



Conference Guide

CWIT 2017

2017 15th Canadian Workshop on Information Theory (CWIT)

June 11-14, 2017
Quebec City,
Quebec, Canada



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WELCOME MESSAGE FROM THE GENERAL CHAIRS

Dear participants,

On behalf of the organizing committee, we warmly welcome you to the 15th Canadian Workshop on Information Theory (CWIT 2017) in beautiful and historic Quebec City. This is the 15th workshop to be held under the auspices of the Canadian Society of Information Theory (CSIT) and the second one in Quebec City: the 4th Canadian Workshop on Information Theory was held in Lac Delage, near Quebec City, in May 1995.

The technical program committee has organized an impressive program on research trends and advances in Information Theory. We are pleased to welcome a number of authors from Canada, the United States, Asia, Europe, the Middle East and Africa. Special thanks go to the technical program committee chairs that organized a very efficient and smooth reviewing process. We would also like to thank all the TPC members for their professional and timely review of technical contributions.

Three plenary talks will be featured at the Workshop. They will be given by Prof. Muriel Médard, Massachusetts Institute of Technology, Prof. André Levchenko, Yale University, and Prof. Alexandros Dimakis, University of Texas at Austin. The Workshop also includes a special track on Biological Information Theory with invited speakers. We would like to thank Prof. Andrew Eckford and Prof. Adam Noel for organizing this special track.

The CWIT 2017 organization and program would not have been possible without the support from an outstanding team of colleagues: we would like to thank all members of the CWIT 2017 organization committee for their support during all phases of the Workshop planning. We would also like to thank the Institute for Information Technologies and Societies (ITIS) at Laval University for its logistical support in organizing the Workshop.

Finally, we wish you an inspiring Workshop on Information Theory and an enjoyable stay in Quebec City.

Jean-Yves Chouinard and Paul Fortier General Chairs, 15th Canadian Workshop on Information Theory

	Sunday, June 11	Monday, June 12	Tuesday, June 13	Wednesday, June 14
8:50 - 9:00		<i>Welcome Remarks</i>		
9:00 - 10:00		PL1: <i>Plenary Speaker 1</i>	PL2: <i>Plenary Speaker 2</i>	PL3: <i>Plenary Speaker 3</i>
10:00 - 10:30		CB1: <i>Coffee Break</i>	CB3: <i>Coffee Break</i>	CB5: <i>Coffee Break</i>
10:30 - 12:10		NCIT: <i>Network Coding and Information Theory</i>	ITLC: <i>Information Theory in Living Cells</i>	CS: <i>Communication Systems</i>
12:10 - 12:30		LB1: <i>Lunch Break</i>	LB2: <i>Lunch Break</i>	CR: <i>Closing Remarks</i>
12:30 - 12:40				
12:40 - 13:30				
13:30 - 14:00		CTP: <i>Coding Theory and Practice</i>		
14:00 - 15:30			ABIT: <i>Applications of Biological Information Theory</i>	
15:30 - 16:00		CB2: <i>Coffee Break</i>		
16:00 - 16:30		CDS: <i>Cryptology and Data Security</i>	CB4: <i>Coffee Break</i>	
16:30 - 17:20				
17:20 - 17:50			DCSC: <i>Data Compression and Source Coding</i>	
17:50 - 18:00				
18:00 - 19:00			CSIT: <i>Meeting of the Canadian Society of Information Theory</i>	
19:00 - 19:30				
19:30 - 22:00	<i>Welcome Reception</i>		WB: <i>Workshop Banquet</i>	

Sunday, June 11

Sunday, June 11, 19:00 - 22:00

Welcome Reception

Monday, June 12

Monday, June 12, 08:50 - 09:00

Welcome Remarks

Chair: Paul Fortier (Laval University, Canada)

Monday, June 12, 09:00 - 10:00

PL1: Plenary Speaker 1

Guessing revisited

Muriel Médard, Massachusetts Institute of Technology

Chair: Jean-Yves Chouinard (Laval University, Canada)

The problem of characterizing the number of guesses required to guess a string in successive tries was originally studied by Massey. Recent results by Christiansen and Duffy on characterizing guesswork behavior with the large deviation principle permit treatment of interesting new problems in network security, where guessing is tightly linked to password cracking. We begin by showing refinements on guesswork characterization, as well as a geometric interpretation of it. We then present recent guesswork results for wireless jamming and for distributed guessing attacks, with different levels of coordination.

Monday, June 12, 10:00 - 10:30

CB1: Coffee Break

Monday, June 12, 10:30 - 12:10

NCIT: Network Coding and Information Theory

Chair: Jean-Yves Chouinard (Laval University, Canada)

10:30 Coded Caching with Non-Identical User Demands

Haider Al-Lawati, Nuwan S. Ferdinand and Stark Draper (University of Toronto, Canada)

10:50 SIC Aided Physical-layer Network Coding for Multi-way Relay Channels

Hao Li (McGill University, Canada); Yunlong Cai (Zhejiang University, P.R. China); Benoit Champagne (McGill University, Canada)

11:10 Asymptotically Tight Performance Bounds for Equal-Gain Combining Over a New Correlated Fading Channel

Adebola Adebawale (University of British Columbia Okanagan, Canada); Julian Cheng (University of British Columbia, Canada); Jonathan F Holzman (University of British Columbia (UBC) Okanagan, Canada)

11:30 A New Technique for Analyzing Asymptotic Outage Performance of Diversity Over Lognormal Fading Channels

Bingcheng Zhu (Nanjing University of Posts and Telecommunications, P.R. China); Julian Cheng (University of British Columbia, Canada); Jun Yan and Jin-Yuan Wang (Nanjing University of Posts and Telecommunications, P.R. China); Lenan Wu (Southeast University, P.R. China); Yongjin Wang (NJUPT, P.R. China)

11:50 Robust LT Designs in Binary Erasures

Khaled F. Hayajneh and Shahram Yousefi (Queen's University, Canada)

Monday, June 12, 12:10 - 13:30

LB1: Lunch Break

Monday, June 12, 13:30 - 15:30

CTP: Coding Theory and Practice

Chair: Yongyi Mao (University of Ottawa, Canada)

13:30 Performance Analysis of Convolutional Codes over the Bernoulli-Gaussian Impulsive Noise Channel

Hassan Hamad (Technical University of Munich, Germany); Ghassan M. Kraidy (Notre Dame University - Louaize, Lebanon)

13:50 Truncated Poisson Distribution for Encoding of Systematic Rateless Codes in Massive Distributed Storage Systems

Toritseju Okpotse (Queens University, Canada); Shahram Yousefi (Queen's University, Canada)

14:10 On minimum distance of locally repairable codes

Mehrtash Mehrabi and Masoud Ardakani (University of Alberta, Canada)

14:30 Almost Minimum-Redundancy Construction of Balanced Codes Using Limited-Precision Integers

Danny Dubé and Mounir Mechqrane (Université Laval, Canada)

14:50 Worst-case, information and all-blocks locality in distributed storage systems: An explicit comparison

Roberta Barbi (Université de Neuchâtel, Switzerland); Valerio Schiavoni (University

of Neuchatel, Switzerland); Hugues Mercier (Université de Neuchâtel, Switzerland); Pascal Felber (University of Neuchatel, Switzerland)

15:10 On the Design of Good LDPC Codes with Joint Genetic Algorithm and Linear Programming Optimization

Ahmadreza Amirzadeh, Mohamed Haj Taieb and Jean-Yves Chouinard (Laval University, Canada)

Monday, June 12, 15:30 - 16:00

CB2: Coffee Break

Monday, June 12, 16:00 - 17:20

CDS: Cryptology and Data Security

Chair: Julian Cheng (University of British Columbia, Canada)

16:00 Physical Layer Secrecy for Wireless Communication Systems using Adaptive HARQ with Error Contamination

Ahmadreza Amirzadeh, Mohamed Haj Taieb and Jean-Yves Chouinard (Laval University, Canada)

16:20 The Operational Secrecy Capacity of Cognitive Radio MIMO Channel

Limeng Dong (Northwestern Polytechnical University & University of Ottawa, P.R. China); Sergey Loyka (University of Ottawa, Canada); Li Yong (Shaanxi, xi'an, P.R. China)

16:40 Secrecy Rate Maximization for MIMO Wiretap Channels with Channel Uncertainty

Mohamed Lassaad Ammari (University of Sousse, Tunisia); Paul Fortier (Laval University, Canada)

17:00 Convolutional Code Design for Secure Transmission on a Two-Link Compound Wiretap Channel

Ghassan M. Kraïdy (Notre Dame University - Louaize, Lebanon)

Tuesday, June 13

Tuesday, June 13, 09:00 - 10:00

PL2: Plenary Speaker 2

Information transfer in living cells: from bits to decisions
André Levchenko, Yale University

Chair: Andrew Eckford (York University, Canada)

Biology is an information science par excellence. One of the key functions of biological systems is the storage of genetic information and its use in a way conditioned on the information from environmental inputs. In this talk I will review the recent exciting developments in evaluation of information processing by the dedicated signaling pathways and networks within living cells. I will also introduce the new directions in this research, focusing in particular on how the information about environmental changes generates complex cell population responses, and ultimately results in shaping of living tissues and other key biological functions. I will argue that the language of information theory can be a universal language allowing convergence of biological and engineering systems on the way to design of hybrid organisms of the future.

Tuesday, June 13, 10:00 - 10:30

CB3: Coffee Break

Tuesday, June 13, 10:30 - 12:30

ITLC: Information Theory in Living Cells

Chair: Andrew Eckford (York University, Canada)

10:30 *On the channel capacity of channel rhodopsin (and other biological signal transduction pathways)*

Peter J Thomas (Case Western Reserve University, USA)

11:00 *Microeconomics: the price of information transfer in living cells*

Michael Hinczewski (Case Western Reserve University, USA)

11:30 *Collective information processing by communicating cells*

Andrew Mugler (Purdue University, USA)

12:00 *On Population Density Estimation via Quorum Sensing*

Nicolò Michelusi (Purdue University, USA)

Tuesday, June 13, 12:30 - 13:30

LB2: Lunch Break

Tuesday, June 13, 14:00 - 16:00

ABIT: Applications of Biological Information Theory

Chair: Adam Noel (University of Ottawa, Canada)

14:00 *Mobile Molecular Communication Networks: Applications to Targeted Drug Delivery*

Tadashi Nakano (Osaka University, Japan)

14:30 *Die-Token-Die vs. Wait-Receiver-Wait: Molecular communication with finite symbol intervals*

Christopher Rose (Brown University, USA)

15:00 *On Nanopore Sequencing of the Epigenome in the Presence of Noise*

Lav R. Varshney (University of Illinois at Urbana-Champaign, USA)

15:30 *Chemical Reactions as Transmission Symbols*

Chun Tung Chou (University of New South Wales, Australia)

Tuesday, June 13, 16:00 - 16:30

CB4: Coffee Break

Tuesday, June 13, 16:30 - 17:50

DCSC: Data Compression and Source Coding

Chair: Eric Plourde (Université de Sherbrooke, Canada)

16:30 *Optimality of Inference in Hierarchical Coding for Distributed Object-Based Representations*

Simon Brodeur (Université de Sherbrooke, Canada); Jean Rouat (University of Sherbrooke, Canada)

16:50 *Color-Based Visual Sentiment for Social Communication*

Mayank Amencherla and Lav R. Varshney (University of Illinois at Urbana-Champaign, USA)

17:10 *On Linear Analog Coding of Sources with Memory Over Fading and Broadcast Channels with Correlated Noise*

Pradeepa Yahampath (University of Manitoba, Canada)

17:30 *Hardware-aware Motion Estimation via Low-Resolution Motion Hints*

Pao-Sheng Chou and Nuwan S. Ferdinand (University of Toronto, Canada); Ihab Amer (Advanced Micro Devices, Canada); Stark Draper (University of Toronto, Canada)

Tuesday, June 13, 18:00 - 19:00

CSIT: Meeting of the Canadian Society of Information Theory

Chair: Andrew Eckford (York University, Canada)

Tuesday, June 13, 19:30 - 22:00

WB: Workshop Banquet

Wednesday, June 14

Wednesday, June 14, 09:00 - 10:00

PL3: Plenary Speaker 3

Coding and Femtocaching for Wireless Content Delivery
Alexandros Dimakis, University of Texas at Austin

Chair: Hugues Mercier (Université de Neuchâtel, Switzerland)

Smartphone and tablet proliferation is generating an enormous increase in the demand for multimedia content. Modern wireless networks cannot support this demand and its large projected growth. We argue that caching of popular content can play a fundamental role in addressing this problem and how several novel mathematical and algorithmic problems arise. We focus on the Femtocaching problem and the Coded Caching problem introduced by Maddah-Ali and Niesen and discuss how caching is very promising for giving gains that scale surprisingly well in the size of the wireless system. Unfortunately, we show that for these gains to appear, the cached files must be separated in a number of blocks that scales exponentially in the number of users and files. We show how this can problem can be resolved if we modify the Maddah-Ali and Niesen scheme to place and deliver coded packets in a less optimistic way. These results use techniques from combinatorial optimization, graph theory and coding theory. Specifically, we present connections to the fundamental problem of index coding and discuss several open problems.

Wednesday, June 14, 10:00 - 10:30

CB5: Coffee Break

Wednesday, June 14, 10:30 - 12:30

CS: Communication Systems

Chair: Benoit Champagne (McGill University, Canada)

10:30 Nonnegative Code Division Multiple Access Techniques in Molecular Communication

Linchen Wang and Andrew Eckford (York University, Canada)

10:50 Optimal User Node Placement for Multi-hop FSO Broadcasting Communications Under Weak Turbulence Conditions

Jun Yan, Bingcheng Zhu and Genfa Zhang (Nanjing University of Posts and Telecommunications, P.R. China); Julian Cheng (University of British Columbia, Canada)

11:10 Information Rate of Multi-Antenna Spectrally-Efficient FDM

Communication

Yi Feng and Jan Bajcsy (McGill University, Canada)

11:30 Efficient Lattice-Reduction-Aided Conditional Detection for MIMO Systems

Mohammad Kazem Izadinasab and Oussama Damen (University of Waterloo, Canada); Hossein Najafi (Huawei Technologies Canada, Canada)

11:50 Adaptive Modulation Analysis in MIMO-OSTBC Systems over Nakagami-M Keyhole Channels

Mohamed Lassaad Ammari (University of Sousse, Tunisia); Paul Fortier (Laval University, Canada)

12:10 An Architecture for Non-Orthogonal Multi-Carrier Faster-than-Nyquist Transmission

Toluwanimi Fagorusi, Yi Feng and Jan Bajcsy (McGill University, Canada)

Wednesday, June 14, 12:30 - 12:40

CR: Closing Remarks

Chair: Jean-Yves Chouinard (Laval University, Canada)

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