RYAN KAVANAGH

PERSONAL INFORMATION

email rkavanagh@cs.cmu.edu

mail Computer Science Department
Carnegie Mellon University
5000 Forbes Ave
Pittsburgh, PA 15213-3891
United States of America

EDUCATION

2015–Present **Carnegie Mellon University**

PhD Candidate

Computer Science
Advisors: Stephen Brookes and Frank Pfenning. Defence: August 2021.

2015–2018 **Carnegie Mellon University**

Master of Science

Computer Science — Research
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 program

PUBLICATIONS AND PRESENTATIONS

Conference Talks

June 2020 **Parametrized Fixed Points and Their Applications to Session Types**

Ryan Kavanagh. Mathematical Foundations of Programming Semantics XXXVI. DOI: 10.1016/j.entcs.2020.09.008. Talk: https://youtu.be/hQjjxEFtDEY.

June 2017 **A Denotational Semantics for SPARC TSO**

Ryan Kavanagh and Stephen Brookes. Mathematical Foundations of Programming Semantics XXXIII. DOI: 10.1016/j.entcs.2018.03.025.

Workshop Talks

August 2020 **Substructural Observed Communication Semantics**

Ryan Kavanagh. Expressiveness in Concurrency/Structural Operational Semantics (EXPRESS/SOS) 2020. DOI: 10.4204/EPTCS.322.7.
Talk: https://youtu.be/-cpqXIRyUDU.

Invited Talks

October 2019 **A Domain Semantics for Higher-Order Recursive Processes**

Ryan Kavanagh. University of British Columbia Computer Science Department.

Journal Articles

May 2019 **A Denotational Semantics for SPARC TSO**

Ryan Kavanagh and Stephen Brookes. Logical Methods in Computer Science **15**(2), DOI: 10.23638/LMCS-15(2:10)2019.

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 **21**, DOI: 10.1007/s10664-015-9371-y.

Technical Reports

May 2020 **A Domain Semantics for Higher-Order Recursive Processes**

Ryan Kavanagh. arXiv: 2002.01960 [cs.PL].

April 2018 **A Denotational Account of C11-Style Memory**

Ryan Kavanagh and Stephen Brookes. arXiv: 1804.04214 [cs.PL].

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.

Miscellaneous

May 2020 **Thesis Proposal: Denotational Semantics for Session-Typed Languages**

Ryan Kavanagh. URL: https://rak.ac/~rak/proposal.pdf.

RESEARCH EXPERIENCE

Sept. 2015–Present **PhD Candidate, CARNEGIE MELLON UNIVERSITY** Pittsburgh, PA, USA

Carnegie Mellon University

I am working on denotational semantics and notions of program equivalence for session-typed languages. Previously, I worked on denotational semantics for weak memory models. I am co-advised by Stephen Brookes and Frank Pfenning.

May–August 2015 **Research Intern, MICROSOFT RESEARCH, LTD.** Cambridge, UK

Microsoft Research

I worked towards formally verifying Domino, Microsoft's distributed, caching

build system. Our approach involved extracting the core of Domino's algorithm from its C# implementation and formally verifying this "essentialized version". To ensure that our "essentialized version" of Domino accurately reflected Domino's actual behaviour, I developed a framework to empirically compare their behaviours. I also 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 formalizing abstract data types (ADTs) with the goal of synthesizing 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

I investigated how to formalize 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 formalization were themselves formalized 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 formalized bisimulation proofs for CCS in Beluga. I then investigated the possibility of formalizing 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.

TEACHING

Fall 2018 15-814: Types and Programming Languages

This graduate course provides an introduction to programming languages viewed through the lens of their type structure. I gave three of its lectures, prepared and graded weekly assignments, and held weekly office hours.

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

An introductory course on 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.

PROFESSIONAL SERVICE

2019–2020 Doctoral Admissions Committee

I read, evaluated, and helped rank approximately two hundred applications to the Computer Science Department PhD program.

SELECTED AWARDS

2019–2020 CMU Presidential Fellowship

Worth 50,000 USD.

2016–2019 NSERC Postgraduate Scholarship — Doctoral

Worth 21,000 CAD per annum for three years.

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.

2010–2012 Principal's Scholarship

Worth 4,000 CAD per annum for two years. 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 2012.

Languages

English · Native speaker

French · Native speaker

Russian · Intermediate

January 16, 2021