# Peterson Jr. Yuhala


Postdoctoral researcher · Trusted Computing

*IIUN, Neuchâtel, Switzerland*

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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)

**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*

- Setting 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, ESP32
- 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 information 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

**Secure computation with trusted execution environments** — *La Chaux-de-Fonds, Switzerland*
Privacy Reunion 3 — *June 2024*

**Securing IoT peripherals with Trusted Execution Environments** — *Avila, Spain*
39th ACM/SIGAPP Symposium on Applied Computing — *April 2024*

**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

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|---|---|
| **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

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|---|---|
| **English** | Native proficiency |
| **French** | Native proficiency |

## Interests

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

# References

**Pascal Felber**

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**Alain Tchana**

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  ENS Lyon, France

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