# Daniel Duclos-Cavalcanti

**Computer Engineer**

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## Summary

Creative thinker and problem-solver with a masters and bachelors in computer engineering from Germany. Today, I am in New York, collaborating on research with Dr.Sivaraman (NYU) on distributed low-latency networking on the cloud.

## Technical Skills

**Languages**: C++, Python, Golang, Rust, C, Bash, JavaScript, HTML, CSS, Lua, VHDL
**Cloud Services**: Google Cloud Platform (GCP), Amazon EC2 (AWS), Terraform, Packer, Vagrant
**Tools**: Linux, Unix Shell, Git, Github CI/CD, Jenkins, CMake, GNU Make, Bazel, Vim, VSCode
**Technologies**: Docker, ZeroMQ, DPDK, MPI, FreeRTOS, FPGA, IoT, TensorFlow, Scipy, NumPy, Pandas, OpenMP
**Verbal/Written**: German – Fluent, Portuguese – Fluent

## Experience

**Research Assistant** Jul 2022 – Oct 2022
*TU Munich* *Munich, Germany*
- Worked on TensorDSE, a Design-Space Exploration framework to guide machine learning model deployments.
- Evaluated the performance of various ML models across GPUs, CPUs and TPUs with TensorFlow Lite.
- Generated cost analysis reports for Google's Coral Edge TPU via USB traffic analysis (PyShark) during inference.
- TensorDSE used reports to distribute a model's inference/deployment optimally onto available hardware devices.

**Embedded Software Engineer – Internship** Aug 2021 – Jan 2022
*Molabo GmbH* *Ottobrunn, Germany*
- Added unit-tests (GTest) and code coverage (lcov) to safety critical features of their motor's embedded controller.
- Developed tooling for state simulations of their electric motor via Linux's virtual CAN interface and mock APIs.
- Extended their firmware update system used by 20+ clients, consisting of partial updates via CAN bus.
- Automated build and testing workflows via Jenkinsfiles, Makefiles and CMake for a team of over 10 engineers.

**Tutor - Embedded Systems Programming Lab** Apr 2021 – Aug 2021
*TU Munich* *Munich, Germany*
- Supervised and aided 20+ students on their final embedded FreeRTOS labroratory projects in C.

## Projects

**Cloud-TreeBuilder** | *GCP, ZMQ, Terraform, Python, C++, Distributed Systems, Heuristic* Mar 2024 – Present
- Launches and selects K out of N VMs in a cluster to create an optimal multicast tree of depth D and fan-out F.
- Deploys UDP based probe jobs on VM subsets, collecting data regarding their network performance (JSON).
- Applies a developed heuristic to examine collected data and select VMs for a tree layer by layer.

**Open-MPI Value Iteration** | *C++, Parallel-Computing, MPI, HPC*
- Uses MPI techniques to distribute workload across an HPC cluster to solve a stochastic navigation problem.

**Hamming Code Error Detection (16,11)** | *C, VHDL, FPGA, SoC, UART*
- Implemented an error detection/correction algorithm for packet transmission on Microsemi's SF2 FPGA/SoC.

## Publications

**Design and Implementation of A Scalable Financial Exchange in the Cloud** | *(Paper)* Jan 2024 – Present
- Novel Cloud financial exchange achieving low latency of <= 250 µs, with a difference < 1 µs for 1K receivers.
- Achieves better scalability and around 50% lower latency than the multicast service provided by AWS.
- Used kernel-bypass techniques (DPDK) to scale performance up to a 35K multicast packet rate.

## Education

**New York University: Courant Institute of Mathematical Sciences** Sept 2023 – May 2024
*Computer Science - Visiting Non-Degree Graduate Student* ***GPA 4.0***
- Co-Authored Publication: Design and Implementation of A Scalable Financial Exchange in the Cloud
- **Related Coursework**: Operating Systems, Technologies in Finance

**Technical University of Munich** Oct 2020 – Oct 2024
*M.Sc. Electrical and Computer Engineering* *Munich, Germany*
- M.Sc. Thesis: **VM Selection Heuristic for Multicast Overlay Trees in the Cloud**
- **Related Coursework**: Machine Learning Methods, Embedded Design for ML, High Performance Computing Lab

**Technical University of Munich** Oct 2016 – Sept 2020
*B.Sc. Electrical and Computer Engineering* *Munich, Germany*