

Ramkumar Ramachandra

Compiler engineer with over a decade of experience, and a track record in open source work, specializing in LLVM middle-end optimizations. Hobby research includes constructing mathematical objects using a proof assistant.

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WORK

- Jun '24 – Present **Compiler Lead** Codasip, Bristol, England
Upstream-first LLVM optimization for RISC-V: landed 350 patches spanning most of the middle-end. Authored a new analysis, HashRecognize, and enabled optimization of CRC loops, with impact on several real-world programs including Linux. Significantly improved vectorization, notably authoring the CSE and constant-folder in VPlan. Drove the *icmp samesign* optimization effort, authoring the foundational structure.
- Mar '23 – Feb '24 **Senior Compiler Engineer** Imagination Technologies, Kings Langley, England
LLVM optimization for a RISC-V VPU. Improved LoopStrengthReduce, LoopAccessAnalysis, and LoopVectorize, with impact on embedded benchmarks, with some patches upstreamed. Introduced vector variants of the [!]rint intrinsics with custom lowering for RISC-V. Downstream work included improving the benchmarking infrastructure, and scheduling support for the chip.
- Aug '19 – Jan '23 **Career break** Inria, IRIF, and Université Paris Cité
Career break to pursue interest in formalized mathematics. Audited courses in algebraic topology, and worked as an apprentice learning Rocq and type theory. Found a long-term collaborator and began a line of research.
- Feb '15 – Aug '17 **Compiler Engineer** MathWorks, Natick, Massachusetts
Fixed the longest-standing bugs in the organization by carefully combing through x86 assembly. Worked with a pre-SSA IR to author and ship a LICM, and incremental-update algorithms for the program structure tree and dominator. Contributed to the in-house alias analysis. Implemented polyhedral loop optimizations using the *Integer Set Library*.

TALKS AND PUBLICATIONS

- Jun '25 **A parametricity-based formalization of $\text{Set}_{\Delta,+}$ and Set_{\square}** with Hugo Herbelin
Mathematical Structures in Computer Science
Published: 10.1017/S096012952500009X. Pre-print: arXiv:2401.00512.
- Apr '25 **Making LoopAccessAnalysis more precise**
EuroLLVM, Berlin
Program: LLVM Developers' Meeting. Recorded video: YouTube.

EDUCATION AND OPEN SOURCE

- 2014 **Masters in Computer Engineering** Columbia University, New York
- 2012 **Integrated Masters in Physics** Indian Institute of Technology, Kharagpur
- 2013 – 2014 **Linux**
Landed 60 patches focused on improving perf tools.
- 2010 – 2014 **Git**
Landed 200 patches. Participated in Summer of Code 2010 and 2011, authoring the sequencer, enabling *git cherry-pick* to resume after conflicts. Designed and implemented *rebase.autostash* and *remote.pushdefault*.
- Summer '10 **Subversion**
Authored svnrump, a tool to import and export history from a remote svn server.