

# Samuel Balco

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Research Software Engineer with a PhD in Computer Science, specialising in functional programming, especially Haskell and Nix, theorem provers and formal verification.

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## Employment

### Runtime Verification

#### Haskell Engineer

REMOTE

April 2022 – present

Working on the development of the symbolic execution engine used by the [K Framework](#). Also developed the [kup](#) utility, providing simple and user friendly way to install the K framework.

### Plow Technologies

#### Research Software Engineer

REMOTE

February 2021 – April 2022

Created [Inferno](#), a functional, statically typed scripting language built in Haskell, which powers the scripting capabilities of the [OnPing SCADA](#) platform. Interesting features of the language include content addressable storage of programs and type-class resolution using a SAT solver.

### University of Leicester

#### Research Software Engineer in the Department of Genetics

LEICESTER, UNITED KINGDOM

March 2020 – January 2021

Worked in the bioinformatics group, led by Professor Anthony J. Brookes, building tools for data discovery and access, using React, PHP, Python and Haskell. Developed and open sourced the [quickjs-hs](#) library, used to interact with the [QuickJS](#) JavaScript engine.

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## Skills

**Programming languages:** Haskell, Python, ReScript, JavaScript (React), Scala, Java, PHP, Isabelle/HOL, Agda, Lean

**Technologies:** Nix, Docker, CI/CD (Github Actions/Microsoft Azure), Cloud (Google Firebase/Heroku), Databases (Postgres/MySQL/Neo4j), REST services, SMT solvers (Z3/CVC4)

**Languages:** English (*native speaker*), Slovak (*native speaker*), German (*elementary proficiency*)

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## Education

### University of Leicester

#### PhD in Computer Science

LEICESTER, UNITED KINGDOM

October 2016 – September 2020

- Helped design the [2019 Compiler Construction](#) and [2019 Programming Languages](#) courses at Chapman University.
- Worked on string diagrams and a new version of the [calculus toolbox](#).
- Was the team leader of the university team at the [Audi Autonomous Driving Challenge 2018](#).
- Was one of the organisers of [MGS 2017](#), a graduate Easter school in Computer Science.

### University of Oxford

#### Master's degree in Computer Science

OXFORD, UNITED KINGDOM

October 2015 – September 2016

Final thesis on formalising intersection types along with proofs of subject invariance for the  $\lambda$ -Y calculus. The thesis and code is available on [GitHub](#).

### University of Leicester

#### Bachelor's degree in Computer Science

LEICESTER, UNITED KINGDOM

September 2012 – June 2015

Dissertation on formalising display calculi in Isabelle/HOL and building a supporting toolbox for reasoning about their properties in Isabelle, which was presented at the [ALCOP 2015](#) conference in Delft.

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## Publications and open source projects

[Inferno scripting language](#) <https://github.com/plow-technologies/inferno>

[Software Tool Support for Modular Reasoning in Modal Logics of Actions](#) S. Balco, S. Frittella, G. Greco, A. Kurz, A. Palmigiano, *Proc. ITP 2018*

[Partially monoidal categories and the algebra of simultaneous substitutions](#) S. Balco, A. Kurz, *arXiv pre-print*

[Nominal String Diagrams](#) S. Balco, A. Kurz, *Proc. CALCO 2019, received the best paper award*

[Display calculi and nominal string diagrams](#) S. Balco, *PhD thesis*

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## Interests

Woodworking, TIG welding, electronics (e.g. Arduino, Raspberry Pi, ESP32), 3D printing, swimming, skiing and playing tennis. Helped build a [fort](#).