The CEA LIST, Software Security Lab (LSL), has several open internship positions in the area of low-level software verification and security, to begin as soon as possible at Paris-Saclay, France. Positions are 4-6 month long and can open the way to a doctoral work. All these positions are articulated around the BINSEC open-source platform (https://binsec.github.io), which aims at providing automatic tools for low-level security analysis by adapting software verification methods initially developed for safety-critical systems.

**Context.** Several major classes of security analyses have to be performed on machine code, such as vulnerability analysis of mobile code or commercial off-the-shelf software, deobfuscation or malware inspection. These analyses are very challenging, and they are still relatively poorly tooled. Our long-term goal is to leverage recent advances in software verification, security analysis and artificial intelligence in order to propose efficient semantic tools for low-level security investigations.

**Current topics.** We are especially looking for curious and enthusiastic students willing to work on the following directions:

- vulnerability detection at scale, with combination of cutting edges techniques such as symbolic execution, fuzzing and static analysis;
- binary-level formal verification of crypto-primitives or microkernels, with combination of abstract interpretation and symbolic execution;
- combination of program analysis and artificial intelligence for reverse or vulnerability analysis;
- advanced methods for code hardening, with a focus on either anti-reverse (obfuscation) or anti-exploitation (control-flow integrity) protections;

More details on the topics will be happily provided! The list is not exhaustive, ask us if you have some project in mind.

For each topic, the goal is to start from existing published solutions (if any), to identify their strengths and weaknesses, and to propose and evaluate a new solution. Results will be integrated in the open-source BINSEC platform. All positions include theoretical research as well as prototyping (preferably in OCaml) and experimental evaluation.

**Host Institution.** Within CEA LIST, LSL is a twenty-person team dedicated to software verification, with a strong focus on real-world applicability and industrial transfer. We design methods and tools that leverage innovative approaches to ensure that real-world systems can comply with the highest safety and security standards. CEA LIST is located in Campus Paris Saclay, the largest European cluster of public and private research https://www.universite-paris-saclay.fr/en.

**Requirements.** We welcome curious and enthusiastic students with a solid background in Computer Science, both theoretical and practical. A good knowledge of functional programming (OCaml) is appreciated. Some experience in verification, security, logic or compilation would be great.

**Application.** Applicants should send an e-mail to Sébastien Bardin (sebastien.bardin@cea.fr) — including CV and motivation letter. **Deadline:** as soon as possible. Contact us for more information.

**References**


**Keywords:** software security, vulnerabilities, code hardening, reverse & deobfuscation, program analysis, formal methods, machine learning