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 of Labs division — 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 [l]lrint 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 Set_{Δ_+} and $\mathrm{Set}_{\square}$ *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 svnrdump, a tool to import and export history from a remote svn server.

Keywords: C++, Python, LLVM, Compiler Optimization, RISC-V, Assembly, Rocq, Formalized Mathematics