PRIYAA VARSHINEE SRINIVASAN

International Research Associate National Institute of Standards and Technology (NIST), MD, USA
priyaavarshinee.srin@ucalgary.ca

*I am a computer scientist and a category theorist. I am also a proponent of **compassionate math**. Compassionate Math is based on the principle that different learners take different approaches to understanding Mathematics and the beauty of any mathematical truth can be perceived irrespective of the approach to it.*

EDUCATION

Ph.D. in Computer Science Jan 2015 – Sep 2021

University of Calgary, AB, Canada CGPA: 3.88 on 4

- Research area: Quantum computing, Categorical Quantum Mechanics (CQM)

CQM is an interdisciplinary area which studies quantum foundations using techniques from theoretical Computer Science and Category Theory. During my Ph.D. I developed a categorical framework for describing quantum processes in infinite dimensions and studied applications to quantum theory. My Ph.D. thesis was recommended by the committee for a National Award.

SoTL Advancing Graduate Education in STEM (SAGES) certification Sep 2019 – Apr 2020

University of Calgary, AB, Canada PASS

I am a SAGES scholar: SAGES is a two-semesters long pedagogical program on the Scholarship of Teaching and Learning, and on the teaching practices of post-secondary education in STEM.

Master of Mathematics Sep 2012 – Dec 2014

University of Waterloo, ON, Canada CGPA: 89.83%

- Research area: Operating Systems

My Master's thesis is a systematic study on the trade-offs associated with synchronous and asynchronous program execution modes in highly multicore computers, and the effect of each mode on the throughput and the resource utilization of applications.

Bachelor of Computer Science Engineering Aug 2005 – May 2009

Madras Institute of Technology, Anna University, India CGPA: 8.88 on 10

RESEARCH EXPERIENCE

International Research Associate NIST, Maryland, USA Jan 2022 – present

(With affiliation to University of Calgary)

- Member of an inter-disciplinary team of engineers and mathematicians researching on using algebraic methods for standardization of engineering design processes.
- Performing the groundwork to estabilish a new interdisciplinary field of Compositional Systems Engineering and Design and to foster research in it. While Systems Engineering is focused on the design and integration of complex systems, the objective of Compositional Systems Engineering and Design is to study the formal logic that underpins the composition of systems and processes' models to create and implement meaningful and verifiable designs.
- As a proof of concept, in a joint project involving Chevron, Carnegie Mellon University, NIST and Topos Institute, we use structures and methods from Category Theory to model Phase 2 of oil wells design process at Chevron while developing prototype software for engineers to apply such methods in their respective design environment.

Mitacs Globallink Research Intern University of Oxford, UK Sep 2018 – Dec 2018

- Successfully proposed a research project titled, 'Complementarity in infinite dimensions', in categorical quantum mechanics for the Globallink Research Internship award of $6000
- Visited the University of Oxford and the University of Edinburgh to research under the supervision of Dr. Coecke and Dr. Heunen
- Presented my research results at the 1st Symposium on Compositional Structures at the University of Birmingham, and various other venues including University of Oxford, and University of Edinburgh.

TEACHING EXPERIENCE

Sessional Lecturer University of British Columbia, Canada Sep 2021 – Dec 2021

- Taught the 4 credits second year course, CPSC 213 – Introduction to Computer Systems, for a section of 126 students under the mentorship Dr. Mike Feely who developed the course
- Effectively assisted Dr. Feely in drafting the final exam
- Supported Dr. Feely throughout the course in various activities including drafting mid-term course survey and TA communication
- Modified the course slides throughout for effective presentation using analogies.
- Conducted a mid-term survey evaluate my teaching and to make changes early-on
- My students showed their appreciation through the high scores (> 4 out of 5) in all the quantitative sections of the end-of-term Student Experience of Instruction survey

SAGES certification Practicum University of Calgary, Canada Jan 2020 – Apr 2020

- Developed a lesson plan, and learning material for a module in the course, CPSC 313 – Computability Theory, under the mentorship of the course instructor, Dr. Renate Scheidler at the Department of Computer Science
- Delivered three 50-minute lectures on the module to a class of 125 students using Powerpoint
- Submitted a reflective report on my teaching based on the feedback from my students, course mentor, SAGES program mentor, and a fellow scholar

Teaching Assistant University of Calgary, Canada Jan 2015 – Sep 2021

I have instructed over 600 undergraduate students in the following courses via group tutorial sessions.

CPSC 457 – Operating systems for Dr. Kawash, and Dr. Federl
CPSC 313 – Computability theory for Dr. Reardon, Dr. Eberly, and Dr. Scheidler
CPSC 411 – Compiler construction for Dr. Cockett
CPSC 449 – Programming Paradigms for Dr. Cockett
In Winter 2016, I was the Head Teaching Assistant of CPSC 457 and effectively trained fellow teaching assistants in kernel programming.

Teaching Assistant University of Waterloo, Canada Sep 2012 – Dec 2014

CS 452 – Real time programming for Dr. Cowan
CS 454 – Computer networks for Dr. Karsten
CS 343 – Concurrent and parallel programming under Dr. Buhr

OTHER PROFESSIONAL EXPERIENCES

Mitacs Globallink Mentor, University of Calgary June 2019 – Sep 2019

- Provided effective on-ground support for 7 Globallink research interns from various countries including Brazil, China, Ukraine, and India on health, safety, and social support during their 4 months research assignment in Canada

Systems/Software Engineer II Aug 2009 – Jul 2012

Hewlett Packard India Software Operations (HPISO), Bangalore, India

I was part of HP Networking team that developed firmware for HP Ethernet switches. During my time as a Systems Software Engineer at HP, I completed the following major projects:

- Efficiently redesigned the Interface Manager application in embedded C language for the control ports in HP 6600 switches for enhanced utilization of Dynamic Host Control Protocol
- Along with a team member, I designed and developed the front of an in-house lab management tool using Java programming language which is currently used by more than 200 employees of HP Networking to access lab devices remotely thereby saving time
- Successfully headed the design and implementation of the command line interface of OpenFlow networking protocol in HP Networking Ethernet switches. The interface was highly appreciated by our customers for its simplicity and usability

PUBLICATIONS

(The publishing convention in Mathematics is to order the authors' names alphabetically by their last name. Hence, in NONE of the following articles, the order of the authors reflects the significance of contribution.)

Refereed journal publications

- Robin Cockett, Cole Comfort, and Priyaa V. Srinivasan. "**Dagger linear logic for categorical quantum mechanics**". Logical Methods in Computer Science, 17(5), Nov. 2021 *(PhD Work)*
- Srinivasan Arunachalam, Vlad Gheorghiu, Tomas Jochym-O'Connor, Michele Mosca, and Priyaa V. Srinivasan. "**On the robustness of bucket brigade quantum RAM**". New Journal of Physics, 17(12), 123010, Dec. 2015 (109 citations) *(Masters Work)*

  (New Journal of Physics is an open-access, peer-reviewed journal that covers topics in physics as well as interdisciplinary areas in physics with an impact factor of 3.849.)

Peer-reviewed conference proceedings

- Robin Cockett, Isabelle Jianing, Carlo Maria Scandolo and Priyaa V. Srinivasan, "**Extending monotones as Kan extensions**". To appear in the conference proceedings of 4th International Conference on Applied Category Theory, 2022 *(postdoctoral work)*
- Robin Cockett, and Priyaa V. Srinivasan, "**Exponential modalities and Complementarity**". To appear in the conference proceedings of Applied Category Theory, 2021 *(PhD work)*
- Robin Cockett, Cole Comfort, and Priyaa V. Srinivasan, "**The category CNOT**". Electronic Proceedings in Theoretical Computer Science 266, pp. 258-293, Quantum Phy. and Logic, 2017. *(PhD work)*

  (QPL is the most prestigious annual international conference in Categorical Quantum Mechanics.)

Pre-prints

- Robin Cockett, Isabelle Jianing, Carlo Maria Scandolo and Priyaa V. Srinivasan, "**Extending monotones as Kan extensions**". arXiv:2206.09784 [quant-ph, math.CT], Jun. 2022 *(Postdoctoral work)*
- Robin Cockett, and Priyaa V. Srinivasan, "**Complementarity and exponential modalities**". ArXiv: 2103. 05191 [math.CT], Mar. 2021 *(PhD work)*
- Robin Cockett, and Priyaa V. Srinivasan, "**Completely positive maps for mixed unitary categories**". ArXiv:1905.08877 [math.CT], May. 2019 *(PhD work)*
- Robin Cockett, Cole Comfort, and Priyaa V. Srinivasan "**Dagger linear logic for categorical quantum mechanics**". arXiv:1809.00275 [math.CT], Sep. 2018 *(PhD work)*
- Robin Cockett, Cole Comfort, and Priyaa V. Srinivasan "**The Category CNOT**". arXiv:1802.09737 [math.CT], Jul. 2017 *(Masters Work)*

PRESENTATIONS

Lectures

- Categorical foundations for quantum mechanics 15 Feb - 15 Apr 2017
  Lectured biweekly as part of the advanced seminar course 'Categories for Physics'.

Invited talks

- "Dagger linear logic for Categorical Quantum Mechanics", 29th Workshop in Foundations Methods in Computer Science, Kananaskis, Canada Jun 2022
- "Dagger linear logic for Categorical Quantum Mechanics", Mathematical Foundations Seminar, University of Bath, UK (online) Nov 2021
- "Preserving locality in parallel applications", Institute for Quantum Science and Technology, Calgary, Canada Oct 2014
- "Hardware and Software Trend - A Computer Scientist Perspective", Centre for Quantum Technologies, National University of Singapore, Singapore Apr 2014

Conference talks

- "Extending monotones as Kan extensions", 5th International Conference on Applied Category Theory 2021, Glasgow, Scotland Jul 2022
- "Exponential modalities and Complementarity", 4th International Conference on Applied Category Theory 2021 (online) Jun 2021
- "Complete positivity for mixed unitary categories", 16th International Conference of Quantum Physics and Logic, Orange, California Jun 2019
- "Complete positivity for mixed unitary categories", 27th Foundational Methods in Computer Science Workshop, Kananaskis, Alberta May 2019
- "Completely positive maps for mixed unitary categories", 2nd Symposium on Compositional Structures, Glasgow, United Kingdom Dec 2018
- "Dagger linear logic for categorical quantum mechanics", 1st Symposium on Compositional Structures, Birmingham, United Kingdom Sep 2018
- "Quantum Channels for mixed unitary categories", 26th Foundational Methods in Computer Science Workshop, Mount Allison University, Sackville, New Brunswick. Jun 2018
- "Categorical description of completely positive maps", Foundational Methods in Computer Science 2017 (FMCS 2017), University of Ottawa, Ontario Jun 2017
- "Resource reflecting functor and its application to non-uniformity", 20th Annual Conference on Quantum Information Processing, Seattle, Washington Jan 2017
- "Structure of quantum information resource theories", 25th Foundational Methods in Computer Science, University of British Columbia, Vancouver, BC Jun 2016
- "On the robustness of bucket brigade quantum RAM", 15th Asian Quantum Information Science Conference (AQIS 2015), Seoul, Korea Aug 2015

Poster presentations

- "Quantum Channels for mixed unitary categories", 15th International Conference on Quantum Physics and Logic, Halifax Jun 2018
- "On the Robustness of Bucket Brigade Quantum RAM", The 19th Conference on Quantum Information Processing (QIP 2016), Banff, Alberta Jan 2016
- "On the Robustness of Bucket Brigade Quantum RAM", Quantum Information Processing and Applications (QIPA 2015), Allahabad, India Dec 2015

AWARDS AND ACHIEVEMENTS

Rizvi Family Scholarship Sep 2021

- An award of 3000 CAD from the Rizvi Family for commitment to serving the university community and improving the student experience. (Award returned since I graduated in Sep'21)

Alberta Graduate Excellence Scholarship (AGES) May 2019 – Apr 2020

- An award of 15000 CAD from the Alberta Advanced Education and Technology recognizing outstanding achievement of students pursuing graduate studies in the province of Alberta.

Lockhart Family Graduate Scholarship Jan 2019 – Dec 2019

- An award of 2600 CAD from May and John Lockhart for a Computer Science graduate student based on academic credit and extra-curricular contribution of computer science skills to the community

Mitacs Globallink Research Award Sep 2018 – Dec 2018

- A scholarship of 6000 CAD is awarded by Mitacs, Canada to graduate students to conduct 12-14 weeks of a research project in overseas universities.
- Won the scholarship for my research project titled "Complementarity in infinite dimensions" at the University of Oxford under the supervision of Dr. Bob Coecke and Dr. Jamie Vicary

Most Disruptive Technology Award Apr 2017

- My team won an award of 600 CAD at the ProtoChallenge 2017 organized by Women in Science and Engineering, the University of Calgary in partnership with Skunkworks cooperative
- Awarded for developing the prototype food-sharing web platform to minimize food waste

Graduate Merit Scholarship Sep 2014 – Dec 2014

- The scholarship of 1800 CAD is awarded by the David. R. Cheriton School of Computer Science at the University of Waterloo to meritorious graduate students near to the degree completion.

COMMITTEES

Sponsorship Chair, 6th International Conference on Applied Category Theory July 2023
Co-chair, NIST workshop on Compositional structures for Systems Engg. and Design Nov 2022
Co-organizer, 27th Foundational Methods in Computer Science Workshop 2019 July 2019

COMMUNITY SERVICE AND LEADERSHIP

Volunteer Let's Talk Science, University of Calgary Aug 2019 – Apr 2020

- Presented a 60 min workshop for preschool/kindergarten/grade1/2 children at the Country Hills Library on elasticity and friction

(Further activities of Let's Talk Science were cancelled due to the onset of CoVid-19)

Garden Leader University of Calgary Garden Club May 2019 – Apr 2020
Event Coordinator Campus Community Kitchen, University of Calgary May 2019 – Apr 2020

- Planned and organized two summer events for the garden club in partnership with the Campus community kitchen
- Initiated and coordinated 'cook and dine' events in the university campus with the vegetables and herbs grown in the community garden for the garden club members and the university community

Vice President Communications Jan 2016 – Aug 2016
Computer Science Graduate Student Association, University of Calgary

- Handled the promotion of CSGSA and its events to the university community, and the internal communication

Program Coordinator, Healthy Living Initiative May 2014 – Dec 2014
David R. Cheriton School of Computer Science, University of Waterloo

- Conceived the idea of a not-for-profit weekly fruit salad sale to promote healthy eating and to support local farmers
- Designed the event to be self-sustainable on the concept of 'Eat what you want, pay what you like' thereby making the event more student-friendly and one of its kind
- Played a key role in procuring funding for the initiative
- Recruited and coordinated volunteers for buying fruits and plates, preparing the salad, etc.

Graduate Student Ambassador Oct 2013 – Dec 2014
David R. Cheriton School of Computer Science, University of Waterloo

- Provided online support for incoming as well as prospective graduate students on courses, research areas, on and off-campus housing, and international travel arrangements

OTHER ACTIVITIES

Gardener Community Garden, University of Calgary Garden Club Apr 2018 – Aug 2019
Volunteer Biodiversity Bee, Brentwood Community Association Apr 2016 – Aug 2020
Artist Paint Party, Graduate Student Association, University of Calgary Apr 2016 – Dec 2019