willemvanhulle@protonmail.com
www.willemvanhulle.tech
+32 479 080 252

# Willem Vanhulle

## Experience

**OTIV** (Railway automation) Ghent, Belgium
*Software engineer* *Apr. 2024 - June 2025*

- **Distributed systems:** Remote freight train control system, async iterator toolkit, real-time connectivity monitoring, video and telemetry streaming, state machines. (`Rust`, `Tokio`)
- **Developer tooling & IDE integration:** Created custom tooling to integrate Rust LSP, Clippy linting, and formatting with Bazel build system. Implemented lint-on-save functionality. Led technical migration from Bazel to Cargo for better developer experience. (`Rust`)
- **Real-time user interfaces:** Multi-monitor desktop application, live-streaming data tables. (`Rust`, `Slint`)
- **Embedded systems:** Developed software for real-time hardware control (touchscreens, physical levers, sensors).

**Inbiose** (Biotechnology) Ghent, Belgium
*Software engineer* *June 2021 - April 2024*

- **Collaborative scientific interfaces:** Built large-scale collaborative web application for biotechnological process data management. Real-time multi-user data grids, D3.js time-series visualizations, automated data parsing from scientific instruments. (`TypeScript`, `JavaScript`, `Svelte`, `D3.js`)
- **Industrial control:** Automatic control industrial fermentation robot, integrate optical sensors. (`Python`, `Rust`, `C++`)

**Independent & school** (Education) Brussels & Leuven, Belgium
*Part-time mathematics lecturer & tutor* *Nov. 2014 - Jan. 2021*

- **Mathematics education:** Taught analysis, statistics, and linear algebra as tutor. (`Python`, `LaTeX`)

## Major professional projects

**Emergency breaking mechanism** - OTIV *Sept. 2024 - Mar. 2025*

- **Real-time monitoring:** Heartbeat system detecting connection failures.
- **Stream processing:** Stream aggregator to trigger emergency breaking.

**Fermentation robot** - Inbiose *Oct. 2023 - April 2024*

- **Cross-language development**: Comprehensive error handling and testing.
- **Real-time industrial control:** Control 48h fermentation process.

## Formal verification & theorem proving

**Lean community building:** Started first Lean event in Ghent through workshop. Active on official Lean communication channels (Zulip). (`Lean`)

**Lean metaprogramming:** Developed probability arithmetic library for formal mathematics. To be merged in Mathlib. See GitHub. (`Lean`, `Mathlib`)

**Educational theorem proving:** Created interactive problem-solving workshop using dependent types. Implemented custom elaboration, delaboration, and unexpanders. See GitHub. (`Lean`)

## Research & publications

**Academic writing & technical blogging:** Published master's thesis on cubical type theory and active technical blog covering formal methods and programming. See thesis and blog. (`Agda`, `Coq`)

**Conference presentations & community leadership:** Presenting at EuroRust 2025, attended RustWeek 2025. Founded and organizes technical communities (sysghent.be). Regular speaker at technical meetups.

## Open-source contributions

**NixOS ecosystem contributions:** Active contributor to NixOS nixpkgs repository. Packaged MCP server for Lean LSP integration with Claude Code. See pull request. (`Nix`)

**Published libraries & tools:** Functional stream processing library using async iterators. Conference talk at EuroRust. See crate and talk. (`Rust`)

## Spoken languages

**English, Dutch:** Native

## Education

**University of Utrecht** (Summer School) — Utrecht, Netherlands
*Formalizing mathematics in Lean* — *July 2025 - July 2025*
Thesis: Formal bayesian inference in Monty Hall

- **Courses:** Lean, Proof-assistants, Dependent type theory, Formal methods and Functional programming.

**KU Leuven** (University) — Leuven, Belgium
*Master Pure Mathematics* — *Sep. 2017 - June 2019*
Thesis: Models of univalence in cubical sets - one year research at DistriNet on formalising algebra using cubical type theory

- **Courses:** Cubical type theory, Category theory, Mathematical logic, Algebra, Topology, Formal methods and Programming language semantics.
- **Volunteering:** Coordinator student association.

**VUB** (University) — Brussels, Belgium
*Bachelor of Science in Mathematics, Minor Computer Science* — *Sep. 2013 - Aug. 2017*
Thesis: Functional analysis and machine learning

- **Courses:** Functional programming (Lisp, Scheme), Philosophy of mathematics (presented on Coq), Compiler construction (Haskell), Algorithms and data-structures, Mathematical logic, Analysis and Algebra.
- **Volunteering:** Managing computer rooms and mathematics tutoring.

## Hobbies

**Community founder:** Founder of sysghent.be. Talks, workshops, networking in Ghent about systems programming.

**Electronics:** Assemble electronical circuits with simple sensors. Some experience with ARM and RISC-V boards such as ESP32c6, Arduino Uno (AVR), Raspberry Pico (RP2040).