Peterson Jr. Yuhala

PhD Candidate · Computer Science

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"Be the change you wish to see in the world."

About

I am a postdoctoral researcher in the Institue of Computer Science at the University of Neuchâtel, Switzerland. I conduct research in the field of systems security, with particular attention on trusted execution environments (TEEs). I obtained my PhD entitled "Enhancing Security and Performance in Trusted Execution Environments" at the University of Neuchâtel in April 2024.

Education

University of Neuchâtel — *Neuchâtel, Switzerland*

PhD in Computer Science — *April 2019 - March 2024*

- *Thesis:* Enhancing security and performance in trusted execution environments.
- *Advisors:* Pascal Felber, Alain Tchana, Valerio Schiavoni

National Advanced School of Engineering (ENSP) — *Yaounde, Cameroon*

Masters of Engineering in Computer Science — *Sept. 2013 - Sept. 2018*

- *Thesis:* Memory address translation optimization in virtualized systems.
- *Advisor:* Alain Tchana

Sacred Heart College — *Bamenda, Cameroon*

GCE Advanced Level — *Sept. 2011 - June 2013*

- 25/25 points (perfect score)

Sacred Heart College — *Bamenda, Cameroon*

GCE Ordinary Level — *Sept. 2006 - June 2011*

- 33/33 points (perfect score)

Research and Work Experience

Postdoctoral researcher — *Neuchâtel, Switzerland*

Computer Science Institute - UniNE — *April 2024 - Present*

- Efficient privacy preserving computation with TEEs and homomorphic encryption.

Research Assistant/PhD Candidate — *Neuchâtel, Switzerland*

Computer Science Institute - UniNE — *April. 2019 - March 2024*

- Efficient confidential computing with TEEs.
- Adding TEE support in GraalVM CE for sensitive data protection in the cloud (collaboration with Oracle labs Zürich).
- Enhancing IoT security and privacy with TEEs and machine learning (VEDLIoT project).

Teaching Assistant — *Neuchâtel, Switzerland*

Faculty of Science - UniNE — *April. 2019 - Present*

- Networking and Web Technologies.
- Discrete Mathematics for Computer Science.
- Computer programming for biologists (Python, R, Linux).
- E-Government Frameworks.

Research Intern — *Toulouse, France*

Toulouse Institute of Computer Science Research (IRIT) — *March. 2018 - Sept. 2018*

- Memory address translation optimization in virtualization systems.

Engineering Intern — *Douala, Cameroon*

Les Brasseries du Cameroun — *July. 2017 - Sept. 2017*

- Set up a sales management module based on Odoo ERP for wholesalers in the brewery industry.

Intern *Yaounde, Cameroon*

National Advanced School of Engineering *July. 2016 - Sept. 2016*

- Leveraging microcontrollers to build domotic systems.
- Implemented prototypes for home automation based on several microcontroller platforms: Arduino, MSP-430.
- See: `https://github.com/Yuhala/arduino-projects`
- Building programmable digital circuits with Altera FPGA.

Projects

Securing IoT data with Arm TrustZone and ML. *Neuchâtel, Switzerland*

University of Neuchâtel (VEDLIoT project) *Feb. 2023 - Present*

- Porting hardware peripheral device drivers to OP-TEE OS.
- Leveraging machine learning classification techniques to filter out sensitive data from data streams.

Multilanguage program partitioning for TEEs. *Neuchâtel, Switzerland*

University of Neuchâtel (collaboration with Oracle labs Zürich) *Sept. 2021 - Dec 2022*

- Developing a programming language implementation with Oracle's Truffle framework which provides generic AST nodes to encapsulate sensitive data (i.e secure values) in polyglot applications.
- Developing a generic taint analysis tool to analyse the resulting ASTs to deduce sensitive program portions which are partitioned into Intel SGX enclaves.
- See: `https://gitlab.com/Yuhala/generic-tools`

Making Intel SGX switchless calls configless. *Neuchâtel, Switzerland*

University of Neuchâtel *Aug. 2021 - Feb. 2022*

- Identifying limitations of the static configuration policy in Intel SGX's switchless call library.
- Building a dynamic SGX switchless call system which obviates the performance penalty due to static configurations.
- See: `https://gitlab.com/Yuhala/zc-switchless`

Partitioning Java programs for TEEs. *Neuchâtel, Switzerland*

University of Neuchâtel (collaboration with Oracle labs Zürich) *July 2020 - June 2021*

- Developing a tool to partition Java-based applications for Intel SGX enclaves.
- The program-partitioning technique leverages Java annotations and byte-code transformations to partition Java classes into trusted and untrusted components.
- The partitioned components are ahead-of-time compiled with GraalVM into native executables that run in and out of secure enclaves in a distributed fashion.
- See: `https://github.com/Yuhala/montsalvat`

Secure and persistent machine learning model training. *Neuchâtel, Switzerland*

University of Neuchâtel *April 2019 - June 2020*

- Leveraging persistent memory (PM) to provide efficient fault-tolerance guarantees for applications running in TEEs like Intel SGX.
- See: `https://github.com/Yuhala/plinius`

Memory address translation optimization in virtualization systems. *Toulouse, France*

Institut de Recherche en Informatique de Toulouse (IRIT) *March. 2018 - Sept. 2018*

- Modifying the Xen hypervisor to provide contiguous memory to paravirtual guest VMs.
- See: `https://github.com/Yuhala/xen`
- Building a VM placement simulator.
- See: `https://github.com/Yuhala/placement-simulator`

SIMbox fraud detection. *Yaounde, Cameroon*

National Advanced School of Engineering *Sept. 2017 - Jan. 2018*

- Developing a tool for SIMbox fraud detection based on the ELK stack.
- See: `https://github.com/Yuhala/elk-fraud-detection`

Publications

Conference Proceedings

Fortress: Securing IoT Peripherals with Trusted Execution Environments
Peterson Yuhala, Jämes Ménétrey, Pascal Felber, Marcelo Pasin, Valerio Schiavoni
. SAC 2024 (2024). Association for Computing Machinery, 2024

A Holistic Approach for Trustworthy Distributed Systems with WebAssembly and TEEs
Jämes Ménétrey, Aeneas Grüter, Peterson Yuhala, Julius Oeftiger, Pascal Felber, Marcelo Pasin, Valerio Schiavoni
CoRR abs/2312.00702 (2023). 2023

SecV: Secure Code Partitioning via Multi-Language Secure Values

Peterson Yuhala, Pascal Felber, Hugo Guiroux, Jean-Pierre Lozi, Alain Tchana, Valerio Schiavoni, Gaël Thomas
Proceedings of the 24th International Middleware Conference, 2023, Bologna, Italy

SGX Switchless Calls Made Configless
Peterson Yuhala, Michael Paper, Timothée Zerbib, Pascal Felber, Valerio Schiavoni, Alain Tchana
2023 53rd Annual IEEE/IFIP International Conference on Dependable Systems and Networks (DSN), 2023

(No)Compromis: Paging Virtualization is Not a Fatality
Boris Teabe, Peterson Yuhala, Alain Tchana, Fabien Hermenier, Daniel Hagimont, Gilles Muller
International Conference on Virtual Execution Environments (VEE), 2021, Virtual, USA

Plinius: Secure and Persistent Machine Learning Model Training
Peterson Yuhala, Pascal Felber, Valerio Schiavoni, Alain Tchana
2021 51st Annual IEEE/IFIP International Conference on Dependable Systems and Networks (DSN), 2021

Montsalvat: Intel SGX Shielding for GraalVM Native Images
Peterson Yuhala, Jämes Ménétrey, Pascal Felber, Valerio Schiavoni, Alain Tchana, Gaël Thomas, Hugo Guiroux, Jean-Pierre Lozi
Proceedings of the 22nd International Middleware Conference, 2021, Québec city, Canada

Talks

SecV: secure code partitioning using multi-language secure values — *Bologna, Italy*
24th ACM/IFIP International Middleware Conference — *Dec. 2023*

SGX Switchless Calls Made Configless — *Porto, Portugal*
53rd International conference on Dependable systems and Networks — *June 2023*

Enhancing IoT Security and Privacy with TEEs and Machine Learning — *Porto, Portugal*
53rd International conference on Dependable systems and Networks (Doctoral Forum) — *June 2023*

Partitioning Java Programs for Intel SGX — *Zürich, Switzerland*
Huawei Research Center Zürich — *Dec. 2022*

SecureL: Secure code partitioning via multi-language secure types — *Rennes, France*
EuroSys Doctoral Workshop 2022 — *April. 2022*

Montsalvat: Intel SGX shielding for GraalVM Native Images — *Virtual Event, Québec, Canada*
22nd ACM/IFIP International Middleware Conference — *Dec. 2021*

Secure and Efficient Learning: approaches, techniques and threats — *Neuchâtel, Switzerland*
Conférence Universitaire de Suisse Occidentale (CUSO) — *Dec. 2021*

Secure and persistent ML model training with persistent memory and Intel SGX. — *Virtual Event, Taipei, Taiwan*
51st International conference on Dependable systems and Networks — *June. 2021*

Paging virtualization is not a fatality. — *Biarritz, France*
Conférence francophone d'informatique en Parallélisme, Architecture et Système (COMPAS) — *July. 2019*

Honors & Awards

Domestic

2018	**Salutatorian,** Computer Engineering class of 2018, ENSP Yaounde	*Yaounde, Cameroon*
2013	**Valedictorian,** Class of 2013, Sacred Heart College	*Bamenda, Cameroon*
2013	**Ralph C. Okwen Award ,** Overall best high school science student, Sacred Heart College	*Bamenda, Cameroon*
2013	**2nd Award,** Academic Excellence Award for a perfect score at the Cameroon GCE A-Level 2013 session (25/25 points)	*Cameroon*
2011	**1st Award,** Academic Excellence Award for a perfect score at the Cameroon GCE O-Level 2011 session (33/33 points)	*Cameroon*

Academic service

Scientific volunteering

University of Neuchâtel

- Organizing a STEM bootcamp: `https://scienceprojectscmr.github.io/`
- Writing scientific articles for LexTech institute blog: `https://www.lextechinstitute.ch/blog`
- University media presence: secure data processing in the cloud

Scientific peer reviewing

University of Neuchâtel

- Artifact Evaluation Committee ASPLOS 2024.
- Artifact Evaluation Committee OSDI 2021.
- Artifact Evaluation Committee EuroSys 2021.
- Sub-reviewer IC2E21.

Conference volunteering

University of Neuchâtel

- Student Volunteer OPODIS 2019.
- Student Volunteer COMPAS 2018.

Skills

Programming Languages	C/C++, Java, Python
Systems Security	Intel SGX, ARM TrustZone, OP-TEE
Web Development	HTML5/CSS, JavaScript, SQL, Laravel with PHP, Flask
Miscellaneous	Linux, Git, Shell(Bash), Docker, LaTeX

Languages

English	Native proficiency
French	Native proficiency

Interests

Reading	I love books on politics, economics, and personal development.
Sports	Football, Biking
Music	Piano, Singing
Board games	Chess

References

Pascal Felber

- Professor
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  University of Neuchâtel, Switzerland

Alain Tchana

- Professor
  alain.tchana@ens-lyon.fr
  ENS Lyon, France

Valerio Schiavoni

- Assistant Lecturer
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  University of Neuchâtel, Switzerland