# RYAN KAVANAGH

## PERSONAL INFORMATION


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## EDUCATION

*2015–Present* **Carnegie Mellon University**

*PhD Candidate*

*Computer Science*
Advisor: Stephen Brookes

*2010–2015* **Queen's University at Kingston**

*Bachelor of Computing (Honours)*

*Computing and Mathematics with Professional Internship*
GPA: 4.21/4.3 · Degree awarded with Distinction

*Fall 2014* **Independent University of Moscow**

*Math in Moscow*

A research-oriented mathematics programme

## RESEARCH EXPERIENCE

*Sept. 2015–Present* **PhD Candidate, Carnegie Mellon University**
Pittsburgh, PA, USA

*Carnegie Mellon University*

I am working on a denotational semantics for weak memory using pomsets. I presented work on such a semantics for SPARC TSO, and I am currently working on a semantics capturing the behaviours of C11 release/acquire and of non-coherent memory models. I am advised by Stephen Brookes.

*May–August 2015* **Research Intern, Microsoft Research, Ltd.**
Cambridge, UK

*Microsoft Research, Ltd.*

I worked towards formally verifying Domino, Microsoft's distributed, caching build system. Our approach consisted of extracting the core of Domino's algorithm from its C# implementation and formally verifying this "essentialised version". To ensure our "essentialised version" of Domino accurately reflected Domino's actual behaviour, I developed a framework to empirically compare their behaviours. I further developed an alternative algorithm for Domino, drawing on graph-theoretic inspirations. I was supervised by Dr. Nick Benton.

*May–August 2014* **Research Assistant, ENS Lyon**
Lyon, France

*École normale supérieure de Lyon*

I investigated how to present various bisimulation-based proof techniques in a unified way, and I developed an axiomatic theory of up-to techniques that does not depend on the monotonicity of the associated functional. A technical report presenting our results is available at arXiv:1410.2833 [cs.LO]. I was supervised by Dr. Daniel Hirschkoff.

*May–August 2013* — Research Assistant, MIT, Cambridge, MA, USA

*Massachusetts Institute of Technology*

I investigated techniques for specifying and formalising abstract data types (ADTs) with the goal of synthesising an ADT's implementation given its specification. I was supervised by Dr. Adam Chlipala.

*Jan.–April 2013* — Research Assistant, Queen's University, Kingston, ON, Canada

*Queen's University at Kingston*

I investigated ties between a discrete event system's rate of mixing and the Frobenius number in order to provide bounds for its state space look-ahead window size. I also investigated methods for computing the Frobenius number and various bounds associated with it. I was supervised by Drs. Juergen Dingel and Karen Rudie.

*Sept.–Dec. 2012* — Research Intern, Microsoft Research, Ltd., Cambridge, UK

*Microsoft Research, Ltd.*

I investigated how to formalise two software verification logics, Local Rely-Guarantee and History Local Rely-Guarantee, in the Views framework (Dinsdale-Young et al., 2013), a metatheory of concurrent reasoning principles. The proofs for Local Rely-Guarantee's formalisation were themselves formalised in Coq. I was supervised by Dr. Matthew Parkinson.

*May–August 2012* — Research Assistant, McGill University, Montreal, QC, Canada

*McGill University*

I investigated the links between functional programs and functor (co-)algebras. I further sought to understand how coinductive proofs could be understood under the Curry-Howard-Lambek correspondence. I formalised bisimulation proofs for CCS in Beluga. I then investigated the possibility of formalising Howe's method for higher-order languages in Beluga. I was supervised by Drs. Prakash Panangaden and Brigitte Pientka.

*May–August 2011* — Research Assistant, Queen's University, Kingston, ON, Canada

*Queen's University at Kingston*

I empirically studied the degree of interdependence of software packages in the Debian operating system. I presented these findings as a poster at PASED 2011. I further studied the integration of third-party software in large software distributions such as Debian, Ubuntu and FreeBSD. This work culminated in a 2015 journal article in Empirical Software Engineering. I was supervised by Drs. Bram Adams and Ahmed Hassan.

## PUBLICATIONS AND PRESENTATIONS

*Conference Talks*

*June 2017* — A Denotational Semantics for SPARC TSO

Ryan Kavanagh and Stephen Brookes. Mathematical Foundations of Programming Semantics XXXIII. (To appear.)

*Journal Articles*

*March 2015* — An Empirical Study of Integration Activities in Distributions of Open Source Software

Bram Adams, Ryan Kavanagh, Ahmed E. Hassan, and Daniel M. German. Empirical Software Engineering. Springer US. DOI: 10.1007/s10664-015-9371-y.

*Technical Reports*

*October 2014* **On Coupled Logical Bisimulation for the Lambda-Calculus**

Ryan Kavanagh and Jean-Marie Madiot. arXiv:1410.2833 [cs.LO].

*Posters*

*June 2011* **A Study of the Debian Package Ecosystem**

Ryan Kavanagh, Bram Adams, and Ahmed Hassan. Canadian Summer School on Practical Analyses of Software Engineering Data.

## TEACHING

*Fall 2017* **15-317 / 15-657: Constructive Logic**

An introductory course to constructive logics, including intuitionistic and substructural logics, and their applications to computer science. I held weekly recitations and office hours, prepared and graded assignments, and answered students' questions.

## SELECTED AWARDS

*2016* **NSERC Postgraduate Scholarship — Doctoral**

Worth 21,000 CAD per annum for three years.

*2015* **NSERC Canada Graduate Scholarship — Master's**

Worth 17,500 CAD each. Awarded by McGill University (declined) and the University of Ottawa (declined).

*2015* **St John's College Benefactors' Scholarship**

Worth the cost of University of Cambridge Consolidated Fee plus 13,900 GBP per annum, renewable for a further three years subject to Distinguished performance. Awarded by the St John's College, University of Cambridge (declined).

*2014* **CMS-NSERC Math in Moscow Scholarship**

One of two awarded Canada-wide for the fall semester. Worth 9,000 CAD. Awarded by the Canadian Mathematical Society.

*2014* **Albert Harold Lightstone Scholarship**

Second-highest standing in honours math & statistics courses entering fourth year. Worth 450 CAD. Awarded by Queen's University at Kingston.

*2014* **Nellie & Ralph Jeffery Award in Mathematics**

Worth 1,000 CAD. Awarded by Queen's University at Kingston.

*2013–2014* **Dean's Honour List with Distinction**

GPA in the top 3% of all science students' GPAs. Awarded by Queen's University at Kingston.

## OTHER INFORMATION

*Volunteer Work*

*2008–Present* **DEBIAN PROJECT**

I maintain various pieces of software for the Debian operating system. This involves bug triage, bug fixing, working with build systems, and collaborating with users, other developers, and release management. I have been a Debian Developer since 2011.

*Languages*

ENGLISH · Native speaker

FRENCH · Native speaker

December 7, 2017