2022)
- C6 Jiang Z., Gan S., Herrera A., **Toffalini F.**, Romerio L., Tang C., Egele M., Zhang C., and Payer M.
 “Evocatio: Conjuring Bug Capabilities from a Single PoC” Proceeding of the ACM SIGSAC Conference on Computer and Communications Security (CCS 2022)
- C5 **Toffalini F.**, Graziano M., Conti M., and Zhou J.
 “SnakeGX: a sneaky attack against SGX Enclaves” Proceeding of the 19th International Conference on Applied Cryptography and Network Security (ACNS 2022)
- C4 **Toffalini F.**, Losiouk E., Biondo A., Zhou J., and Conti M.
 “ScaRR: Scalable Runtime Remote Attestation for Complex Systems” Proceeding of the 22nd International Symposium on Research in Attacks, Intrusions and Defenses (RAID 2019)
- C3 **Toffalini F.**, Ochoa M., Sun J., and Zhou J.
 “Careful-Packing: A Practical and Scalable Anti-Tampering Software Protection enforced by Trusted Computing” Proceeding of the 9th ACM Conference on Data and Application Security and Privacy (CODASPY 2019)
- C2 **Toffalini F.**, Sun J., and Ochoa M.
 “Static Analysis of Context Leaks in Android Applications” Proceeding of the 40th International Conference on Software Engineering: Software Engineering in Practice (SEPA@ICSE)
- C1 **Toffalini F.**, Abba’ M., Carra D., and Balzarotti D.
 “Google Dorks: Analysis, Creation, and new Defenses” Proceeding of the 13th International Conference of Detection of Intrusions, Malware, and Vulnerability Assessment, (DIMVA 2016)

Workshop

- W6 Rusconi D., Zoia M., Buccioli L., Pierazzi F., Bruschi D., Cavallaro L., **Toffalini F.**, and Lanzi A.
 “EmbedWatch: Fat Pointer Solution for Detecting Spatial Memory Errors in Embedded Systems” Proceeding of the 6th Workshop on CPS and IoT Security (CPSIoTSec)
- W5 Zheng H., **Toffalini F.**, and Payer M.
 “TuneFuzz: Adaptively Exploring Target Programs” Proceeding of the 17th Intl. Workshop on Search-Based and Fuzz Testing (SBFT 2024)

- W4 Visintin A., **Toffalini F.**, Losiouk E., Conti M., and Zhou J.
 “HolA: Holistic and autonomous attestation for IoT networks” Proceeding of the Applied Cryptography and Network Security Workshops (ACNS 2022) - **Best Paper**
- W3 **Toffalini F.**, Homoliak I., Harilal A., Binder A., and Ochoa M.
 “Detection of Masqueraders Based on Graph Partitioning of File System Access Events” Proceeding of IEEE Security and Privacy Workshops (SPW)
- W2 Harilal A., **Toffalini F.**, John C., Guarnizo J., Homoliak I., and Ochoa M.
 “TWOS: A Dataset of Malicious Insider Threat Behavior Based on Gamified Competition” Proceeding of the 9th ACM CCS International Workshop on Managing Insider Security Threats (MIST)
- W1 De Stefani F., Gamba P., Goldoni E., Savioli A., Silvestri D., and **Toffalini F.**
 “REnvDB, a RESTful Database for Pervasive Environmental Wireless Sensor Networks” Proceeding of the 30th IEEE International Conference on Distributed Computing Systems Workshops

Journal

- J4 **Toffalini F.**, Oliveri A., Graziano M., Zhou J., and Balzarotti D.
 “The evidence beyond the wall: Memory forensics in SGX environments” Forensic Science International: Digital Investigation, 2021
- J3 Homoliak I., **Toffalini F.**, Guarnizo J., Elovici Y., and Ochoa M.
 “Insight Into Insiders and IT: A Survey of Insider Threat Taxonomies, Analysis, Modeling, and Countermeasures” ACM Computing Surveys (CSUR), 2019
- J2 **Toffalini F.**, Sun J., and Ochoa M.
 “Practical static analysis of context leaks in Android applications” Software: Practice and Experience, 2019
- J1 Harilal A., **Toffalini F.**, Homoliak I., John C., Guarnizo J., Mondal S., and Ochoa M.
 “The Wolf Of SUTD (TWOS): A Dataset of Malicious Insider Threat Behavior Based on a Gamified Competition” Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications (JoWUA), 2018

ACADEMIC SERVICE

NDSS reviewer 2022/23/24/25/26
 Usenix SEC 2025/26
 DIMVA reviewer 2022/23/24/25
 DIMVA poster chair 2024/25
 ACSAC reviewer 2024/25
 ISSTA reviewer 2024/25
 TOSEM reviewer 2024
 Usenix SEC AE reviewer 2022
 EuroSP shadow-reviewer 2020
 TIFS reviewer 2018/19

OTHER ACTIVITES

Employee in IT Companies: 2009-2011
 Part-time Student during Master: 2012-2014