



Archibald Samuel Elliott

Computer Science PhD Student • BSc (Hons) St And, MS

I work in Program Synthesis, examining using synthesis and solver technologies within optimizing compilers. I am currently working on approaches to scaling up solver-aided compilers for image pipelines, as well as novel methods for using ILP- and SMT-solvers for resource allocation in specialised compilers.

Education

2015 → Current **PhD Computer Science & Engineering**, *University of Washington*, Seattle, WA.
I'm a member of the PLSE and Sampa Groups, advised by Rastislav Bodik.

Graduate Courses

- Principles of Programming Languages (Tatlock)
- Computer Architecture (Oskin)
- Computer-Aided Reasoning for Software (Torlack)
- Probabilistic Robotics (Fox)
- PL Analysis & Implementation (Bodik)
- Design & Analysis Of Algorithms I (Rao)
- Hardware-Software Cooptimization for ML (Ceze)

2015 → 2017 **MS Computer Science & Engineering**, *University of Washington*, Seattle, WA.

Masters Project

2017 **Putting the Checks into Checked C**, Advised by Ras Bodik and Dan Grossman.
During my time at Microsoft Research, working with David Tarditi, I developed the bounds propagation algorithm and the dynamic checks for Checked C, and performed the first evaluation as to their performance overhead.

2011 → 2015 **BSc (Hons) Computer Science**, *University of St Andrews*, St Andrews, UK, First Class Honours.
With Year Abroad (2013–2014) at the *University of Virginia*, Charlottesville, VA.

Bachelor's Dissertation

2015 **A Concurrency System for Idris & Erlang**, Supervised by Edwin Brady.
I explored how Idris could be used to reason about the behaviour of concurrent Erlang programs. This included writing an Idris to Erlang compiler, and modelling Erlang's concurrency using dependent types.

Papers

- IEEE SecDev '18 **Checked C: Making C Safe by Extension**, Archibald Samuel Elliott, Andrew Ruef, Michael Hicks, and David Tarditi. In: *IEEE Cybersecurity Development Conference (SecDev)*. Sep. 2018.
- ICFP SRC '15 **Erlang/OTP Meets Dependent Types**, Archibald Samuel Elliott. In: Student Research Competition at the International Conference of Functional Programming. Sep. 2015.
- IJPP 42.4 **Cost-Directed Refactoring for Parallel Erlang Programs**, Christopher Brown, Marco Danelutto, Kevin Hammond, Peter Kilpatrick, and Archibald Elliott. In: *International Journal of Parallel Programming* 42.4 (Aug. 2014).
- PaPEC '14 **Riak DT Map: A Composable, Convergent Replicated Dictionary**, Russell Brown, Sean Cribbs, Christopher Meiklejohn, and Sam Elliott. In: *Principles and Practice of Eventual Consistency*. 2014.

Dissertations

BSc (Hons) Archibald Samuel Elliott, **A Concurrency System for Idris & Erlang**. Bachelor's Dissertation. School of Computer Science, University of St Andrews, Apr. 2015.

Industrial Experience

- June 2018 → **Research Intern, NVIDIA**, Redmond, WA.
Aug 2018 I worked for Vinod Grover on synthesising compilers for Deep Learning and other applications.
- June 2017 → **Research Intern, Microsoft Research**, Redmond, WA.
Sept 2017 I returned to the Checked C project, again with David Tarditi, in order to continue my work on run-time bounds checks, this time examining their interactions with LLVM's compiler optimization pipeline.
- Jan 2017 → **Research Intern, Microsoft Research**, Redmond, WA.
April 2017 I worked on the Checked C project, under David Tarditi. Checked C is a language extension that aims to make C safer, by adding bounds-checked pointer types. I designed the bounds propagation algorithm and the run-time checks inserted by the compiler.
- July 2011 → **Freelance Software Engineer**, UK.
July 2015 I freelanced as a distributed systems engineer. Previous clients include *The Wine Trade Ltd* (Cambridge, UK), and *Hypernumbers* (Linlithgow, UK).
- June 2013 → **Junior Software Engineer, Basho Technologies**, Remote (London, UK & Cambridge, MA).
Sept 2014 I worked in the data types team, designing and building *Convergent Replicated Data Types* (CRDTs) for *Riak*, a distributed database. This work included writing papers and collaborating with academics in Portugal.
- June 2012 → **Research Intern, University of St Andrews**, St Andrews, UK.
Aug 2012 I worked on the *ParaPhrase* project, devising *Skel*, a parallel skeleton framework for Erlang/OTP.
- April 2010 → **Junior Software Developer, 55degrees Ltd**, Glasgow, UK.
May 2011 I built websites and other systems for a variety of both public and private sector clients.

Awards

- 2015 **Lockheed Martin Award for Software Engineering, ScotSoft 2015**, Edinburgh, UK.
For *A Concurrency System for Idris & Erlang*; Part of The Young Software Engineer of the Year Awards.

Technical Reports

- Checked C TR02 Archibald Samuel Elliott, **Putting the Checks into Checked C**. Checked C Technical Report 2. Paul G. Allen School, University of Washington, 2017.

Conference Talks

- RICON West '13 **CRDTs: An Update (or maybe just a PUT)**, Sam Elliott. At: RICON West. San Francisco, USA, 2013.
- IFL '12 **Skel: A Streaming Process-based Skeleton Library for Erlang**, Archibald Elliott. At: Implementation and Application of Functional Languages. Oxford, UK, 2012.

Teaching

- Autumn 2016 **CSE 401: Introduction to Compiler Construction**, *Teaching Assistant*, for Rastislav Bodik.

Other Interests

- Sailing I am one of the bowmen on *Bravo Zulu*, a 40' racing yacht based in Seattle, racing regularly on Puget Sound. In 2016 we were ranked 10th on the WA coast by *48° North*. I occasionally race on other boats.