



NIKLAS HAAS

Staff Software Engineer — Performance Optimization & GPU Computing

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Professional Summary

Open-source developer with nearly 20 years of active programming experience, specializing in high-performance data processing, GPU algorithms, and low-level CPU optimization. Recognized expert in multimedia processing and color management, with an extensive, 15-year history of contributions to industry-leading open source projects. Maintainer of multiple widely used software projects, and member of the FFmpeg and VideoLAN technical committees. Seeking opportunities to apply my deep technical expertise to challenging problems in emerging fields.

Core Competencies

- **Low-Level Optimization:** SIMD programming (x86 SSE/AVX2/AVX512, ARM NEON, RISC-V Vectors), assembly optimization, performance profiling and tuning, cache optimization
- **GPU Computing:** Vulkan compute shaders, GPGPU algorithm design, GPU pipeline optimization, OpenGL/GLSL, parallel processing architectures
- **Language Theory & Compilers:** Type systems, functional programming, compiler design, JIT compilation, runtime code generation
- **Systems Programming:** C/C++, kernel drivers, memory management, concurrency, lock-free data structures, software transactional memory
- **Performance Engineering:** Profiling, benchmarking, algorithmic complexity analysis, cache-oblivious data structures

Professional Experience

Independent Consultant

2017 — Present

Germany

- Developed novel SIMD-based pixel format conversion system for FFmpeg's libswscale, achieving dramatic performance improvements through runtime compilation and assembly of custom domain-specific AST.
- Designed and implemented GPU-accelerated image processing pipelines using Vulkan compute shaders for real-time video processing
- Optimized critical multimedia processing routines achieving 2-10x speedups through SIMD vectorization (AVX2/AVX512/NEON/RVV)
- Led architectural design and implementation of high-performance color management systems supporting HDR workflows
- Performed in-depth performance analysis and optimization of large-scale codebases, identifying and resolving bottlenecks across CPU and GPU workloads
- Delivered comprehensive code reviews and technical audits for performance-critical systems

FFmpeg, VideoLAN, libplacebo

- **libplacebo** (Author & Maintainer): Created cross-platform GPU-accelerated library featuring advanced compute shader algorithms for real-time image processing, now integrated into VLC, mpv, and FFmpeg
- **FFmpeg** (Technical Committee): Architectural improvements, format negotiation optimization, first open-source implementations of ITU-R H.274, AFGS1, SMPTE RDD5, MV-HEVC
- **checkasm** (Maintainer): Overhauled SIMD verification and benchmarking framework, enabling cycle-accurate performance metrics for large-scale projects
- **dav1d**: Developed experimental GPU-based Vulkan decoder using compute shaders, implemented RISC-V SIMD routines
- **VLC** (Technical Committee): Integrated Vulkan rendering pipeline, enabled HDR and Dolby Vision support

Key Technical Projects

libswscale Reimplementation

2024 — 2025

Complete refactor of FFmpeg's pixel format conversion code. Developed innovative approach combining SIMD fragments at runtime to generate optimized conversion routines, dramatically reducing code complexity while improving performance across all supported formats. Utilized advanced compiler techniques, including heavily templated SIMD, custom ABIs and continuation passing style for code generation.

libplacebo — GPU Processing Library

2017 — Present

Designed and implemented comprehensive cross-platform GPU computing framework using Vulkan / OpenGL / Direct3D for real-time image processing. Features include: fully dynamic rendering pipeline, GPU film grain synthesis, high-quality scaling algorithms, and completely novel real-time tone mapping algorithm. Active and ongoing maintainership role. Used in VLC, FFmpeg, mpv, and more.

GPU-based AV1 Decoder (dav1d)

2019

Experimental implementation of video decoder using Vulkan compute shaders, exploring feasibility of fully GPU-based video decoding. Demonstrates expertise in algorithm parallelization and GPU performance optimization.

Technical Skills

Languages: C (expert), Assembly (x86/ARM/RISC-V), GLSL/HLSL, Haskell (expert), Python, Lua, Go, JavaScript, C#, Prolog

GPU: Vulkan, OpenGL, RDNA architecture, Compute Shaders, Pipeline Optimization, Memory Hierarchy Management

Performance: SIMD (SSE, AVX2, AVX512, NEON, RVV), Profiling Tools (perf, Radeon GPU Profiler, checkasm)

Systems: Linux, Mesa (RADV), Threading/Concurrency, Memory Management, Cache Optimization

Algorithms: Signal Processing, Computer Vision, Machine Learning/AI, Codec Design, Numerical Methods

Tools: Git, GDB, Toolchains (GCC/LLVM), Meson, Docker

Education

Bachelor of Science in Computer Science

Ulm University, Germany

Graduated with highest honors

2014 — 2017

Additional Information

- **Languages:** German (native), English (native), Norwegian (B2)
- **Location:** Currently based in Germany, open to relocation (e.g. Dublin, Zurich, Munich)
- **Work Authorization:** EU citizen (German)