# Christian Blume, PhD

*Principal Software Engineer*

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*bloomen*
*christian-blume*

## Summary

Results-driven, highly experienced software developer with over 14 years of expertise in high-performance computing, machine learning, and software architecture. Proven track record in contributing to innovative projects, researching solutions, and providing technical guidance. Holds a PhD in geoscience and a Master's in physics, along with peer-reviewed publications, patented technologies, conference speaking, and authorship of popular open-source libraries. Fluent in C++, Python, Rust, and experienced in Linux environments. Website: `https://bloomen.github.io`

## Core Skills

| | |
|---|---|
| Programming | C++ (11-23), C, Python, Rust, JavaScript, Java, Go, CUDA, Bash, UML, SQL, QML, Matlab |
| Libraries | Boost, Armadillo, Eigen, NetCDF4, HDF5, Qt, React, OpenMP, NumPy, Scikit, SciPy, Pandas, TensorFlow, Keras, IntelMKL, ROOT, LIBSVM, OpenCV, FFTW, inotify, dlib, LIBSVM, Curl, Juce, etc. |
| Domains | Machine Learning, High-Performance Computing, Low-Latency, Concurrency, Audio, Acoustic Sensing, Digital Signal Processing, Computer Graphics, Data Storage, Software Testing, Linux, Networking, Virtualization, Web Services |
| Languages | English (fluent), German (native), Spanish (basic), Mandarin (elementary) |

## Work Experience

Since Aug 21 **Principal Software Engineer** at **Nyriad** in Auckland, New Zealand.
- Contribute to UltraIO, Nyriad's converged storage solution exploiting both CPU and GPU
- Analyze UltraIO performance characteristics at block, file, and object level
- Pioneer a novel, highly-available cluster solution for file and object storage
- Develop a virtualization engine for UltraIO using QEMU/KVM for rapid deployments and testing
- Research erasure coding techniques on both CPU and GPU; compare performance characteristics
- Assist development teams; Provide technical guidance including software design & architecture
- Mentor a team of interns, help them productionize an internal prototype
- Tech: Linux, C++, Python, Bash, ISCSI, RDMA, Samba, NFS, MinIO, AWS S3, QEMU/KVM, Docker, REST, Pacemaker/Corosync, Keepalived, O2CB, OCFS2, XFS, Networking, Security

Apr 20 - Jul 21 **Senior Research Engineer II** at **Soul Machines** in Auckland, New Zealand.
- Contribute to the character animation engine of Soul Machine's Digital DNA Studio
- Implement novel high-performance strategies for predicting 3D geometries using machine learning and contribute to patented technologies
- Refine the facial animation engine of digital humans; collaborate with 3D artists
- Research and implement new methods to rapidly generate unique digital humans
- Design and implement various algorithms, e.g., expression transfer, geometry blending, laplace smoothing
- Develop efficient, low-latency software in C++ from libraries and command line tools to end user interfaces
- Mentoring, guide research engineers, literature and code reviews, unit testing
- Tech: Windows, Linux, C++, Python, Eigen, dlib, LIBSVM, OpenCV, Maya, Boost, HDF5

Apr 19 - Mar 20 **Senior Software Developer** at **Mega Limited** in Auckland, New Zealand.
- Develop cross-platform software in C++ for Mega's desktop and mobile applications
- Implement a novel synchronization strategy that allows for the one-way transfer of data
- Various improvements to the open-source SDK, e.g., FAT filesystem support, two-factor auth, high-speed

logging, better performance and stability
- Implement a tool to allow for the quick analysis of chat archives for monitoring purposes
- Focus on highly efficient and scalable solutions; Continuous integration and unit testing
- Tech: Linux, Windows, Mac, C++, C, Crypto, Qt, SQLite, gtest, inotify

Jul 16 - Mar 19 **Senior Software Engineer** at **Serato Limited** in Auckland, New Zealand.
- Build real-time applications (Serato DJ, Serato Studio) for the audio industry on Mac/Windows
- Develop object-oriented, multi-threaded, low-latency software in C++
- Improve graphical user interfaces using Qt and in-house GUI technology
- In-depth work with MIDI and audio interfaces and hardware
- Helped with releasing Serato DJ v2.0 and Serato Studio v1.0
- Unit testing, mentor fellow developers, sharing knowledge in seminars
- Tech: Mac, Windows, C++, Python, Bash, SQL, Qt, Boost, Juce, XCode, Visual Studio, LLDB, QML, Curl

Mar 14 - Jun 16 **Senior Software Developer, Team Lead** at **Fotech Solutions Ltd** in Calgary, Canada.
- Develop server-based Distributed Acoustic Sensing (DAS) applications on Linux
- Lead a team of four to five developers within an agile environment
- Build high-throughput, multi-threaded, low-latency software in C++ and CUDA
- Develop algorithms for data analysis, signal processing, and machine learning
- Design and implement novel noise floor estimation using support vector machines (ML)
- Design and implement a new data storage system based on HDF5 and lossless compression
- Real-time data processing, graph-based data flow, high-performance storage
- Unit testing, system testing in Python, and continuous integration
- Tech: Linux, C++, C, CUDA, Python, Ruby, Bash, SQL, SQLite, Qt, Boost, libunittest, Armadillo, NetCDF4, HDF5, LIBSVM, Eclipse, GDB, REST, Websockets, Curl

Jun 12 - Feb 14 **Software Developer** at **Blue Yonder GmbH** in Karlsruhe, Germany.
- Develop an automated cloud-based prediction service on Linux
- Object-oriented, high-performance software in Python and C++
- Build software for data analysis, web services, machine learning, user interaction
- Work with data scientists on improving predictions and feature understanding
- Build and test REST interfaces, in-depth work with relational databases
- Unit testing, system testing, and continuous integration
- Tech: Linux, Python, C++, Bash, SQL, Redis, PostgreSQL, EXASOL, Boost, CppUnit, NumPy, Pandas, Scikit, SciPy, Flask, GDB, REST, Nginx

Feb 09 - Apr 12 **Research Scientist** at **Freie Universität Berlin**, Germany.
- Predict stratospheric phenomena using machine learning and pattern recognition
- Compare methods such as neural networks and support vector machines including ensemble techniques
- Apply clustering techniques to gain insights and manage the feature space
- Develop novel high-performance applications to model high-dimensional, geophysical data
- Publish several peer-reviewed papers and present results at conferences
- Hold seminars in statistics and data analysis
- Tech: Linux, C++, Python, Matlab, Bash, NetCDF3, ROOT, TMVA, LIBSVM, FFTW, GDB, LaTeX

Sep 08 - Jan 09 **Intern** at **Siemens** in Munich, Germany.
- Build the prototype of a web interface for internal business processes using PHP and MySQL

Oct 07 - Jan 08 **Intern** at **IBM Research and Development** in Böblingen, Germany.
- Evaluate the Linux I/O Stack on an IBM Mainframe using C and C++

## Education

Feb 09 - Apr 12 **Doctorate degree** in **geoscience** from Freie Universität Berlin, Germany.
Areas of research: Atmospheric interactions, stratospheric weather and climate patterns, prediction and pattern recognition, machine learning. Develop software in C++, Python, and Matlab for machine learning, signal processing, and data analysis.
Thesis: *Statistical Learning to Model Stratospheric Variability*.
`https://refubium.fu-berlin.de/handle/fub188/13901`

Oct 05 - Jan 09 **Master's degree** in **physics** from Technical University Munich, Germany.
Specialized in particle and computational physics. Develop software in C++ for simulations and data analysis.
Thesis: *Simulation of Frictional Cooling*.
`https://bloomen.github.io/pub/simulation_of_frictional_cooling.pdf`

Feb 05 - Aug 05 **Study abroad** at Universitat de València, Spain. Majoring in physics.

Apr 03 - Feb 05 **Intermediate diploma** in physics from the University of Bonn, Germany.

## Authored Open-Source Projects (Selected)

Hosted at `https://github.com/bloomen`

**circbuf** *A circular buffer for C++20.* `https://github.com/bloomen/circbuf`

**cxxpool** *A header-only thread pool for C++.* `https://github.com/bloomen/cxxpool`

**densitas** *A C++ library for density estimation of regression problems.* `https://github.com/bloomen/densitas`

**featureimpact** *A Python package for estimating the impact of features on machine learning models.* `https://github.com/bloomen/featureimpact`

**gcl** *A graph concurrent library for C++.* `https://github.com/bloomen/gcl`

**libpca** *A C++ library for principal component analysis.* `https://github.com/bloomen/libpca`

**libunittest** *A portable C++ library for unit testing.* `https://github.com/bloomen/libunittest`

**gmlp** *A multi-layer perceptron trained via either backprop or GA.* `https://github.com/bloomen/gmlp`

**rsgrep** *A simple version of grep implemented in Rust.* `https://github.com/bloomen/rsgrep`

**scriptor** *A high-performance logger using unix/tcp sockets implemented in C++.* `https://github.com/bloomen/scriptor`

**svmegn** *A C++ wrapper library around libsvm & liblinear using the Eigen linear algebra library.* `https://github.com/bloomen/svmegn`

**transwarp** *A header-only C++ library for task concurrency.* `https://github.com/bloomen/transwarp`

**vca** *A prototype for file indexing and discovery (C++, QML).* `https://github.com/bloomen/vca`

## Public Speaking

Dec 2019 **A quick intro to Mega's open-source SDK** at Auckland C++ Meetup
`https://github.com/bloomen/talks`

Oct 2017 **Using tasks to simplify concurrency in modern C++** at Pacific++ conference
`https://youtu.be/xuL7rfkcWus`

May 2017 **transwarp - a header-only C++ library for task concurrency** at Auckland C++ Meetup
`https://github.com/bloomen/talks`

Jun 2012 **Statistisches Lernen zur Modellierung von Stratosphärischer Variabilität** at Freie Universität Berlin. PhD Defense in German language.
`https://bloomen.github.io/pub/phd_defense.pdf`

Sep 2011 **Can we statistically forecast sudden stratospheric warmings?** at 11th EMS Annual Meeting/10th European Conference on Applications of Meteorology (ECAM) (Berlin 2011) https://bloomen.github.io/pub/forecast_of_ssw_abstract.pdf

May 2010 **Investigating the occurrence of sudden stratospheric warmings with non-linear statistical methods** at General Assembly European Geosciences Union (Vienna, Austria 2010) https://bloomen.github.io/pub/occurrence_of_ssw.pdf

## Publications

Mar 2022 C. Mauger, C. **Blume**, F. Marcon Swadel, J. Shin, S. Van Hove, T. Szu-Hsien Wu. *Conversational Digital Character Blending and Generation*. WO2023187730. Filed Mar 31, 2023. https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2023187730

Jul 2012 **Blume**, C., 2012: *Statistical Learning To Model Stratospheric Variability*. Doctoral thesis, Institute for Meteorology, Freie Universität Berlin. https://refubium.fu-berlin.de/handle/fub188/13901

Jul 2012 **Blume**, C. and K. Matthes, 2012: *Understanding and forecasting polar stratospheric variability with statistical models*. Atmos. Chem. Phys., 12, 5691–5701. https://www.atmos-chem-phys.net/12/5691/2012

Jun 2012 **Blume**, C., K. Matthes and I. Horenko, 2012: *Supervised Learning Approaches to Classify Sudden Stratospheric Warming Events*. J. Atmos. Sci., 69 (9), 1824–1840. https://journals.ametsoc.org/doi/full/10.1175/JAS-D-11-0194.1

Jul 2010 SPARC CCMVal, *SPARC CCMVal Report on the Evaluation of Chemistry-Climate Models*. V. Eyring, T. G. Shepherd, D. W. Waugh (Eds.), SPARC Report No. 5, WCRP-X, WMO/TD-No. X, 2010, C. **Blume** contributed to chapter 8. https://www.sparc-climate.org/activities/previous-activities/ccmval

Aug 2009 Bao, Y., A. Caldwell, D. Greenwald and C. **Blume**, 2009: *Frictional Cooling Demonstration at MPP*. Proceedings of COOL 2009, TUM1MCCO03, Lanzhou, China. http://epaper.kek.jp/COOL2009/papers/tum1mcco03.pdf

Feb 2009 **Blume**, C., 2009: *Simulation of Frictional Cooling*. Master's thesis, Max-Planck-Institute for Physics, Technical University of Munich. https://bloomen.github.io/pub/simulation_of_frictional_cooling.pdf

## My favorite software related books

- *Clean Code: A Handbook of Agile Software Craftsmanship* by Robert C. Martin
- *The Clean Coder: A Code of Conduct for Professional Programmers* by Robert C. Martin
- *Design Patterns: Elements of Reusable Object-Oriented Software* by the Gang of Four
- *Template Metaprogramming with C++* by Marius Bancila
- *C++ Concurrency in Action* by Anthony Williams
- *A Tour of C++* by Bjarne Stroustrup
- *Effective Modern C++* by Scott Meyers
- *The Rust Programming Language* by Steve Klabnik & Carol Nichols et al
- *Programming in Python 3* by Mark Summerfield
- *The Go Programming Language* by Alan A. A. Donovan & Brian W. Kernighan
- *Quantitative Finance - An Object-Oriented Approach in C++* by Chapman & Hall

## Hobbies

- Passionate about volleyball, running, and various outdoorsy activities
- Enthusiastic about coffee from growing to roasting to brewing
- Actively involved in contributing to open source projects

*Please contact me for any further information or references.*