# Daniel Duclos-Cavalcanti

**Computer Engineer**

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## Summary

Creative thinker and problem-solver with a masters and bachelors in traditional german electrical engineering. 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, C++, Python, Golang, Rust, Bash, JavaScript, HTML/CSS, Lua, VHDL, Tcl
**Tools**: Terraform, Docker, Packer, AWS, Google Cloud (GCP), Git, Unix Shell, Makefile, CMake, Linux, Jenkins, Vim
**Technologies**: Cloud Computing, Computer Networking, Machine Learning, TCP, UDP, IP, FPGA, RTOS, IoT, HPC
**Frameworks**: ZeroMQ, DPDK, Tensorflow, TFLite, Numpy, Pandas, OpenMPI, OpenMP
**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*
- Generated reports to establish a Design-Space Exploration framework to guide ML model deployments.
- Evaluated and compared the performance of various Machine Learning models across GPUs, CPUs and TPUs.
- Analyzed USB traffic through PyShark between the host and externally added TPUs.

**Embedded Engineer Intern** Aug 2021 – Jan 2022
*Molabo GmbH* *Ottobrunn, Germany*
- Developed tooling for state simulations of their electric motor via Linux's virtual CAN interface and mock APIs.
- Added unit-tests and code coverage to safety critical features of their motor drive embedded controller.
- Automated build and testing workflows via Jenkins 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 TreeFinder** | *GCP, Terraform, Python, C++, Distributed Systems, ZMQ, Protobufs* March 2024 – Present
- Launches a cloud cluster and from it's pool of **N** VMs **forms** 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++, Multi-Threaded, HPC* Sept 2021 – Feb 2022
- Asynchronous value iteration model to distribute workload on an HPC cluster.

## Publications

**Jasper: Fair Multicast for Financial Exchanges in the Cloud** | *(Paper)* Jan 24 – Present
- Novel cloud hosted financial exchange achieving low latency multicast service for up to 1000 market participants.
- Achieves better scalability and around 50% lower latency than the multicast service provided by AWS.
- Used kernel-bypass techniques (DPDK) to achieve ultra-low latency at up to 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: Jasper: Fair Multicast for Financial Exchanges 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*