Uma **Zalakain**

Software Engineer · Functional Programming

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I bring a blend of academic insights and practical experience to any Scala or functional programming role. During my time in academia, I've specialised in advanced functional programming and language design. During my time in industry, I've leveraged foundational functional programming principles to drive product development and incorporate complex requirements into existing distributed systems.

Professional Experience

ITV PLC — *London*

Scala Engineer — *July 2022 - present*

Product ITV News serves an average of over 1 million daily page views. Purely functional backend Scala stack using cats, cats-effect and fs2. Daily use of Kafka, PostgreSQL and Redis. Delivery through GA and Jenkins. Deployment through AWS, Docker, Kubernetes and Terraform. RESTful and GraphQL APIs. Significant emphasis on testing, including integration tests and property-based tests. Product development following agile processes. Role Actively led discussions around architectural solutions. Brought forward initiatives that generalise existing ad-hoc solutions into more powerful principled ones. Converted loose high-level ideas and into functioning, real-world solutions quickly. Re-engineered systems and codebases to simplify structure. Directly coordinated with stakeholders and responded to external bug reports. Assisted colleagues with functional programming queries, fostering a collaborative learning environment.

University of Edinburgh — *Edinburgh*

Research Assistant — *2021*

Product RISE: a functional pattern-based data-parallel language. A high-level functional Scala DSL gets compiled to high performance C, OpenMP, OpenCL and CUDA. The program is rewritten following user-defined optimisation strategies. Role Led refactoring efforts to consolidate the existing codebase and addressed longstanding issues. Interfaced with researchers actively developing new features.

Microsoft Research Cambridge — *Cambridge*

Research Intern — *2021*

Product Research on supporting *type changing operations* for *distributed data structures*. Akin to a real-time collaborative text editor, but where the data is structured and typed instead of plain text. The operations executed on the data need to be well typed and enable type changes. Role Placement in the Calc Intelligence group, took part in their day-to-day activities. Modelled a distributed system with type changing operations, defined some of its desirable properties and mechanised proofs that show they hold.

Academic Qualifications

PhD Computing Science · interrupted — *Glasgow*

University of Glasgow — *2019 - April 2022*

Machine verification of typed process calculi. Modelled typed process calculi with support for linear types, defined type safety properties, and proved they hold. Used theorem provers, dependent types and advanced functional programming techniques to mechanise the models and proofs, and verify them correct.

MSc Computing Science · with Distinction — *Glasgow*

University of Glasgow — *2018 - 2019*

BSc Hons Computer Science · First class honours — *Glasgow*

University of Strathclyde — *2014 - 2018*

Awarded Andrew McGettrick prize for outstanding performance throughout the degree (2 recipients).

Invited Talks

Errata: precision error handling in FP Scala

London Scala User Group, 2024 [presentation recording]

Proving in Constructive Mathematics by Programming in Agda

Seminar series at the Basque Center for Applied Mathematics, 2022 [presentation recording]

Theorem Proving with Dependent Types in Agda

Formal Analysis, Theory & Algorithms Seminar, 2021

An Introduction to Session Types

Mathematically Structured Programming 101 Seminar, 2020

Mechanising the Linear π-Calculus

Languages, Systems, and Data Seminar, 2020

π with leftovers: a mechanisation in Agda

- Programming Languages at the University of Glasgow, 2020
- Verification of Session Types, 2020
- Agda 'mplementors' Meeting XXXII, 2020

Machine Verification with Agda

Seminar series at the UoG, 2020

Type-checking session-typed π-calculus with Coq

- BehAPI – student talks, Leicester, 2019
- SPLV – student talks, Glasgow, 2019

Articles and Publications

Co-Contextual Typing Inference for the Linear π-Calculus in Agda [extended abstract]

(Extended abstract) Uma Zalakain, Ornela Dardha [presentation recording]

Extended abstract at Workshop on Type-Driven Development (TyDe) 2021

π with leftovers: a mechanisation in Agda [published version]

Uma Zalakain, Ornela Dardha [presentation recording]

In Proceedings of Formal Techniques for Distributed Objects, Components, and Systems (FORTE) 2021

Type-Checking Session-Typed π-calculus with Coq [thesis]

Uma Zalakain, supervised by Ornela Dardha

MSc Thesis, University of Glasgow, 2019

Evidence-Producing Problem Solvers in Agda [thesis]

Uma Zalakain, supervised by Conor McBride

BSc Thesis, University of Strathclyde, 2018

Research Activities

2021 **PLACES** Program committee member
2021 **TyDe** sub-reviewer
2021 **PLDI Artifact Evaluation Committee** Program committee member
2021 **ICE** Program committee member

Tutoring

Co-supervision of MSc theses

- Empirical study of mechanised session types, *Di Cheng*, 2021
- Typed Operations on Distributed Data Structures, *Peng Zhao*, 2021
- Encoding session types into the linear pi-calculus in Agda, *Yuan Gao*, 2021

Co-supervision of BSc theses

- Encoding session types into the linear pi-calculus in Agda, *Patryk Kaczmarczyk*, 2020
- Abalone in Haskell, *Jing Lee*, 2020

Tutoring

- CS1P, first year programming, 2021
- CS1CT, introduction to computational thinking, 2020

Language Skills

English	fluent
Basque	native
Spanish	native
Dutch	basic
Italian	basic
French	basic

Skills

Programming Languages	Scala, Agda, Haskell, Coq, Python, JS, Java, Rust, C, LaTeX
Services	PostgreSQL, Kafka, Redis
Remote interfaces	GraphQL, RESTful APIs
Delivery	Jenkins, Github Actions
Deployment	Docker, AWS, Kubernetes, Terraform
Sysadmin	NixOS & GNU/Linux administration, Bourne shells, Git