

# Frank (Peng) Fu

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## 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

- Postdoctoral Researcher, Dalhousie University, Halifax, Nova Scotia, Canada. May 2017 to present.
- Lecturer (co-instructor), Discrete Structures I (online), Dalhousie University, Canada. May 1, 2020 to July 31, 2020.
- Lecturer, Discrete Structures I, Dalhousie University, Canada. May 1, 2019 to July 31, 2019.
- Postdoctoral Researcher, University of Dundee and Heriot-Watt University, Scotland, UK. October 2014 to August 2016.

## Refereed conference publications

### C1 **Proto-Quipper with dynamic lifting.**

Peng Fu, Kohei Kishida, Neil J. Ross, Peter Selinger, Conditionally accepted, 50th ACM SIGPLAN Symposium on Principles of Programming Languages, POPL 2023.

### C2 **A biset-enriched categorical model for Proto-Quipper with dynamic lifting.**

Peng Fu, Kohei Kishida, Neil J. Ross, Peter Selinger, 19th International Conference on Quantum Physics and Logic, QPL 2022.

### C3 **Linear dependent type theory for quantum programming languages.**

Peng Fu, Kohei Kishida, Peter Selinger, 35th Annual ACM/IEEE Symposium on Logic in Computer Science, LICS 2020.

### C4 **A tutorial introduction to quantum circuit programming in dependently typed Proto-Quipper.**

Peng Fu, Kohei Kishida, Neil J. Ross, Peter Selinger, 12th Conference on Reversible Computation, RC 2020.

### C5 **Proof relevant corecursive resolution.**

Peng Fu, Ekaterina Komendantskaya, Tom Schrijvers, Andrew Pond. 13th International Symposium on Functional and Logic Programming, FLOPS 2016.

### C6 **A type-theoretic approach to resolution.**

Peng Fu, Ekaterina Komendantskaya. 25th International Symposium on Logic-Based Program Synthesis and Transformation, LOPSTR 2015.

### C7 Self types for dependently typed lambda encodings.

Peng Fu, Aaron Stump. Joint 25th International Conference on Rewriting Techniques and Applications and 12th International Conference on Typed Lambda Calculi and Applications, RTA-TLCA 2014.

## Refereed journal publications

### J1 Linear dependent type theory for quantum programming languages.

Peng Fu, Kohei Kishida, Peter Selinger, Logical Methods in Computer Science, 2022

### J2 Operational semantics of resolution and productivity in horn clause logic.

Peng Fu, Ekaterina Komendantskaya. Formal Aspect of Computing, 2017.

### J3 Efficiency of lambda-encodings in total type theory.

Aaron Stump, Peng Fu. Journal of Functional Programming, 2016.

## Refereed workshop publications

### W1 Equational reasoning about programs with general recursion and call-by-value semantics.

Garrin Kimmell, Aaron Stump, Harley Eades III, **Peng Fu**, Tim Sheard, Stephanie Weirich, Chris Casinghino, Vilhelm Sjöberg, Nathan Collins, Ki Yung Ahn. Programming Languages meets Program Verification, PLPV 2012.

### W2 Irrelevance, heterogeneous equality, and call-by-value dependent type Systems.

Vilhelm Sjöberg, Chris Casinghino, Ki Yung Ahn, Nathan Collins, Harley Eades III, **Peng Fu**, Garrin Kimmell, Tim Sheard, Aaron Stump, Stephanie Weirich. Mathematically Structured Functional Programming, MSFP 2012.

### W3 A framework for internalizing relations into type theory.

Peng Fu, Aaron Stump, Jeff Vaughan. International Workshop on Proof-Search in Axiomatic Theories and Type Theories, PSATTT 2011.

## Manuscripts

### M1 On the Lambek embedding and the category of product-preserving presheaves.

Peng Fu, Kohei Kishida, Neil J. Ross, Peter Selinger, 2022, Preprint available at arXiv: <https://arxiv.org/abs/2205.06068>.

### M2 Dependently typed folds for nested data types.

Peng Fu, Peter Selinger, 2018, Preprint available at arXiv: <https://arxiv.org/abs/1806.05230>.

### M3 A type checking algorithm for higher-rank, impredicative and second-order Types.

Peng Fu, 2017, Preprint available at arXiv: <http://arxiv.org/abs/1711.04718>.

### M4 Representing nonterminating rewriting with $F_2^\mu$ .

Peng Fu, 2017, Preprint available at arXiv: <http://arxiv.org/abs/1706.00746>.

## Teaching experience

- Teaching assistant, “Topic in Logics: theorem proving in Agda”, 2021 Spring, Dalhousie University.
- Lecturer (Co-instructor), “Discrete structures I”, 2020 Summer, Dalhousie University.
- Lecturer, “Discrete structures I”, 2019 Summer, Dalhousie University.
- Teaching Assistant, “Introduction to functional programming in Haskell”, 2015 Spring. Computer Science, University of Dundee.
- Graduate Teaching Assistant, “Programming Language Concepts”, 2013 Spring, 2014 Spring. Department of Computer Science, The University of
- Graduate Teaching Assistant, “Object-Oriented Software Development ”, 2013 Fall. Department of Computer Science, The University of Iowa.
- Graduate Teaching Assistant, “Computer Networking”, 2009 Fall. Department of Computer Science, The University of Iowa.

## Conference and workshop presentations

- **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 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 21st - June 26th, 2022, 29th Foundational Methods in Computer Science Workshop (FMCS), University of Calgary, Canada.
- **Proto-Quipper: a quantum programming language**, July 2nd, 2021, Logic, Quantum Computing, and Artificial Intelligence, Online workshop.
- **Linear dependent theory for quantum programming languages**, June 11th, 2021, 18th International Conference on Quantum Physics and Logic, Online conference.
- **Linear dependent theory for quantum programming languages**, July 8th, 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.
- **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, Wrocław. Poland.

## Professional activities

- Organizer. Atlantic Category Theory Seminar (2022 winter-present).
- Program committee. 8th International Conference on Formal Structures for Computation and Deduction (FSCD 2023).
- Program committee. The Third International Workshop on Programming Languages for Quantum Computing (PLanQC 2022).
- External Reviewer. 19th International Conference on Quantum Physics and Logic (QPL 2022).
- Reviewer. Theoretical Computer Science (2022).
- Reviewer. Logical Methods in Computer Science (2021).
- Reviewer. Quantum journal (2020).
- External Reviewer. 19th International Conference on Foundations of Software Science and Computation Structures (FoSSaCS 2016).
- External Reviewer. 32nd International Conference on Logic Programming (ICLP 2016).
- External Reviewer. 24th International Conference on Rewriting Techniques and Applications (RTA 2013).