

# Raphael Isemann

[isemann.raphael@gmail.com](mailto:isemann.raphael@gmail.com) | [github.com/teemperor](https://github.com/teemperor) | Location: Stockholm (Sweden)

Nationality: German Languages: German (native), English (C2, 117/120 TOEFL), Swedish (A1)

## RESEARCH MISSION

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My goal is to make the software we all use better and faster by improving compilers, analyzers and programming languages. Teaching a human software development helps them create better software, but teaching software how to create better software will help everyone.

## EDUCATION

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### Chalmers University

Göteborg, Sweden

*M.S., Computer Science – algorithms, languages and logic programme*

*Aug. 2016 – Aug. 2019*

**Final average grade: 4.7** (Grading scheme: 5 – best grade, 3 – lowest passing grade)

Thesis Title: Beyond Debug Information: Improving Program Reconstruction in LLDB Using C++ Modules

Advisor: Dr. Thomas Sewell, Dr. Magnus Myreen

My master thesis was concerned with whether C++ modules could be used to effectively fill gaps in debug information or otherwise aid in program reconstruction for debuggers such as LLDB, the debugger of the LLVM project. C++ modules are a part of the recent ISO C++20 standard that provide a more principled and faster alternative to the traditional header system inherited from the C language.

The resulting LLDB-based prototype was able to reliably reconstruct types and functions that have been optimized away or otherwise omitted. The prototype has since become part of the LLVM project and is the foundation of Apple's most recent C++ developer toolchain.

### Kempen University of Applied Sciences

Kempen, Germany

*B.S., Computer Science*

*Oct. 2012 – Apr. 2016*

**Final average grade: 1.5** (Grading scheme: 1 – best grade, 4 – lowest passing grade)

Thesis Title: A WebAssembly Interpreter with Integrated Debugging Capabilities

Advisor: Prof. Dr.rer.nat. Ulrich Göhner

My bachelor thesis was concerned with creating an interpreter for the then recently announced WebAssembly standard. I took part in the first W3 WebAssembly language specification process and developed one of the first WebAssembly implementations for the duration of my thesis. As part of my thesis I examined how the metadata that is required to support reverse execution in interpreters could also be used to perform fast cycle detection in deterministic programs.

## PUBLICATIONS

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Takahashi, Y., Vassilev, V., Shadura, O. and Isemann, R., 2019. Optimizing Frameworks' Performance Using C++ Modules Aware ROOT. In EPJ Web of Conferences (Vol. 214, p. 02011). EDP Sciences.

## TALKS

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### Better C++ Debugging using Clang Modules in LLDB

San Jose, USA

*Technical talk, LLVM Developers' Meeting*

*2019*

### A CMake Toolkit for Migrating C++ Projects to Clang's Module System

San Jose, USA

*Lightning talk, LLVM Developers' Meeting*

*2017*

### Finding Code Clones in the AST With Clang

San Jose, USA

*Lightning talk, LLVM Developers' Meeting*

*2016*

## REVIEWING FOR CONFERENCES

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I reviewed submissions for the 2020 LLVM' developers meeting. I also reviewed selected submissions for WebConf 2019, IEEE SP 2019 and POST 2019.

## POSTERS

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Takahashi, Y., Vassilev, V., Shadura, O. and Iseemann, R., 2019. Optimizing Frameworks' Performance Using C++ Modules Aware ROOT. CHEP 2018 Posters. July 09-13, 2018, Sofia, Bulgaria.

## EXPERIENCE

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### Senior Software Engineer

Jun. 2019 – Present

*Apple Inc.*

*Stockholm, Sweden*

- Working on integrating the prototype developed during my master thesis into Apple's C++ developer toolchain.
- Modernizing LLDB to support newer C and C++ standards, including its debug information parser, type system and expression evaluator.
- Further developing Clang's C++ module implementation and the C++ modules build mode in the different sub-projects of the LLVM umbrella project.
- Developing fuzzing tools that automatically find debugger bugs.
- Coordinating development between Apple's fork of LLDB and the LLDB project that is part of the LLVM umbrella project.

### Software Engineering Intern

Jun. 2018 – Aug. 2018

*Apple Inc.*

*Cupertino, CA/USA*

- Implemented several IDE-style features in the LLDB debugger such as accurate code completion and syntax highlighting

### Technical Student

Feb. 2017 – Jan. 2018

*European Organization for Nuclear Research (CERN)*

*Geneva, Switzerland*

- Integrated C++ modules into CERN's C++ interpreter ROOT/Cling to improve parsing performance.
- Made the offline data analysis software of the Compact Muon Solenoid (CMS) experiment compatible with Clang's C++ modules prototype.

### Google Summer of Code Student

Mar. 2016 – Aug. 2016

*LLVM Compiler Infrastructure*

- Developed a framework for finding identical or similar code clones in Clang's AST.
- Developed a Clang static analyzer plugin that warns about inconsistent use of variables in similar code clones.

## OPEN SOURCE CONTRIBUTIONS

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I am actively contributing to different parts of LLVM since 2016. From 2012 to 2015 I was also one of the main developers of the popular Linux distribution *elementary OS* that has the goal of making open source computing accessible to people with limited computer experience.

## TEACHING EXPERIENCE

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I was a Google Summer of Code mentor at the LLVM organization in 2017 and 2020 where I guided students that are interested in working on LLVM through beginner projects. I represented the LLVM organization at the 2017 Google Summer of Code Mentor Summit.

My mentored students were:

<b>Gongyu Deng</b> (Shanghai Jiao Tong University)	2020
<b>Shu Anzai</b> (The University of Tokyo)	2020
<b>Yuka Ikarashi (née Takahashi)</b> (MIT, The University of Tokyo during the GSoC project)	2017

## GRANTS

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**LLVM foundation** Travel stipend to LLVM' developers meeting 2017

**LLVM foundation** Travel stipend to LLVM' developers meeting 2016

**Software Freedom Conservancy and Boost Steering Committee** Travel stipend to C++now 2016