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

Jan '26 – Present	**Sr. Staff Compiler Engineer**	TensTorrent, United States

Upstream-first LLVM optimization for RISC-V.

Jun '24 – Jan '26	**Compiler Tech Lead**	Codasip, Bristol, England

Upstream-first LLVM optimization for RISC-V: landed 400 patches spanning most of the middle-end. Authored a new analysis, HashRecognize, and enabled optimization of CRC loops using a table-lookup, with impact on several real-world programs including Linux. Followed up, introducing a carry-less multiply intrinsic with generic lowering. 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. 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.

| 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.

2014 **Masters in Computer Engineering** Columbia University, New York

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