

# Quentin Guilloteau

**PhD Student** in Computer Science at UGA  
LIG CTRL-A & LIG DATAMOVE Teams

+33 778 540 189 • [Quentin.Guilloteau@univ-grenoble-alpes.fr](mailto:Quentin.Guilloteau@univ-grenoble-alpes.fr) • <https://guilloteauq.github.io>

## RESEARCH INTERESTS

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*Distributed Systems, Reproducible Research, Performance Evaluation, Autonomic Computing*

## EDUCATION

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| SEPT. 2017 - JUNE 2020 | Student in <b>COMPUTER SCIENCE</b><br>at <b>ENSIMAG</b> , Grenoble (Engineering School)<br>along with a <b>Master of Sciences in Informatics</b> (MoSIG)<br><u>Specialization</u> : Digital Infrastructure |
| SEPT. 2015 - JULY 2017 | <b>Intensive 2-year-degree in Maths, Physics and Computer Science</b><br>to prepare for the admission to the main French engineering schools<br>at Lycée Camille Guérin, Poitiers (France)                 |
| JULY 2015              | <b>Baccalauréat in Sciences</b> , with option in Computer Science<br>at Lycée Isaac de l'Etoile, Poitiers (France)<br>Highest Honours  |

## RESEARCH AND TECHNICAL EXPERIENCES

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### PhD Student at Université Grenoble Alpes

Date: October 2020 - September 2023

Place: Université Grenoble Alpes, France

Supervisors: Dr. Eric RUTTEN (CTRL-A) and Dr. Olivier RICHARD (DATAMOVE)

Title: Autonomic management of HPC cluster resources with a control-based approach

Description: Continuation of the M2 Internship. The research work will consist of designing and implementing a runtime management of resources based on feedback loops, targeting in particular the computation platform CiGri, a lightweight, scalable and fault-tolerant grid system which exploits the unused resources of a set of computing clusters. It interacts with the computing clusters through the Resource Job Management System OAR, a batch scheduler software, developed in the DATAMOVE team. Support from CTRL-A and Gipsa-lab Grenoble will target the design of the software architecture of the self-adaptation infrastructure and the control algorithms. The energy consumption of the cluster is one of the main motivation for improving the runtime management.

### Master Intern at LIG

Date: February 2020 - June 2020

Place: Laboratoire d'Informatique de Grenoble (LIG), France

Supervisors: Dr. Eric RUTTEN (CTRL-A) and Dr. Olivier RICHARD (DATAMOVE)

Description: HPC systems have become more and more complex to manage due to the increase in the number of machines and also to the increase in usage. The variations in their behavior (e.g. in performance or in power consumption) make them truly unpredictable. An example could be the difference in performance for an application executing read and write operations on a file-server depending on the number of users querying this server. This situation requires runtime management, which is usually done by humans. But such systems are too large to continue being manually administrated and must be automated to avoid slow or error-prone manipulations by humans. Managing such phenomena must be done online based on real-time measurements performed during execution.

**Control Theory** provides tools to manage and regulate complex dynamical systems.

The goal of this internship is to apply Control Theory methods to minimize the under-use of resource in a computing cluster. We will focus on two measured values: the usage of the cluster and the load of the cluster's file-server.

This work is based on the work of previous interns.

The main steps are:

- Modelling of the HPC system
- Implementation of a controller adapted to the model
- Experimental validation of the model

## Software Intern at Tait Communications

Date: June 2019 - September 2019

Place: Tait Communications, Christchurch, New-Zealand

Supervisor: Lionel HOPGOOD

Description: Tait Communications is a company producing radios. Unit radios are interfaced with a base-station that administrates a network. A feature proposed by the company is an API server to query information about the network, the radios, etc. Thus the base-station needs to communicate with a database storing server, in order to send the new events (new call, location of radio, etc).

The goal of this internship was to **develop, using the Rust programming language, an adaptor between the base-station and the server**. The code written during this internship has been deployed into production and is being used by customers around the world.

## Research Intern at LIG

Date: January 2019 - May 2019 (Part Time), June 2019 (Full Time)

Place: Laboratoire d'Informatique de Grenoble (LIG), France

Supervisor: Dr. Frédéric WAGNER (DATAMOVE)

Description: Parallel algorithms should not depend on the architecture of the machines they run on. Techniques, such as **adaptive algorithms**, have been developed to make abstraction of the architecture of the machines. Adaptive algorithms are algorithms that can change their behavior based on various parameters: size of the input, number of threads available in the system, etc

This work consisted of the first steps of implementing an adaptive mergesort algorithm in the Rust programming language. We implemented an adaptive version of the "classical" mergesort that divides the work in two parts, and optimized it from the results of our experiments. The optimizations focused on improving memory usage as well as time of execution by adapting the sequential fallback of the algorithm. We then compared its performance to the sorting algorithms of standard parallel libraries (OpenMP, TBB). The results show that our version performed better than parallel libraries sorts in most situations.

## Summer Intern at Alstom

Date: July 2018 - August 2018

Place: Alstom, La Rochelle, France

Supervisor: Eric MARC

Description: Alstom is a company designing and producing Trains and Tramways. Almost every material in a train must respect international fire safety standards. For every new train, employees have to go through each piece in the Bill of Materials and specify if it has to be put in a compiled document (based on size, material, etc) that will be approved by a competent authority.

The goal of this internship was to **develop a user-friendly VBA application** to automatize this hand-made process. The developed application managed to accelerate the completion of this process by a factor more than 10.

## Research Intern at LIG

Date: June 2018

Place: Laboratoire d'Informatique de Grenoble (LIG), France

Supervisor: Dr. Frédéric WAGNER (DATAMOVE)

Description: With the development of the work-stealing paradigm in parallel libraries, it is more and more complex to know how truly behaves a parallel program. In order to understand it fully, an idea is to visualize the execution.

The goal of this internship was to start **developing a library for the Rust programming language to be able to visualize the execution of parallel programs** that are using the Rust parallel library Rayon. This work set the base of a now fully operational visualizing library: **rayon-logs**.

## PUBLICATIONS & COMMUNICATIONS

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### International conferences

- [C1] Quentin Guilloteau, Jonathan Bleuzen, Millian Poquet, and Olivier Richard. “Painless Transposition of Reproducible Distributed Environments with NixOS Compose”. In: *CLUSTER 2022 - IEEE International Conference on Cluster Computing*. Vol. CLUSTER 2022 - IEEE International Conference on Cluster Computing. Heidelberg, Germany, Sept. 2022, pp. 1–12. URL: <https://hal.science/hal-03723771>.
- [C2] Quentin Guilloteau et al. “Model-free control for resource harvesting in computing grids”. In: *CCTA 2022 - Conference on Control Technology and Applications, CCTA 2022*. Trieste, Italy: IEEE, Aug. 2022. DOI: 10.1109/CCTA49430.2022.9966035. URL: <https://hal.science/hal-03663273>.
- [C3] Quentin Guilloteau, Olivier Richard, Bogdan Robu, and Eric Rutten. “Controlling the Injection of Best-Effort Tasks to Harvest Idle Computing Grid Resources”. In: *ICSTCC 2021 - 25th International Conference on System Theory, Control and Computing*. Iasi, Romania, Oct. 2021, pp. 1–6. DOI: 10.1109/ICSTCC52150.2021.9607292. URL: <https://hal.inria.fr/hal-03363709>.

### National conferences

- [N1] Quentin Guilloteau, Adrien Faure, Millian Poquet, and Olivier Richard. “Comment rater la reproductibilité de ses expériences ?” In: 1-9 (July 2023). URL: <https://hal.science/hal-04132438>.
- [N2] Quentin Guilloteau, Jonathan Bleuzen, Millian Poquet, and Olivier Richard. “Transposition d’environnements distribués reproductibles avec NixOS Compose”. In: (July 2022), pp. 1–9. URL: <https://hal.science/hal-03696485>.
- [N3] Quentin Guilloteau, Olivier Richard, and Éric Rutten. “Étude des applications Bag-of-Tasks du méso-centre Gricad”. In: (July 2022), pp. 1–7. URL: <https://hal.science/hal-03702246>.
- [N4] Quentin Guilloteau, Olivier Richard, Eric Rutten, and Bogdan Robu. “Collecte de ressources libres dans une grille en préservant le système de fichiers : une approche autonome”. In: (July 2021), pp. 1–11. URL: <https://hal.inria.fr/hal-03282727>.

### Working papers

- [W1] Quentin Guilloteau. “Simulating a Multi-Layered Grid Middleware”. working paper or preprint. May 2023. URL: <https://hal.science/hal-04101015>.
- [W2] Quentin Guilloteau, Olivier Richard, Raphaël Bleuse, and Eric Rutten. “Folding a Cluster containing a Distributed File-System”. working paper or preprint. 2023. URL: <https://hal.science/hal-04038000>.
- [W3] Quentin Guilloteau. “Parallel Dithering: How Fast Can We Go ?” M2 Project. Mar. 2022. URL: <https://hal.science/hal-03594790>.

### Theses

- [T1] Quentin Guilloteau. “Minimizing Cluster Under-use using a Control-Based Approach”. Internship report. Grenoble INP Ensimag ; Université Grenoble Alpes, June 2020. URL: <https://hal.inria.fr/hal-03167242>.

## Tutorials

- [P1] Quentin Guilloteau, Jonathan Bleuzen, Millian Poquet, and Olivier Richard. *Initiation to NixOS Compose*. URL: <https://nixos-compose.gitlabpages.inria.fr/tuto-nxc/> (visited on 07/10/2023).
- [P2] Quentin Guilloteau et al. *Introduction to Control Theory for Computer Scientists*. URL: <https://control-for-computing.gitlabpages.inria.fr/tutorial/intro.html> (visited on 07/10/2023).

## Software

- [SW1] Quentin Guilloteau, Jonathan Bleuzen, Millian Poquet, and Olivier Richard. *NixOS-Compose*. 2022. URL: <https://gitlab.inria.fr/nixos-compose/nixos-compose>.

## TEACHING

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### Polytech Grenoble, Univ. Grenoble Alpes, Grenoble, France (94h)

Algorithms and Imperative Programming • 2020-2022 • 38.5h/year • undergraduates

Introduction to C and Algorithms • 2022-2023 • 17h /year • undergraduates

### UFR IM2AG, Univ. Grenoble Alpes, Grenoble, France (48.5h)

Algorithms and Modelisation • 2020-2022 • 16.5h/year • undergraduates

Parallel Algorithms • 2021-2022 • 9.5h/year • undergraduates

Tutoring software project • 2020-2021 • 6h/year • undergraduates

## SUPERVISION

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Co-supervision of 4 second-year master students in Control Theory (3 MiSCIT, 1 Politecnico di Milano)

Co-supervision of 3 first-year master students in Computer Science (3 Polytech Grenoble)

## LANGUAGES

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ENGLISH:	Fluent (TOEIC: 960/990)
FRENCH:	Mother-tongue
GERMAN:	B1