

# 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	<b>Compiler Lead</b> 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 <i>icmp samesign</i> optimization effort, authoring the foundational structure.	Codasip, Bristol, England
Mar '23 – Feb '24	<b>Senior Compiler Engineer</b> 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 [I]lrint intrinsics with custom lowering for RISC-V. Downstream work included improving the benchmarking infrastructure, and scheduling support for the chip.	Imagination Technologies, Kings Langley, England
Aug '19 – Jan '23	<b>Career break</b> 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.	Inria, IRIF, and Université Paris Cité
Feb '15 – Aug '17	<b>Compiler Engineer</b> 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 <i>Integer Set Library</i> .	MathWorks, Natick, Massachusetts

## TALKS AND PUBLICATIONS

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

## EDUCATION AND OPEN SOURCE

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