Rafael Auler

Resumé

Contact

Redwood City-CA

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Employment

10/2016–current
Research Scientist
Facebook, Inc.
Menlo Park, CA

9/2015–12/2015
Software Engineer Intern
Facebook, Inc.
Menlo Park, CA

8/2014–10/2014
Compiler Engineer Intern
Sony Computing Entertainment America
San Mateo, CA

5/2013–8/2013
Research Intern
Microsoft Corporation
Redmond, WA

Education

Ph.D., Computer Science, from Aug 2011 to Sep 2016
University of Campinas (UNICAMP)
Thesis: *Efficient Emulation Techniques for a New Instruction Set Architecture*
Advisor: Dr. Edson Borin
GPA: 4.0/4.0

M.S., Computer Science, Aug 2009 to July 2011
University of Campinas (UNICAMP)
Thesis: *ADL-Based Automatic Generation of Compiler Backends*
Advisor: Dr. Paulo Cesar Centoducatte
GPA: 4.0/4.0

B.S., Computer Engineering, May 2005 to July 2009
University of Campinas (UNICAMP)
CR: 0.83/1.0

Honors

Microsoft Research 2013-2014 Graduate Research Fellowship

Research Interests

Binary translation, dynamic compilation, compilers, and virtual machines

Publications

Book

Getting Started with LLVM Core Libraries, Aug. 26, 2014, Packt Publishing, Bruno Cardoso and Rafael Auler. Rated 4.7 out of 5 stars on Amazon (17 reviews), best seller in its category (checked Apr 15 2015).

Most Relevant Journal and Conference Papers

Bruno Cardoso Lopes†, Rafael Auler†, Luiz Ramos, Edson Borin, and Rodolfo Azevedo. SHRINK: Reducing the ISA Complexity via Instruction Recycling. In *ISCA 42: The 42nd International Symposium on Computer Architecture*, June 2015, Portland, Oregon.

Rafael Auler, Edson Borin, Peli de Halleux, Michal Moskal, and Nikolai Tillmann. Addressing JavaScript JIT engines performance quirks: A crowdsourced adaptive compiler. In *CC 2014: In The 23rd International Conference on Compiler Construction*, April 2014, Grenoble, France.

Marcelo Guedes, Rafael Auler, Liana Duenha, Edson Borin, and Rodolfo Azevedo. An Automatic Energy Consumption Characterization of Processors Using ArchC. *Journal of Systems Architecture*, 59(8):603–614, September 2013.

Pending patent

I'm a co-inventor in patent BR 10 2015 005838 (pending) for the mechanism described in the paper *SHRINK: Reducing the ISA Complexity via Instruction Recycling*, ISCA 42.

† these authors contributed equally to this work

Industry Experience

Facebook, Inc. (Sep 2015 - Dec 2015)

- I worked in the HHVM team, responsible for the PHP virtual machine that runs the site.
- I and a coworker built tools based on the LLVM library to reorder binary code based on profiling information, delivering up to 3% speedup in HHVM at the end of the internship.

Sony Computing Entertainment America (Aug 2014 - Oct 2014)

- I worked remotely as an open source contributor to the Clang/LLVM project. After submitting patches to clang and lld (linker), I obtained commit access in the project under the login name rafauler.
- I improved the Clang driver in Windows, bypassing Windows command line limitations with response files, and improved the lld linker, implementing the linker script parser component.

Microsoft Research (May 2013 - Aug 2013)

- I built a system to keep track of the performance of scripts created in the TouchDevelop platform, a language to easily create apps for mobile devices that compiles to JavaScript and runs in the browser.
- I wrote optimizations with speedups from 1.12x up to 35x. I show how different browsers-platforms behave differently and need different compilation passes in a paper that I wrote for CC 2014.

Google Summer of Code 2011 - LLVM community (May 2011 - Aug 2011)

- I proposed and completed the "Superoptimization for LLVM IR" project with Duncan Sands (mentor).
- My project uses arbitrary LLVM bitcode as a training set to discover new peephole optimizations. My mentor presented the results in the 2011 LLVM Developer's Meeting.

Research Experience

PhD (Aug 2011 - Sep 2016)

- I studied binary translation techniques using the LLVM framework.
- I studied the x86 instruction set and their use in old and new x86 programs. I implemented a Linux kernel module that handles artificial traps to emulate selected old instructions. We published the results in a paper for ISCA 42 and also filed a patent for this mechanism.
- I studied the runtime of each LLVM optimization pass and built a linear model to predict compilation time based on the input, helpful for JIT compilation (results in Technical Report).

Extracurricular

- External expert reviewer for papers of CGO'12, WSCAD-WIC'12, SBAC-PAD'12, ASE 2014 and CGO 2016. Member of the PLDI 2014 Artifact Evaluation Comittee.

October 18, 2016