

## EXPERIENCE

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- **OTIV (Remote operation of semi-autonomous rail vehicles)** Ghent, Belgium  
*Mid-level software engineer (Rust)* *Apr. 2024 - current*
  - **Distributed systems:** Write real-time, dynamic presence detection and monitoring system for network-connected devices inside a system to operate freight trains remotely. Co-author and maintain a large codebase in Rust (within a team of 5).
  - **Developer tools:** Implement fundamental integrations between editors, language servers and build systems, used company-wide. Write internal documentation for developers. Maintain build system, toolchains, internal and external dependencies. Maintain CI/CD pipelines.
  - **Mentorship:** Mentor and coach members of the internal software teams. Assist team members in debugging and understanding type systems, concurrent, async and generic programming. Organise and lead internal training sessions about software engineering. Perform company-wide code reviews.
  - **Tests:** Write extensive unit tests for software modules. Implement integration tests based on requirements given by railway companies. Use Docker and containerization to simulate network interactions between subsystems.
  - **Native GUI:** Implement multiple, immersive, multi-monitor, graphical, native, desktop user-interfaces. Implement customised graphical widgets representing live-streaming data tables and updating geographical maps with routes, mostly using Slint and Rust. Integrate graphical user-interfaces with live audio- and video-streams using GStreamer.
- **Inbiose (Microbial production of speciality carbohydrates)** Ghent, Belgium  
*Software engineer (Rust, Typescript)* *June 2021 - January 2024*
  - **Micro-biotechnology:** Learn scientific fundamentals of cellular cloning, fermentation and chemical down-stream processing. Get involved in lab activities with lab workers, operators and researchers.
  - **Web-development:** Create graphical web-based data collection procedure and application for the down-stream processing department. Create accompanying simple time-series and data-grid visualisation widgets with Svelte. Single-developer team.
  - **Bio-informatics:** Implement property-based unit tests in Python to verify correctness of batch operations on internal, proprietary genetic data. Extend and maintain internal tools for bio-informatics.
  - **Embedded systems:** Operate industrial small-scale microbial fermentation robots. Interface with legacy hardware and optical industrial sensors. Write (low- and) high-level fermentation control software with Rust.
  - **Data modelling:** Analyse and model internal scientific processes. Model and construct scientific databases. Learn and graph-oriented databases.
  - **Mentorship:** Assist embedded engineers in optimising C programs for micro-controllers. Coach engineers in learning and using modern software design patterns in Python. Organise regular training sessions.
  - **Software architecture:** Introduce Rust as a language for writing complex control software. Introduce TypeScript as a tool for creating large web applications. Give workshops for new technologies.
- **CVO (Adult and refugee high-school)** Leuven, Belgium  
*Mathematics guest lecturer* *Sept. 2020 - Jan. 2021*
  - **Automation:** Write a script in Python and LaTeX to generate arithmetic problem-sheets for students on-demand and save time during preparation of lectures.
  - **Teaching:** Prepare lectures for adult students with learning difficulties or refugee status. Give introductions to the history of mathematics and latest development. Write and grade exams.

## MAJOR PROFESSIONAL PROJECTS

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- **Presence detection system** OTIV  
*Distributed, peer-to-peer systems, back-end (Rust)* *Sept. 2024 - Dec. 2025*
  - **Heart monitor:** Keep track of all peers and subsystems, currently connected on the network, between a remote human operator and a semi-autonomous freight train.
  - **Heart:** Broadcast heartbeats as part of a custom heartbeat protocol to broadcast presence.
- **Fermentation robot** Inbiose  
*Robotics, automation (Python, Rust)* *Oct. 2023 - April 2024*

- **Serial communication abstraction layer:** High-level and safe API in Rust for COM devices. Error detection and propagation.
- **Fermentation process manager:** Add nutrients and chemicals throughout a 48h biological process for growing bacteria. Detect anomalies and stabilise with PID-control.

Inbiose

### • Distributed data-grid

*Collaborative software, UX, UI design (Typescript, Svelte)*

*Apr. 2023 - Feb. 2024*

- **Distributed data-frames:** Distributed, database-backed, persisted data-grid.
- **Spreadsheet interface:** Interactive table view for lab workers to enter chemical process data with columns grouping and multiple cell types.

## HOBBY PROJECTS

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- **Splitting data streams (Rust):** A combinator in Rust to split data streams / asynchronous iterators. Intended to be used in critical points with many, simultaneous forks. Built with low-level asynchronous primitives such as Waker, Poll and Pin. Available as a public Rust crate.
- **Reactive operators (TypeScript):** Create observables from one or more input observables using Typescript. Available at [vvhulle/reactive](https://github.com/vvhulle/reactive).

## SPOKEN LANGUAGES

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- **English:** Native (20 years).
- **Dutch:** Native (30 years).
- **French:** Advanced (8 years).
- **German:** Basics (2 years).
- **Mandarin Chinese:** Basics (3 years).

## PROGRAMMING LANGUAGES (USED PROFESSIONALLY)

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- **Rust:** Advanced (2 years). Specialized in trait bounds and life-times. Frameworks used: Axum (web server), Tokio (asynchronous runtime), Zenoh (publish-subscribe), Serde (serialization), Prost (protobuf), Bazel (build system).
- **TypeScript, JavaScript:** Advanced (3 years). Specialized in reactivity and stream-based programming. Frameworks used: Express (web servers), Svelte and SvelteKit (modular front-end), Node.JS and Deno (Javascript runtimes).
- **Python:** Advanced (6 years). Bio-informatics with BioPython. Typing with MyPy. Property-based testing with Hypothesis (fuzzer).

## EDUCATION

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- **KU Leuven** Leuven, Belgium  
*Preparation program and Master of Science in Theoretical Physics (terminated early)* *Sep. 2019 – April 2021*
  - **Completed courses:** Statistical mechanics, data mining and neural networks, thermodynamics, analytical mechanics, electrodynamics.
  - **Volunteering roles:** Guide for international students.
- **KU Leuven** Leuven, Belgium  
*Master of Science in Pure Mathematics (Eng.), thesis on functional progr. lang.* *Sep. 2017 – June 2019*
  - **Completed courses:** Algebra, analysis, discrete mathematics, differential geometry, unified geometry, topology.
  - **Volunteering roles:** Coordinator of Groot-Begijnhof Leuven student association.
- **VUB** Brussels, Belgium  
*Bachelor of Science in Mathematics, Minor Computer Science, thesis on unsupervised learning* *Sep. 2013 – Aug. 2017*
  - **Completed courses:** Functional programming, algorithms and data-structures, logic, analysis, algebra, philosophy, geometry.
  - **Student job:** Mathematics tutor.

## HOBBIES

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- **Community founder:** Founder of the community “Systems Programming Ghent”, a community for systems programmers in Ghent. Goal is to learn from others. Created a website which is available at [sysghent.be](https://sysghent.be).
- **Programming language design:** Studies design and implementation of strongly-typed programming languages such as Coq, Agda (proof assistants) and Haskell. Keeps an eye open for new upcoming programming paradigms.
- **Social dancing:** Over the years I took courses in kizomba, rock 'n roll, swing, forro, salsa, bachata, folk.