# Frank (Peng) Fu


| | |
|---|---|
| Email: | pfu@cse.sc.edu |
| Website: | `https://cse.sc.edu/~pfu` |
| Mailing Address: | Computer Science and Engineering Department,<br>Storey Innovation Center, Rm 2200<br>550 Assembly Street,<br>Columbia, SC 29201 |


## Education

- Ph.D. Department of Computer Science, University of Iowa, Iowa City, Iowa, USA. September 2009 – August 2014. Advisor: Aaron Stump. Thesis Title: Lambda encodings in type theory.
- B.Eng. School of Computer Science, Huazhong University of Science and Technology, Wuhan, Hubei, China. September 2005 – June 2009.

## Academic positions

- Assistant Professor, University of South Carolina, Columbia, South Carolina, USA. 2023 August – present
- Postdoctoral Researcher, Dalhousie University, Halifax, Nova Scotia, Canada. May 2017 – August 2023.
- Lecturer, Discrete Structures I, Dalhousie University, Canada. May – July, 2019 and 2020.
- Postdoctoral Researcher, Heriot-Watt University, Edinburgh, Scotland, UK. March – August 2016.
- Postdoctoral Researcher, University of Dundee, Dundee, Scotland, UK. October 2014 – February 2016.

## Publications


[1] Peng Fu and Peter Selinger. **Towards an induction principle for nested data types**. To appear in *29th Workshop on Logic, Language, Information and Computation (WoLLIC 2023), Halifax, Canada.* Also available from `arXiv:2306.10124`., July 2023

[2] Peng Fu, Kohei Kishida, Neil J. Ross, and Peter Selinger. **Proto-Quipper with Dynamic Lifting**. *Proc. ACM Program. Lang.*, 7(POPL), jan 2023. Also available from `arXiv:2204.13041`

[3] Peng Fu, Kohei Kishida, and Peter Selinger. **Linear Dependent Type Theory for Quantum Programming Languages**. *Logical Methods in Computer Science*, Volume 18, Issue 3, September 2022

[4] Peng Fu, Kohei Kishida, Neil J. Ross, and Peter Selinger. **A biset-enriched categorical model for Proto-Quipper with dynamic lifting**. To appear in *Proceedings of the 19th International Conference on Quantum Physics and Logic (QPL 2022), Oxford, 2022.*. Available from `arXiv:2204.13039`, April 2022

[5] Peng Fu, Kohei Kishida, and Peter Selinger. **Linear dependent type theory for quantum programming languages**. In *Proceedings of the 35th Annual ACM/IEEE Symposium on Logic in Computer Science, LICS 2020, Saarbrücken, Germany*, pages 440–453, 2020. Also available from `arXiv:2004.13472`

[6] Peng Fu, Kohei Kishida, Neil J. Ross, and Peter Selinger. **A tutorial introduction to quantum circuit programming in dependently typed Proto-Quipper**. In *Proceedings of the 12th International Conference on Reversible Computation, RC 2020, Oslo, Norway*, volume 12227 of *Lecture Notes in Computer Science*, pages 153–168. Springer, 2020. Also available from `arXiv:2005.08396`

[7] Peng Fu and Ekaterina Komendantskaya. **Operational semantics of resolution and productivity in Horn clause logic**. *Formal Aspects of Computing*, 29(3):453–474, May 2017

[8] Aaron Stump and Peng Fu. **Efficiency of lambda-encodings in total type theory**. *Journal of Functional Programming*, 26:e3, 2016

[9] Peng Fu, Ekaterina Komendantskaya, Tom Schrijvers, and Andrew Pond. **Proof Relevant Corecursive Resolution**. In Oleg Kiselyov and Andy King, editors, *Functional and Logic Programming*, pages 126–143, Cham, 2016. Springer International Publishing

[10] Peng Fu and Ekaterina Komendantskaya. **A Type-Theoretic Approach to Resolution**. In Moreno Falaschi, editor, *Logic-Based Program Synthesis and Transformation*, pages 91–106, Cham, 2015. Springer International Publishing

[11] Peng Fu and Aaron Stump. **Self Types for Dependently Typed Lambda Encodings**. In Gilles Dowek, editor, *Rewriting and Typed Lambda Calculi*, pages 224–239, Cham, 2014. Springer International Publishing

[12] Garrin Kimmell, Aaron Stump, Harley D. Eades, Peng Fu, Tim Sheard, Stephanie Weirich, Chris Casinghino, Vilhelm Sjöberg, Nathan Collins, and Ki Yung Ahn. **Equational Reasoning about Programs with General Recursion and Call-by-Value Semantics**. In *Proceedings of the Sixth Workshop on Programming Languages Meets Program Verification*, PLPV '12, page 15–26, New York, NY, USA, 2012. Association for Computing Machinery

[13] Vilhelm Sjöberg, Chris Casinghino, Ki Yung Ahn, Nathan Collins, Harley D. Eades III, Peng Fu, Garrin Kimmell, Tim Sheard, Aaron Stump, and Stephanie Weirich. **Irrelevance, Heterogeneous Equality, and Call-by-value Dependent Type Systems**. In James Chapman and Paul Blain Levy, editors, *Proceedings Fourth Workshop on Mathematically Structured Functional Programming, MSFP@ETAPS 2012, Tallinn, Estonia, 25 March 2012*, volume 76 of *EPTCS*, pages 112–162, 2012

[14] Peng Fu, Aaron Stump, and Jeffrey Vaughan. **A Framework for Internalizing Relations into Type Theory**. In *PSATTT'11: International Workshop on Proof-Search in Axiomatic Theories and Type Theories*, Wroclaw, Poland, August 2011. Germain Faure, Stéphane Lengrand, Assia Mahboubi

## Conference and workshop presentations

- **Towards an induction principle for nested data types**, July 13, 2023, 29th Workshop on Logic, Language, Information and Computation, WoLLIC 2023, Halifax, Canada
- **Towards an induction principle for nested data types**, June 8, 2023, 30th Foundational Methods in Computer Science Workshop, Mount Allison University, Sackville, New Brunswick, Canada.
- **Designing quantum programming languages with types**, April 26, 2023, University of South Carolina, Online.
- **Proto-Quipper with dynamic lifting**, April 5, 2023, Quantum Information Theory seminar, University of Bristol. Online.
- **Designing quantum programming languages with types**, March 17, 2023, Toronto Metropolitan University, Toronto, Canada.
- **Proto-Quipper with dynamic lifting**, January 20, 2023, 50th ACM SIGPLAN Symposium on Principles of Programming Languages. Online.
- **Programming quantum circuits with Proto-Quipper**, Invited talk, Quantum Information Theory, December 4, 2022, CMS Winter Meeting, Toronto, Canada.

- **Proto-Quipper with dynamic lifting**, June 27th - July 1st, 2022, 19th International Conference on Quantum Physics and Logic, Oxford, UK.
- **A biset-enriched categorical model for Proto-Quipper with dynamic lifting**, June 27 - July 1, 2022, 19th International Conference on Quantum Physics and Logic, Oxford, UK.
- **A biset-enriched categorical model for Proto-Quipper with dynamic lifting**, 21 – 26 June, 2022, 29th Foundational Methods in Computer Science Workshop (FMCS), University of Calgary, Calgary, Canada.
- **Proto-Quipper: a quantum programming language**, July 2, 2021, Logic, Quantum Computing, and Artificial Intelligence, Online workshop.
- **Linear dependent theory for quantum programming languages**, June 11, 2021, 18th International Conference on Quantum Physics and Logic, Online conference.
- **Linear dependent theory for quantum programming languages**, July 8, 2020, 35th Annual ACM/IEEE Symposium on Logic in Computer Science, Online conference.
- **A tutorial introduction to quantum circuit programming in dependently typed Proto-Quipper**, July 10th, 2020, 12th Conference on Reversible Computation, Online conference.
- **Linear dependent types for quantum circuit programming**, February 17th, 2020, University of Maryland, College Park, Maryland, USA.
- **Dependent types in Proto-Quipper**, September 20, 2018, Dagstuhl Seminar: Quantum Programming Languages, Dagstuhl, Germany.
- **Proof relevant corecursive resolution**. June 22, 2016, The Scottish Programming Languages Seminar, Heriot-Watt University, Edinburgh, UK.
- **A type-theoretic approach to structural resolution**. July 13, 2015, 25th International Symposium on Logic-Based Program Synthesis and Transformation, Siena, Italy.
- **Self types for dependently typed lambda encodings**. July 15, 2014, Joint 25th International Conference on Rewriting Techniques and Applications and 12th International Conference on Typed Lambda Calculi and Applications, Vienna, Austria.
- **Dependent lambda encoding with self types**. September 2013, ACM SIGPLAN Workshop on Dependently-Typed Programming(DTP), Boston, MA.
- **A framework for internalizing relations into type theory**. August 2011, International Workshop on Proof-Search in Axiomatic Theories and Type Theories, Wroclaw. Poland.

## Service

- **Organizer**. Atlantic Category Theory Seminar (2022 Winter – 2023 Winter).
- **Program committee member**.
  - The 8th International Conference on Formal Structures for Computation and Deduction (FSCD 2023).
  - The Third International Workshop on Programming Languages for Quantum Computing (PLanQC 2022).
- **Reviewer**.
  Conferences

  - The 20th International Conference on Quantum Physics and Logic (QPL 2023).
  - The 19th International Conference on Quantum Physics and Logic (QPL 2022).
  - The 9th International Conference on Foundations of Software Science and Computation Structures (FoSSaCS 2016).
  - The 32nd International Conference on Logic Programming (ICLP 2016).
  - The 24th International Conference on Rewriting Techniques and Applications (RTA 2013).

  Journals

  - IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (2023).
  - ACM Transactions on Quantum Computing (2023).
  - Information and Computation (2023).
  - Theoretical Computer Science (2022).
  - Logical Methods in Computer Science (2021).

- **Volunteering**.
  - Local organizer, 29th Workshop on Logic, Language, Information and Computation, WoLLIC 2023, Halifax, Canada, July 11–14, 2023.
  - Local organizer, 15th International Conference on Quantum Physics and Logic, QPL 2018, Halifax, Canada, June 3–7, 2018.

## Teaching

- **University of South Carolina**
  - CSCE 330:002 Programming language structures. (Fall 2023)
- **Dalhousie University**
  - **Undergraduate courses**
    - Discrete structures I (Summer 2019, Summer 2020).
  - **Course development**
    - Topic in Logics: theorem proving in Agda, Spring 2021.
  - **Special lectures**
    - Fun with cryptography, Math Circles monthly online event (February 2021, March 2022).
- **University of Dundee** (2015)
  - Introduction to functional programming in Haskell, Spring 2015.
- **University of Iowa** (2009 – 2014)
  - Graduate Teaching Assistant.