

# 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.

### 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.
- Uses terraform to manage cloud state, ZMQ for node communication and Protobufs for data serialization.

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

- An HPC prototype that solves a stochastic navigation problem through Asynchronous Value Iteration (AVI).
- Uses MPI techniques to iteratively distribute workload across an HPC cluster and gather results.

#### 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  $\leq 250 \mu s$ , with a 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-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, Computer Networks, High Performance Computing Lab  
Embedded Design for Machine Learning, Embedded Systems Programming Lab, Secure SoC for IoT

#### Technical University of Munich

Oct 2016 – Sept 2020

*B.Sc. Electrical and Computer Engineering*

*Munich, Germany*