RYAN KAVANAGH

PERSONAL INFORMATION

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Université du Québec à Montréal
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Canada

PROFESSIONAL APPOINTMENTS

Université du Québec à Montréal

2023–Present Professeur régulier, Département d'informatique
Montréal, QC, Canada

EDUCATION

Carnegie Mellon University

2015–2021 Doctor of Philosophy

Computer Science
Dissertation: *Communication-Based Semantics for Recursive Session-Typed Processes*. Advised by Stephen Brookes and Frank Pfenning.

Carnegie Mellon University

2015–2018 Master of Science

Computer Science — Research
Advised by Stephen Brookes.

Queen's University at Kingston

2010–2015 Bachelor of Computing (Honours)

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

Independent University of Moscow

Fall 2014 Math in Moscow

A research-oriented mathematics program

PUBLICATIONS AND PRESENTATIONS

Journal Articles

April 2024 Message-Observing Sessions

Ryan Kavanagh and Brigitte Pientka. Proceedings of the ACM on Programming Languages **8**(OOPSLA1), Article 142. DOI: 10.1145/3649859.

October 2023 Mechanizing Session-Types Using a Structural View: Enforcing Linearity Without Linearity

Chuta Sano, Ryan Kavanagh, and Brigitte Pientka. Proceedings of the ACM on Programming Languages **7**(OOPSLA2), pp. 374–399. DOI: 10.1145/3622810.

May 2022 **Fairness and Communication-Based Semantics for Session-Typed Languages**

Ryan Kavanagh. Information and Computation **285**(B), 77 pp., DOI: 10.1016/j.ic.2022.104892.

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

Ryan Kavanagh and Stephen Brookes. Logical Methods in Computer Science **15**(2), 23 pp., 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**, pp. 960–1001, DOI: 10.1007/s10664-015-9371-y.

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

April 2023 **Channel-Dependent Session Types**

Ryan Kavanagh and Brigitte Pientka. Celebration in Honor of Frank Pfenning.

May 2022 **Channel-Dependent Session Types**

Ryan Kavanagh and Brigitte Pientka. NJ Programming Languages and Systems Seminar.

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 2023 **Message-Observing Session Types**

Ryan Kavanagh and Brigitte Pientka. Max Plank Institute for Software Systems.

October 2023 **Mechanizing Session Types Using a Structural View**

Chuta Sano, Ryan Kavanagh, and Brigitte Pientka. University of Malta.

October 2023 Denotational Semantics for Recursive Session-Typed Processes

Ryan Kavanagh. Institut de recherche en informatique fondamentale (IRIF).

October 2019 A Domain Semantics for Higher-Order Recursive Processes

Ryan Kavanagh. University of British Columbia Computer Science Department.

Dissertations

September 2021 Communication-Based Semantics for Recursive Session-Typed Processes

Ryan Kavanagh. PhD thesis. Computer Science Department, Carnegie Mellon University, x+313 pp. DOI: 10.1184/r1/17102318.v1

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.

Panelist

January 2023 Career Trajectories in Programming Languages

Programming Languages and Mentoring Workshop at POPL 2023.

RESEARCH EXPERIENCE

McGill University

October 2021–November 2023 Postdoctoral Researcher, Montréal, QC, Canada

I worked on dependently session-typed programming languages that specify rich communication protocols and that statically guarantee that these protocols are satisfied by communicating systems. I was supervised by Dr. Brigitte Pientka.

Carnegie Mellon University

August 2015–December 2021 Doctoral Student, Pittsburgh, PA, USA

I developed denotational semantics and notions of program equivalence for session-typed languages with recursion. I also devised compositional reasoning

techniques for weak memory models. I was advised by Drs. Stephen Brookes and Frank Pfenning.

Microsoft Research

May–August 2015 — Research Intern, Cambridge, UK

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.

École normale supérieure de Lyon

May–August 2014 — Research Assistant, Lyon, France

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.

Massachusetts Institute of Technology

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

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.

Queen's University at Kingston

Jan.–April 2013 — Research Assistant, Kingston, ON, Canada

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.

Microsoft Research

Sept.–Dec. 2012 — Research Intern, Cambridge, UK

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.

McGill University

May–August 2012 — Research Assistant, Montréal, QC, Canada

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.

Queen's University at Kingston

May–August 2011 Research Assistant
Kingston, ON, Canada

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

Université du Québec à Montréal

Winter 2024 INF1070: Utilisation et administration des systèmes informatiques

An introductory course on the fundamentals of UNIX systems. Covers shell scripting, system administration, and networking.

McGill University

Fall 2021 COMP 302: Programming Languages and Paradigms

An introductory course on functional programming and on programming language design and implementation. As co-instructor, I gave a weekly lecture, helped prepare assessments, held office hours, and coordinated teaching assistants.

Carnegie Mellon University

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.

Carnegie Mellon University

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, and prepared and graded assignments.

PROFESSIONAL SERVICE

Spring 2024 GandALF 2024, Program Committee

Spring 2024 NSERC USRA Selection Committee (UQAM)

Spring 2024 CICM 2024, Program Committee

Fall 2023 Journal of Automated Reasoning, Reviewer

Winter 2023 Eastern Canada Logic and Programming Seminar, Organizer

Fall 2022 POPL 2023 Artifact Evaluation Committee

Summer 2022 OOPSLA 2022 Artifact Evaluation Committee

Spring 2022 OOPSLA 2022 Extended Review Committee

Winter 2022 Transactions on Computational Logic, Reviewer

Winter 2022 OOPSLA 2022 Artifact Evaluation Committee

Fall 2021 OOPSLA 2022 Extended Review Committee

Fall 2021 POPL 2022 Artifact Evaluation Committee

2020–2021 Computer Science Department "Speakers Club"

I evaluated and provided feedback on presentations given by PhD students in the Carnegie Mellon University Computer Science Department for their "Speaking Skills" degree requirement.

2019–2020 Doctoral Admissions Committee

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

Winter 2018 Logical Methods in Computer Science, Reviewer

SELECTED AWARDS

2021–2023 NSERC Postdoctoral Fellowship

Worth 45,000 CAD per annum for two years.

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.

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

March 7, 2024