

# NIKLAS HAAS

Staff Software Engineer — Performance Engineering, GPU Computing & Compilers

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## Professional Summary

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Performance engineering specialist with nearly 20 years of programming experience, including 7+ years optimizing production systems processing billions of operations daily. Serves as a technical committee member shaping technical direction of FFmpeg (2600+ companies) and VideoLAN (5B+ downloads), influencing decisions affecting operations at Meta, Google, Netflix, Spotify, Comcast, Twitch and more. Track record of 5x-10x performance improvements through SIMD optimization, GPU acceleration, and algorithmic innovation. Expert in low-level optimization, high-performance computing, GPU programming, and making data-driven tradeoffs between performance, quality, and complexity in production-scale systems.

## Core Competencies

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- **Performance Engineering:** Profiling, benchmarking, optimization achieving 5x-10x improvements in production systems; performance analysis and tuning for high-throughput, low-latency workloads
- **Low-Level Optimization:** SIMD programming (x86 SSE/AVX2/AVX512, RISC-V Vectors), assembly language, cache optimization, memory hierarchy tuning
- **Algorithm Design:** Developing novel algorithms and data structures; prototyping and validation; navigating tradeoffs between performance, quality, and complexity
- **Compiler Development & Language Design:** Designed and implemented 5+ domain-specific languages; experience with functional programming paradigms, type systems, program analysis, and code generation; applied programming language theory to solve practical optimization challenges
- **GPU Computing:** Vulkan compute shaders, GPU pipeline optimization, OpenGL/GLSL, parallel algorithm design for throughput-oriented workloads
- **Systems Programming:** C/C++, lock-free algorithms, concurrency, memory management, thread-safe data structures
- **Technical Leadership:** Design reviews, mentorship, cross-company collaboration (Meta, Dolby, Comcast), technical decision-making for projects with 50+ contributors

## Professional Experience

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### Independent Consultant

*January 2024 — Present*

*Self-employed · Full Time*

- Provided specialized consulting on performance optimization, algorithm design, and feature development for multimedia infrastructure
- Led complete rewrite of FFmpeg's pixel format conversion system (libswscale), achieving 4-5x average speedup through novel runtime code generation approach combining SIMD fragments at runtime

### Senior Software Engineer

*2021 — Present*

*FFlabs SAS · Remote*

- Core developer for FFmpeg, used by 2600+ companies including Meta, Google, Netflix, Spotify; work affects infrastructure processing billions of videos daily

- Led redesign of core format negotiation system, enabling support for advanced codecs across the ecosystem; coordinated implementation across multiple contributors
- Developed and published novel tone-mapping algorithm combining real-time frame analysis with psycho-visual models; algorithm adopted by multiple downstream projects
- Mentored junior engineers through code reviews and design feedback; 50+ substantial code reviews annually, focusing on maintainability, style, and correctness
- Authored first open-source implementations of industry-standard video technologies (Dolby Vision, ITU-R H.274, SMPTE RDD5, MV-HEVC), reducing industry dependency on proprietary solutions
- Debugged and fixed critical race conditions in multi-threaded processing pipeline affecting production deployments at major streaming companies

## Software Engineer

2018 — 2021

*Videolabs SAS · Remote*

- Created and maintain libplacebo, a GPU computing framework integrated into VLC, mpv, and FFmpeg; processing millions of frames daily across diverse platforms
- Designed and implemented GPU-accelerated real-time video processing pipeline using Vulkan compute shaders, achieving 10x+ performance improvements over CPU-only approaches
- Implemented advanced algorithms for HDR tone mapping, upscaling, and color management, optimized for real-time performance on GPU
- Led Vulkan integration enabling HDR and Dolby Vision playback in VLC; feature used by 50M+ monthly active users
- Contributed fixes and debugging work improving stability of the Linux AMD ecosystem, used by millions of users including Steam Deck

## Software Engineer

2018

*Pebbles Digital Media · Contract · Remote*

- Developed a Vulkan backend for use in multimedia applications
- Integrated libmpv for seamless video playback and control

## System Administrator

2015 — 2018

*Ulm University · Part-time · On-site*

- Administration of Linux servers and user-facing systems for the computer science faculty
- Managed infrastructure, security, and reliability of critical university systems
- Provided technical support and troubleshooting for faculty and students

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## Leadership & Impact

### Open Source Community Leadership

- **Technical Committee Member:** FFmpeg (50 active developers, 10,000+ commits/year) and VideoLAN (VLC media player, 200+ active contributors)

- Review and approve major architectural changes, set technical direction, resolve disputes on API design and performance tradeoffs
- **Mentorship:** Guided 10+ first-time contributors through their initial patches; several became regular contributors
- **Maintainership:** Active maintainer on FFmpeg, VLC, and libplacebo; reviewed and merged 1000+ pull requests

## Project Leadership & Adoption

- **libplacebo:** Created and maintain GPU computing framework (3,700+ commits, 50 community contributors); integrated into VLC (5B+ downloads), FFmpeg, mpv and more (17,700+ GitHub references, 660+ stars)
- **libspscale:** Led team of 3 engineers through complete rewrite achieving 4-5x performance improvement; coordinated testing across 200+ supported formats and 5+ supported architectures
- **checkasm:** Overhauled benchmarking and correctness validation tool used by 10+ major projects including FFmpeg, dav1d, and x264 (350+ GitHub references); improvements reduced benchmark runtime and noise floor by 80%+

## Technical Influence

- **Design Documents:** Authored 4+ technical design proposals for major architectural changes in FFmpeg
- **Conference Speaking:** Held 4+ presentations on optimization techniques and algorithm designs at VideoLAN Dev Days, fostering knowledge sharing across the community
- **Publications:** Author of technical documentation and blog posts; referenced during the hiring process at Open Broadcast Systems

## Technical Skills

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**Languages:** C (expert), Haskell (expert, functional programming), Assembly (x86/RISC-V), GLSL/HLSL, Python, Lua, Go, C++

**Compiler & Language Design:** Type systems, program analysis, intermediate representations, code generation, DSL design and implementation; experienced with functional programming paradigms and programming language theory

**GPU & Parallel Computing:** Vulkan, OpenGL, Compute Shaders, GPU Architecture, Pipeline Optimization

**Performance Optimization:** SIMD (SSE, AVX2, AVX512, RVV), Profiling (CPU, GPU), Cache Optimization

**Systems:** Linux, Threading/Concurrency, Memory Management, GPU Drivers (Mesa)

**Domains:** High-Performance Computing, Algorithm Design, Signal Processing, Codec Development, Real-time Systems

**Tools:** Git, GDB, GCC/LLVM, Meson, Docker

**Leadership & Communication:** Technical writing (design documents, performance analysis reports, public blog posts), cross-team coordination across distributed open-source communities

## Education

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### Bachelor of Science in Computer Science

Ulm University, Germany

*Graduated with highest honors*

2014 — 2019

## Honors & Awards

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- **Landessieger Mathematik & Informatik** (State Winner), Jugend Forscht Baden-Württemberg 2013  
*Project: Developed a Haskell library using type system metaprogramming to automatically track and verify physical units throughout computations, preventing dimensional analysis errors at compile time*

## Additional Information

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- **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)