Lei Zhang

CONTACT *Phone:* 1 (647) 771-5490 *E-mail:* leiz86@gmail.com

HIGHLIGHTS

- Theoretical research in error-correcting codes with focus on quantum key-distribution and fiber-optic communications
- Practical code design experience at Nokia Bell Labs, Inphi, and Cipher Q
- Experienced in scientific software development using C/C++, Python, and Matlab
- Strong knowledge of coding and information theory, inference, optimization, and signal processing

EDUCATION

PhD, Electrical Engineering **Sep. 2011 - Jan. 2017**
University of Toronto, Canada

Advisor: Prof. Frank R. Kschischang
GPA: 3.94 / 4.0
Thesis: Analysis and Design of Staircase Codes for High Bit-Rate Fiber-Optic Communication
Selected Courses: Error-Correcting Codes, Information Theory, Optimization, Graph Theory
Teaching: Probability and Random Processes, Digital Communications, Signals and Systems

MASc, Electrical Engineering **Sep. 2009 - Jun. 2011**
University of Toronto, Canada

Advisor: Prof. Frank R. Kschischang
GPA: 4.0 / 4.0
Thesis: Design of Multi-Edge-Type LDPC Codes for High-Order Coded Modulation

BASc, Electrical Engineering, Math Option **Sep. 2004 - Jun. 2009**
University of Waterloo, Canada

Co-op: Broadcom, Pixelworks, AB Sciex
GPA: 94.8 / 100
Courses: Coding Theory, Abstract Algebra, Real Analysis, PDEs, Network Security

Bell Labs, Stuttgart, Germany **Jun. 2015 - Nov. 2015**
Research Intern

- Designed low-complexity channel codes for several optical-fiber communication architectures
- Developed C++ simulator with 10 million bits per second simulated throughput
- 5 inventions, 1 patent, 2 publications

Cipher Q (formerly QKD Corp.), Toronto, Canada **Sep. 2013 - Apr. 2015**
Research Scientist (part-time)

- Designed high-throughput multi-edge LDPC codes for quantum key-distribution
- Developed C simulations with block-length of 1 million bits and message-passing decoding
- 1 patent, 1 publication

Inphi (formerly Cortina Systems), Ottawa, Canada **May 2013 - Aug. 2013**
System Design Engineering Intern

- Designed efficient soft-input erasure-declaration algorithm for block codes
- Developed soft-input concatenated coding scheme for optical interconnects
- Characterized performance of Turbo equalization for concatenated coding scheme

SELECTED PUBLICATIONS

Zhang L. M., and Kschischang F. R., "Complexity-Optimized Concatenated LDGM-Staircase Codes", *IEEE International Symposium on Information Theory (ISIT 2017)*, Jun. 2017, Aachen,

Germany.

Milicevic, M., Feng C., **Zhang L. M.**, and Gulak P. G., "Quasi-Cyclic Multi-Edge LDPC Codes for Long-Distance Quantum Cryptography", *Nature Quantum Information (submitted)*, 2017

Zhang L. M., and Kschischang F. R., "Low-Complexity Soft-Decision Concatenated LDGM-Staircase FEC for High Bit-Rate Fiber-Optic Communication", *Journal of Lightwave Technology*, 2017

Zhang L. M., and Schmalen L., "Feed-Forward Staircase Codes", *IEEE Transactions on Communications (under review)*, Apr. 2016. Pre-print: https://arxiv.org/abs/1604.06574.

Zhang L. M., and Kschischang F. R., "Concatenated LDGM-Staircase Codes for Long-haul Optical-fiber Networks", *Biennial Symposium on Communications (BSOC 2016)*, Jun. 2016, Kelowna, Canada.

Truhachev D., Karami A., **Zhang L.**, and Kschischang F. R., "Decoding Analysis Including Mis-Corrections for Spatially-Coupled Split-Component Codes", *IEEE International Symposium on Information Theory (ISIT 2016)*, Jul. 2016, Barcelona, Spain.

Zhang L. M., Truhachev D., and Kschischang F. R., "Spatially-coupled Split-component Codes with Iterative Algebraic Decoding", *IEEE Transactions on Information Theory (under review)*, Oct. 2015. Pre-print: https://arxiv.org/abs/1512.01132.

Zhang, L. M., Truhachev, D., and Kschischang, F. R.,"Spatially-coupled Split-component Codes with Bounded-distance Component Decoding" *IEEE International Symposium on Information Theory (ISIT 2015)*, 14-19 June 2015, Hong Kong, China.

Truhachev D., **Zhang L.**, and Kschischang F. R., "Information Transfer Bounds on Iterative Thresholds of Staircase Codes", *Information Theory and Applications Workshop (ITA)*, 1-6 Feb. 2015, San Diego, California, USA.

Zhang L. M., and Kschischang F. R., "Staircase Codes With 6% to 33% Overhead," *Journal of Lightwave Technology*, vol. 32, no. 10, pp. 1999-2002, May 2014.

Zhang L. M., and Kschischang F. R., "Multi-edge-type Low-density Parity-check Codes for Bandwidth efficient Modulation," *IEEE Transactions on Communications*, vol. 61, no. 1, pp. 43-52, Jan. 2013.

Patents and Applications

Milicevic, M., Feng C., **Zhang L. M**, and Gulak P. G., "Key Reconciliation with Low-Density Parity-Check Codes for Long-Distance Quantum Cryptography", 2017. USPTO No. 62/454,741.

Zhang L. M., Schmalen L., "Method and Aparatus for Forward Error Correction Encoding", 2016. European Patent Office No. EP 16305442.2.