

Daniel Firth

Haskell Programmer and Mathematician.

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Summary

- 15+ years experience in Haskell.
- 8+ years experience in Nix and NixOS.
- 6+ years experience in financial services and blockchain.
- 6+ years experience in automotive and systems engineering.
- Author of Horizon Haskell — Stable Package Sets for Haskell on Nix.
- Major contributor to Cardano and Hydra.
- Polyglot with 10+ years across Python, C, C++, C#, Java, Scala, Rust, Go, Clojure, Agda, Idris.

Skills

Languages	Haskell, Idris, Agda, TypeScript, Python, Rust, Scala
Infrastructure	Nix, NixOS, Bazel, Dhall, Shake, GitLab CI, PostgreSQL
Cardano	Plutus, Hydra, eUTxO smart contracts, ZK-SNARKs
Methods	Type-driven design, domain modelling, model checking (quickcheck-dynamic), functional programming training

Experience

Software Engineer at Habito (Monzo)

2026–Present

Habito is an online mortgage broker, now part of Monzo, whose application is written in Haskell. It is a system of microservices providing both the business logic and the frontend, built with Servant and mtl, routed through habassador and orchestrated with process-compose. We use Bazel and Nix for the build and infrastructure.

Founder/CEO at Homotopic.Tech

2019–Present

Homotopic.Tech is a statically typed functional programming consultancy specialising in Haskell, Nix and Dhall. We produce open source research in domain modelling, software architecture and type-driven design, and maintain close to 100 projects in the Haskell ecosystem under permissive licenses at [Homotopic.Tech](https://homotopic.tech) and its [GitLab](https://gitlab.com). I provide consultancy, training and engineering in typed functional programming.

Our flagship project is the [Horizon Haskell Platform](#), a toolchain for producing Stable Package Sets for Haskell on Nix. We maintain public package sets on its [GitLab](#), each serving a different use case, and give open source developers and private customers direct support for their dependency chain on new versions of GHC — in public and in self-hosted settings.

Software Engineer at IOG

2023–2026

At IOG I worked on Hydra, a Layer 2 scaling solution for Cardano that uses isomorphic state channels and multi-party signatures to reduce fees and congestion on the mainnet. It is developed in Haskell with comprehensive end-to-end testing using nix and quickcheck-dynamic.

I have also designed and implemented several technologies built on Hydra, including [hydra-lightning-router](#), a Bitcoin-Lightning-style demonstration of moving funds between Hydra heads using HTLC contracts.

I worked on the demo project [hydra-doom](#), which runs Doom on Hydra: it uses a modified version of the open source chocolate-doom to store all user input as transactions and read the gamestate back from the L2 ledger, demonstrating Hydra's throughput. I ran this demonstration live at RareEvo 2025 in Las Vegas and at the Token 2049 conference in Singapore.

Smart Contract Architect at Orbis Labs

2021–2022

Orbis is a Layer 2 scaling solution for Cardano, written in Haskell, that uses ZK-SNARKS to roll up transactions from an auxiliary chain into a proof object. I led the design and engineering of the Layer 2 prover node and the Layer 1 contract that verifies its claims, using a custom effect system to construct transactions and serve API data for both layers, and a quickcheck-dynamic model checker for end-to-end correctness.

Smart Contract Engineer at Ardana

2021–2022

Ardana was a decentralised exchange protocol for Cardano. I designed the first iterations of the platform on the nascent Plutus smart contract tooling. Though unsuccessful, it led to more robust smart contract architectures in subsequent projects.

Software Engineer at Millennium

2021

I was hired by Millennium Management Global Investment to fix the architecture of a Haskell trade generation system used by one of the trading teams. This postgres, Haskell and reflex stack had fallen into disrepair and would not build outside a specific set of machines. We corrected the build issues with Nix to fully automate the development environment, and

established proper merge and release processes. We then improved the codebase throughout — Dhall configuration, extensible records, and reader patterns to simplify the transformer stack.

Software Engineer at Discovery Inc

2019

I was hired by Discovery Inc to contribute to the engineering of the Eurosport platform, a typescript react project whose team wanted to draw on functional programming through formal Haskell training. Over several weeks I trained their web developers and architects in Haskell and produced high quality video resources for new engineers. Together we built microservices using Servant and RIO, with Shake and nix for the build tooling, and the team went on to apply optics in typescript.

Senior Software Engineer / Software Architect (Codethink)

2011–2019

At Codethink we delivered a wide range of industry and R&D projects across the entire stack and open source space. The major areas I worked in:

- **Optical/Speech Recognition and Augmented Reality Systems for iOS and Android**

Delivered mobile AI frameworks and applications for analysing video and audio, integrating the opencv image processing and CMUSphinx speech recognition libraries with Unity on iOS and Android.

- **Power management software for developing and debugging prototype hardware.**

Designed and built, with a large semiconductor company, a hardware debugging system in python and QT that accepts board specifications in yaml and generates a user interface programmatically to manipulate I2C and GPIO pins.

- **Architect/Lead Engineer for the Xamarin Android Player.**

Developed Xamarin's android emulation platform, using VirtualBox as the hypervisor to replace the stock google emulator. We built a Xamarin/VS GUI for Windows and MacOS and CI to build Android ROMs at all major versions, spoofing device type, battery level, rotation, GPS and connectivity.

- **Continuous Integration/Delivery for the automotive industry.**

Redesigned several automotive companies' build processes into a declarative CI system using baserock, git and yaml, significantly reducing the overhead of live testing large component stacks on a target vehicle.

- **Research into logic frameworks for trustable software ecosystems.**

Led initiatives to bring a mathematical backbone to safety critical software, designing and teaching internal Haskell workshops — two series, called [A Non-Linear Guide To Haskell](#) and

[Rapid Applications Prototyping in Haskell](#). I also drove discussions with the community and partners on applying mathematics from other domains, including:

- SMT/SAT solvers for requirements capture and coherence.
- Arrow-based DSLs for control systems that guarantee dimensional coherence, for use with systems-theoretic process analysis (STPA).

Education

Master of Mathematics — University of Leeds

2006–2010

Harmonic Analysis, Topological Algebra, Physics

Online Educator

2010–2011

Covering Undergraduate Point-Set Topology

Open Source Work

Author of over fifty packages available on [hackage](#).

Inventor of [horizon](#), a toolchain for constructing Haskell stable package sets.

Contributions to the Idris standard library.

Further Links

- [homotopic.tech](#)
- [gitlab.homotopic.tech](#)
- [horizon-haskell.net](#)