

# 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

**Tools:** Linux, Terraform, Google Cloud (GCP), AWS, Docker, Packer, Git, Unix Shell, Makefile, CMake, Vim, VSCode

**Frameworks:** ZeroMQ, DPDK, MPI, Protobufs, Pydantic, Tensorflow, Scipy, Numpy, Pandas, Jenkins, Travis CI

**Technologies:** Cloud Computing, Computer Networking, Operating Systems, Machine Learning, HPC, FPGAs

**Certificates:** UCSD: Data Structures Fundamentals, UT Austin: Embedded Systems - uC I/O

**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 onto a set of available hardware devices.

#### Embedded Software Engineer

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, Make and CMake for a team of over 10 engineers.

### PROJECTS

#### Cloud TreeFinder | *GCP, Terraform, Python, C++, Distributed Systems, ZMQ, Protobufs*

March 2024 – Present

- Launches a cloud cluster and from a pool of N VMs, creates an optimal multicast tree of depth D and fanout F.
- Deploys probe jobs on randomly selected node subsets, collecting and processing resulting reports (JSON).
- Applies a developed heuristic from the collected data to select nodes in the tree layer by layer.
- Uses terraform to manage cloud state, ZMQ for node communication and Protobufs for data (de)-serialization.

#### Open-MPI Value Iteration | *C++, Parallel-Computing, MPI*

Sept 2021 – Feb 2022

- Asynchronous pipeline using OpenMPI to scatter workloads across an HPC cluster and gather results.

### PUBLICATIONS

#### Design and Implementation of A Scalable Financial Exchange in the Cloud | *(Paper)*

Jan 24 – Present

- Cloud financial exchange achieving low latency of  $\leq 250 \mu s$  and a latency difference  $< 1 \mu s$ , 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-Authoring 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*

- M.Sc. Thesis: **VM Selection Heuristic for Multicast Overlay Trees in the Cloud**
- **Related Coursework:** Machine Learning Methods and Tools, Embedded Design for Machine Learning, Chips Multicore Processors, Secure SoCs for IoT, High Performance Computing for Machine Intelligence

#### Technical University of Munich

Oct 2016 – Sept 2020

*B.Sc. Electrical and Computer Engineering*