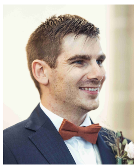
# Nicolas Badoux

✉ n.badoux@hotmail.com ☎ +41 79 914 00 47 in nbadoux

Rue de la Gare 21
1030 Bussigny
CH—Switzerland
Swiss citizen—married
Born in 1994



## Statement of Purpose

Passionate about cybersecurity, its ever evolving nature, and the adaptations it requires.
Curious by nature, I love to understand architectures and their security implications.
With automated defenses and monitoring, I hope to reduce the repercussion of cyber incidents.
Can-do attitude, committed, and strong ability to adapt to changing requirements.

## Experience

**PhD Researcher** - HexHive @ EPFL - Lausanne, CH *Mar' 2020–May 2025*

- Lead the development and evaluation of different security-themed projects reducing the attack surface of low-level code (C/C++). With novel secure dialects, compiler passes (SAST) and automated testing (DAST), we ease secure development across large code bases.
- As part of our research, we extensively tested low-level APIs and dutifully followed the vulnerability lifecycle, from responsible disclosure to contribution of fixes.
- Facing continuously evolving requirements, I strategically scoped our projects and effectively communicated their outcomes to a global audience.
- In a diverse team, I lead projects with senior professors and designed and mentored research projects for junior students. We contributed to open source projects and reported CVEs.

**Software Engineer** - Fondation Digger, NGO - Tavannes, CH *Aug' 2019–Mar' 2020*

- Quantified the feasibility of low-latency VR in C++ for an industrial demining machinery.

**Software Engineer** - Compassion Suisse, NGO - Yverdon, CH *Mar'–May 2018*

- Contributed in an Agile environment to open source modules for the Python Odoo ERP.

**Security Engineer Intern** - Ergon Informatik - Zürich, CH *60%—Sept' 2017–Mar' 2018*

- Designed and developped a blackbox fuzzer for testing a Web Application Firewall (WAF).

**Technology Summer Analyst** - Morgan Stanley - London, UK *Jun'–Aug' 2016*

- Developed a webview for metrics tracked by the Architecture Security team of the bank.

## Education

**Doctorate of Sciences (PhD)** *2020–2025*
*École Polytechnique Fédérale de Lausanne (EPFL)* - Switzerland

- Advisor: Prof. Mathias Payer in the HexHive laboratory.
- Thesis: Securing low-level code with minimal developer efforts.
- Keywords: System security, software testing, compiler-based defenses, fuzzing.

**Master of Science ETH in Computer Science** *2016–2019*
*Eidgenössische Technische Hochschule Zürich (ETHZ)* - Switzerland

- Specialization in Information Security, GPA: 5.39/6.

**Bachelor in Communication Sciences** *2013–2016*
*École Polytechnique Fédérale de Lausanne (EPFL)* - Switzerland

- **Exchange program** @ *Carnegie Mellon University* - USA, GPA: 5.26/6. *2015–2016*

**Billingual Matura (German/French)** *2010–2013*
*Kantonschule Frauenfeld & Gymnase d'Yverdon* - Switzerland

- Specialization in Mathematics and Physics, GPA: 5.19/6, Best 3%.

## Skills

**Programming Languages**: Python, C++, LaTeX, Bash.

**Software**: LLVM, Docker, GDB, Linux, Make, afl++, libfuzzer.

**Spoken Languages**: French (native), English (C2), Swiss-German (C2), German (C1).

## Talks

**BlackAlps**: No App? No Problem: Automatic Library Fuzzing *Upcoming, Nov' 2025*

## Research Projects

**`type++`: prohibiting type confusion with inline type information** *NDSS'25*

*Authors:* **Nicolas Badoux**, Flavio Toffalini, Yuseok Jeon, & Mathias Payer.

- *Distinguished Paper Award* (top 1% of submissions).
- In C++, incorrect downcasts are a severe vulnerability often exploited in the wild.
- By inlining the type in each C++ object, we create a compiler-based mitigation against type confusion attacks allowing downcast to be checked at runtime while requiring minimal code adaptations. We evaluate our prototype against the state-of-the-art and achieve less than 1% runtime overhead while protecting 90B casts. We deploy our prototype on Chromium.
- Built on top of LLVM, `type++` is available on GitHub and its artifact evaluated.
- During this multi-year project, I learned some intricacies of compilers, developed my writing skills, and strategic planning to face a constantly evolving project.

**libErator: Balancing library fuzzing without consumer code** *FSE'25*

*Authors:* Flavio Toffalini, **Nicolas Badoux**, Zurab Tsinadze, & Mathias Payer.

- Drivers, a sequence of API calls building state, allows for dynamic testing like fuzzing, to execute a library's code. Manually written drivers are rare and exhaustively tested.
- libErator automates the generation of fuzzing drivers without consumer code and allows for balancing resources between driver generation and fuzzing.
- From insights gathered through LLVM passes, we build valid C drivers calling the API.
- We report and fix 24 bugs, including CVE-2024-8006. We release our prototype on Github.
- Through the design and multifaceted evaluation of libErator, I improved my cross-cutting understanding of complex systems.

**Sourcerer: channeling the void** *DIMVA'25*

*Authors:* **Nicolas Badoux**, Flavio Toffalini, & Mathias Payer.

- In C++, conversions from `void*` to typed pointers are ubiquitous but, if the type is not the original one, leads to type confusions and possibly further memory corruption.
- By extending the protection of type++ to all the types used in casts, we design Sourcerer, a complete type confusions sanitizer. With a low-overhead of 5% on average, we conduct the first fuzzing campaign targeting specifically type confusions.
- We find type confusions in Blender and OpenCV and release our prototype on GitHub.
- As the main author, I designed and evaluated our system as well as wrote the paper.

## Teaching Assistant

**Operating System** *(2021)* **Software Security** *(2021 & 2023)* **Information, Calcul & Communication** *(2022 & 2024)* **Information Security & Privacy** *(2023)*

## Activities

**Board Member, Treasurer** - Groupes Bibliques des Écoles et Universités *2023–ongoing*

- Define the vision, hiring, and budget planning ($\simeq$ 500kCHF).

**Camp Leader** - Interjeunes & Ligue pour la Lecture de la Bible *2014, 2017, 2021, 2022*

- Lead week-long camps with up to 110 kids/young adults. Built a team, prepared the event, managed the team and had final authority.

## References

**Prof. Dr. Mathias Payer** *mathias.payer@nebelwelt.net*

- Associate Professor at EPFL in Lausanne (CH) and head of HexHive.
- Advised me during my PhD between 2020 and 2025.

**Prof. Dr. Flavio Toffalini** *flavio.toffalini@rub.de*

- Assistant Professor at Ruhr-Universität in Bochum (DE).
- Close collaborator and advising post-doc during my PhD (2021–2025).

**Benoît Pfister** *benoit.pfister@gbeu.ch*

- Chairman of the Board at Groupes Bibliques des Écoles et Universités.
- We worked together for hiring committees, budgeting, and general strategy.