

# Two PhD studentships on compiler testing, verifier testing and mutation testing at Imperial College London

**Supervisor:** Professor Alastair Donaldson (<https://multicore.doc.ic.ac.uk>)

**Start dates:** PhD students typically start in either October or April of each academic year, so these options are for students starting in:

- October 2023 (if you apply quickly)
- April 2024
- October 2024

## Funding:

- The studentships cover “home” fees. UK citizens are eligible for home fees, and so are people who have lived in the UK for a sufficient period of time, as detailed [here](#)
- Unfortunately the studentships do not cover overseas fees
- The studentships come with a full bursary

**Topics:** I am looking to recruit two PhD students to continue my research group’s line of work on compiler testing, which has included tools for testing GPU compilers (e.g. [GLFuzz, OOPSLA 2017](#), which led to the [GraphicsFuzz startup](#) company that was later acquired by Google), methods for testing C compilers (e.g. the [GrayC tool, to appear at ISSTA 2023](#)), as well as new techniques to help with test-case reduction (e.g. [this PLDI 2023 paper](#)). Topics for the PhD positions could focus on any combination of:

- Compiler testing: using randomised testing to automatically find bugs in the implementations of compilers and related tools (such as interpreters and programming language virtual machines)
- Verifier and analyser testing: adapting techniques that have been successful in compiler testing to find bugs in formal verification tools (such as deductive verification engines and model checkers)
- Mutation testing: investigating the use of randomised testing to automatically grow high quality test suites, where quality is measured by the ability of the test suite to kill “mutants”: synthetic defects injected into the system under test
- The application of mutation testing to the compiler and verifier testing
- Fuzzing more generally: while I have many ideas about compiler fuzzing, I am open to supervising a PhD topic on other applications of randomized testing.

The studentships will include exciting opportunities to contribute to the reliability of a number of widely-used open source projects and open standards. Examples include (but are not limited to) the [Clang/LLVM](#) compiler infrastructure, the [Dafny](#) verified programming language, and the [WebGPU](#) standard.

## Prerequisites:

- A Masters degree at Distinction or equivalent (or a prediction that you will achieve such a degree before the PhD commences)
- An interest in software reliability or software testing
- Basic knowledge of how either compilers or verification tools work
- Good programming skills and an enthusiasm for building high quality software

Please get in touch with me – [alastair.donaldson@imperial.ac.uk](mailto:alastair.donaldson@imperial.ac.uk) – if you are interested in applying for these opportunities.